Boston-Logan International Airport

2011 ESPR

ENVIRONMENTAL STATUS AND PLANNING REPORT

credit: Massport\Rudy Chiarello

April 2013

EOEA #3247

SUBMITTED TO
Executive Office of Energy and Environmental Affairs, MEPA Office

SUBMITTED BY
Massachusetts Port Authority
Economic Planning & Development

PREPARED BY
VHB

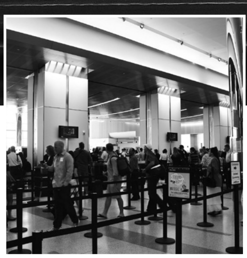
IN ASSOCIATION WITH
Harris Miller Miller & Hanson, Inc.
KB Environmental Sciences, Inc.
SH&E, an ICF Company

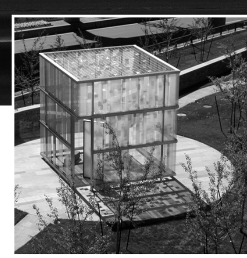
Boston-Logan International Airport

2011 ESPR

ENVIRONMENTAL STATUS AND PLANNING REPORT

credit: Massport\Rudy Chiarello





April 2013
EOEA #3247

SUBMITTED TO
Executive Office of Energy and Environmental Affairs, MEPA Office

SUBMITTED BY
Massachusetts Port Authority
Economic Planning & Development

PREPARED BY
VHB

IN ASSOCIATION WITH
Harris Miller Miller & Hanson, Inc.
KB Environmental Sciences, Inc.
SH&E, an ICF Company

Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909
Telephone (617) 568-5000
www.massport.com

April 12, 2013

The Honorable Richard K. Sullivan, Jr., Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: ***Logan Airport 2011 Environmental Planning and Status Report* (*2011 ESPR*) - EOEA #3247**

Dear Secretary Sullivan:

On behalf of the Massachusetts Port Authority (Massport), I am pleased to submit for your review, the *Boston-Logan International Airport 2011 Environmental Status and Planning Report* (*2011 ESPR*). Logan Airport continued to show improvements in a number of environmental categories in calendar year 2011 through more efficient operations in cleaner and quieter aircraft and a range of Massport and tenant programs aimed at increasing operating efficiencies and reducing impacts. In addition to presenting the environmental analyses of 2011 Logan Airport activities, this ESPR also provides a long-range analysis of cumulative environmental effects in the future based on projected operations and passengers at the Airport in 2030. This represents Massport's best prediction of future impacts based on the most current data available as well as foreseeable trends in the aviation industry. To provide further context, this ESPR places the analyses of the current (2011) and future (2030) conditions at Logan Airport within the context of historical data from 2004 and earlier when there were more operations and largely greater environmental impacts at Logan Airport. *Chapter 1, Introduction/Executive Summary* also provides an expanded discussion of ongoing airport sustainability initiatives.

Logan Airport saw an overall increase in passengers and aircraft operations in 2011. The trend of increasing activity levels at the Airport marked a continued recovery from high fuel prices and the 2008/2009 economic recession that depressed traffic levels across the U.S. Air traffic increases at Logan Airport have been driven primarily by the growth of low-cost carriers (LCCs), including jetBlue Airways and Southwest Airlines, over the past decade. In 2011, passenger levels at Logan Airport reached a new peak, exceeding the previous 2007 historic peak but with fewer aircraft operations. This *2011 ESPR* considers the continuing effects of airlines operating much more efficiently with cleaner and quieter fleets and flying more passengers per aircraft operation for the future 2030 year analysis. While these changes continue to yield environmental benefits, as the economy and aviation industry recover, Massport anticipates increases in activity levels and passenger growth. The analysis for this projected growth is included in the 2030 forecast sections. As described throughout the *2011 ESPR*, Massport remains fully committed to minimizing those effects. The *2011 ESPR* is outlined below.

Content and Structure

The *2011 ESPR* responds fully to the Secretary's Certificate on the *Boston-Logan International Airport 2010 Environmental Data Report* (*EDR)* and reports on the status of airport operations, environmental conditions, and Massport milestones achieved in 2011. The document also provides updates on more recent significant Logan activities. The document incorporates comments made on the *2010 EDR* and consists of a single volume reporting on 2011 conditions and projections for 2030 for the following categories:

- Highlights for 2011 and 2030, including Logan Airport sustainability initiatives;
- Passenger levels, aircraft operations, aircraft fleets and cargo volumes;
- Planning, design and construction activities at Logan Airport;
- Regional transportation statistics and initiatives;
- Key environmental indicators (Ground Access, Noise Abatement, Air Quality/Emissions Reduction, and Water Quality/Environmental Compliance and Management);
- Mitigation status of Logan Airport projects;
- Secretary's Certificate on the *Boston-Logan International Airport 2010 EDR* and other comment letters received on the *2010 EDR*;
- Individual responses to comments received on the *2010 EDR;*
- Proposed scope for a combined *2012/2013 EDR;*
- Distribution list; and
- Supporting technical appendices.

Review Period, Distribution, and Consultation

To facilitate community and agency review of the expanded *2011 ESPR*, Massport requests an extended 45-day public comment period to begin on **April 24, 2013**, the publication date of the next Environmental Monitor, and to end on **June 7, 2013**. The distribution list included as Appendix D indicates that all parties on the distribution list will be sent an electronic copy of the *2011 ESPR* on CD. A smaller number of reviewers will be sent hard copies of the *2011 ESPR*. The full *2011 ESPR* will also be available on Massport's website (www.massport.com).

A public meeting on the *2011 ESPR* is scheduled for **May 22, 2013** at 6:00 PM at the Logan Office Center, One Harborside Drive, East Boston (Logan Airport). We appreciate the MEPA Office's continued participation in these meetings. Additional copies of the *2011 ESPR* may be obtained by contacting Lisa Carisella at (617) 568-3507 during the 45-day public comment period.

Future Filings and Timing

Starting in 1997, Massport has followed a five-year filing cycle for the *EDRs* and *ESPRs*, with EDRs being filed for each year between the ESPRs. While the last Logan ESPR was filed for calendar year 2004, with prior approval from the Secretary, this next ESPR has been deferred to report on 2011 conditions. As with previous ESPRs, the level of effort involved in preparing the broader *2011 ESPR* analyses and new forecast and planning studies that form the foundation of our long-range environmental analysis is considerably greater than that of an annual EDR. Rather than providing the next EDR update for calendar year 2012 in the fall of 2013, as was done for the 1994 and 1995 annual updates, Massport proposes to report on 2012 and 2013 conditions in a combined EDR to be filed in Fall 2014.

Combining the 2012 and 2013 reports will allow Massport to analyze trends as the economy continues to rebound from the 2008/2009 economic recession. Accordingly, Massport requests an extended schedule for filing the *2012/2013*; specifically, Massport requests the Secretary's approval to file a combined 2012 and 2013 *Logan EDR* in fall 2014**.** Like we have done with the current *ESPR*, we will continue to provide interim updates on key environmental topics on the Massport website (http://www.massport.com/environment/Pages/Default.aspx).

Massport hopes that you and other reviewers of the *2011 ESPR* find it informative and complete. We look forward to your review of this document and to close consultation with you and other reviewers in the coming weeks. Please feel free to contact me at (617) 568-3524 or Tom Ennis at (617) 568-3546, if you have any questions.

Very truly yours,

MASSACHUSETTS PORT AUTHORITY

Stewart Dalzell
Deputy Director, Environmental Planning and Permitting

cc: *2011 ESPR* Distribution List (Appendix D in the *2011 ESPR*)

Table of Contents

List of Appendices

MEPA Appendices

Technical Appendices

List of Tables

Table No.	Description	Page

Table No.	Description	Page

List of Figures

Figure No.	Description	Page

Figure No.	Description	Page

Figure No.	Description	Page

1

Introduction/ Executive Summary

Introduction

Boston-Logan International Airport (Logan Airport or Airport), owned and operated by the Massachusetts Port Authority (Massport), is New England's primary international and domestic airport. This *2011 Environmental Status and Planning Report (2011 ESPR)* is one in a series of annual environmental review documents submitted to the Massachusetts Environmental Policy Act (MEPA)[1] Office since 1989 to report on the cumulative environmental effects of Logan Airport's operations and activities. Approximately every five years, Massport prepares ESPRs, which provide an historical and prospective view of Logan Airport. Environmental Data Reports (EDRs), prepared annually in the intervals between ESPRs, provide a review of environmental conditions for the reporting year compared to the previous year.

The scope for this *2011 ESPR* was established by the Secretary of the Executive Office of Energy and Environmental Affairs' (EOEEA) Certificate dated December 16, 2011, which is included in *Appendix A, MEPA Certificates and Responses to Comments*. This *2011 ESPR* updates and compares the data presented in the *2010 EDR*, and presents activity levels (including aircraft operations and passenger activity) and environmental conditions at Logan Airport for calendar year 2011. In addition to the annual report on 2011 conditions, two other primary functions of this *2011 ESPR* are to provide a discussion of future activity levels at Logan Airport through the year 2030 based on an updated forecast, and to predict the associated potential environmental conditions at the Airport in 2030. To enhance the usefulness of the *2011 ESPR* as a reference document for reviewers, this report also presents historical data on the environmental conditions at Logan Airport dating back to 1990 in instances where historical information is available. Historical data are included in the technical appendices.

1 Massachusetts General Laws Chapter 30, Sections 61-62H. MEPA is implemented by regulations published at 301 Code of Massachusetts Regulations (CMR) 11.00 (the "MEPA Regulations").

EOEA # 3247

Submitted By

Massachusetts Port Authority
One Harborside Drive, Suite 200S
East Boston, MA 02128

Stewart Dalzell, Deputy Director
Environmental Planning and Permitting
(617) 568-3524

Tom Ennis, Senior Project Manager
Economic Planning and Development
(617) 568-3546

Logan Airport Environmental Review Process

This *2011 ESPR* is part of a two-decade-long, progressive state-level environmental review process that assesses Logan Airport's cumulative environmental impacts. The process provides a context against which individual Airport projects meeting state and federal environmental review thresholds are evaluated on a project-specific basis. The Airport-wide and project-specific environmental review processes are described below.

Historical Context for the Logan Airport EDR/ESPR

In 1979, the Secretary of the Executive Office of Environmental Affairs (EOEA) (now EOEEA) issued a Certificate requiring Massport to define, evaluate, and disclose, every three years, the impact of long-term growth at the Airport through a Generic Environmental Impact Report (GEIR). The Certificate also required interim Annual Updates to provide data on conditions for the years between the GEIRs. The GEIR evolved into an effective planning tool for Massport and provided projections of environmental conditions so that the cumulative effects of individual projects could be evaluated within a broader context.

EOEEA eliminated GEIRs following the 1998 revisions to its MEPA Regulations. However, the Secretary's Certificate on the *1997 Annual Update*[2] proposed a revised environmental review process for Logan Airport resulting in Massport's preparation of EDRs/ESPRs. In the last several years, aircraft operations and passenger activity levels and associated environmental effects have remained well below levels previously analyzed for Logan Airport. Thus, the forecasted aviation growth presented in the *2004 ESPR*, the predicate upon which the ESPR schedule was initially established, has not occurred. Accordingly, with the approval of the Secretary, Massport prepared *2009* and *2010 EDRs* in lieu of the scheduled ESPR, now presented.

The *2011 ESPR* provides a comprehensive, cumulative analysis of the effects of all Logan Airport activities based on actual and predicted passenger activity and aircraft operation levels in 2011 and 2030 and presents environmental management plans for addressing areas of environmental concern.

2 Certificate of the Secretary of the Executive Office of Environmental Affairs on the *Logan Airport 1997 Annual Update*, issued on October 16, 1998.

Project-Specific Review

While this Airport-wide review provides the broad planning context for proposed projects and future planning concepts, Airport projects are also subject to a project-specific, public environmental review process when state environmental review thresholds are met. When required, Massport and Airport tenants submit Environmental Notification Forms (ENF) and Environmental Impact Reports (EIR) pursuant to MEPA. Similarly, where National Environmental Policy Act (NEPA)[3] environmental review is triggered, projects are reviewed under the Federal Aviation Administration (FAA) environmental review process.

Analysis Framework for the 2011 ESPR

Massport has adopted a new, long-term forecast for the long-range planning horizon, 2030. Previous forecasts for the *1999 ESPR* and the *2004 ESPR* forecasts anticipated that Logan Airport would be handling 37.5 million annual passengers in 2015 and 42.8 million passengers in 2020, respectively. The *2011 ESPR* provides an opportunity to revisit previous forecasts and revise them based on current and predicted conditions, and to consider a more distant time horizon. For this *2011 ESPR*, Massport updated the Logan Airport long-range forecast with 2015, 2020, and 2030 as the forecast years. Three scenarios were also developed (Low, Moderate, and High). Massport views the Moderate forecast scenario as the most likely forecast of future activity levels at Logan Airport. Massport's forecast under the Moderate scenario predicts that there will be 39.8 million passengers using Logan Airport in 2030. The updated forecast takes into account slower-than-anticipated passenger growth (compared to previous forecasts), the increasing efficiency of aircraft (higher passenger load factors), and fleet mix trends, including a growing prevalence of larger capacity jet aircraft.

This *2011 ESPR* examines both airside and landside activities, including planned Massport projects, and projects being carried out by others that affect the Airport, such as the FAA's Boston Logan Airport Noise Study (BLANS). Future year projections incorporate available information about projects that have undergone or are currently under MEPA review.

Cumulative analysis of airport activities are based on actual and projected passenger activity levels, aircraft operations, and the facilities and services needed to serve them. Analysis conditions for current and future years are used to assess environmental conditions and to develop, evaluate, and adjust environmental management actions.

Technical Analyses

Table 1-1 summarizes the technical analyses conducted for this *2011 ESPR.* The technical and environmental analyses of 2030 are based on the forecast of 39.8 million passengers using Logan Airport in 2030. Further information on the 2030 environmental analyses is provided in detail within subsequent chapters.

3 42 USC Section 4321 et seq. The Federal Aviation Administration implements NEPA through *Federal Aviation Administration Order 1050.1E, Environmental Impacts: Policies and Procedures*, Federal Aviation Administration, United States Department of Transportation, Effective Date: March 20, 2006.

Table 1-1	**2011 Logan Airport ESPR Summary of Technical Analyses, 2011 and 2030**		
Chapter	**Technical Analyses**	**2011**	**2030**
Ground Access	■ Mode Share Analysis	X	
	■ Traffic Volumes	X	X
	■ Parking Conditions	X	X
	■ Vehicle Miles Traveled	X	X
	■ Passenger Ground Access Survey (2010)	X	
Noise	■ Aircraft Operations	X	X
	■ Runway Use	X	X
	■ Noise Contours	X	X
	■ Population Counts	X	X
	■ Cumulative Noise Index	X	
	■ Dwell and Persistence	X	
	■ Time-Above Analysis	X	
	■ Preferential Runway Advisory System (PRAS) Program Compliance	X	
	■ Sound insulation program	X	
Air Quality	■ Emissions Inventory	X	X
	■ Greenhouse Gas Inventory	X	X
	■ Nitrogen Dioxide (NO_2) Monitoring	X	
	■ NO_x emissions (AQI)	X	
Water Quality	■ National Pollutant Discharge Eliminations System (NPDES) permit monitoring results	X	
	■ Fuel Spill reporting	X	

Overview of Logan Airport

Logan Airport is New England's primary domestic and international airport, operating as an origin-destination airport, rather than a connecting hub for major airlines. The Airport plays a key role in the metropolitan Boston and New England passenger and freight transportation networks and is a significant contributor to the regional economy. In 2011, Logan Airport employed approximately 14,000 people, including approximately 970 Massport jobs. The Aeronautics Division of the Massachusetts Department of Transportation (MassDOT) *Statewide Airport Economic Impact Study* found that in 2010, Logan Airport supported over 94,000 jobs in Massachusetts and the total economic impact is now estimated at approximately $8.9 billion per year. The total economic impact includes on-airport, visitor-related, construction, and all associated multiplier impacts.[4] In 2011, Logan Airport was the 18th busiest commercial aviation facility in North America ranked by aircraft operations, and the 20th busiest in North America ranked by number of passengers.[5]

4 MassDOT Statewide Airport Economic Impact Study, December 20, 2011.
5 *ACI-NA Airport Traffic Reports 2011 at* http://www.aci-na.org/content/airport-traffic-reports *accessed August 2012.*

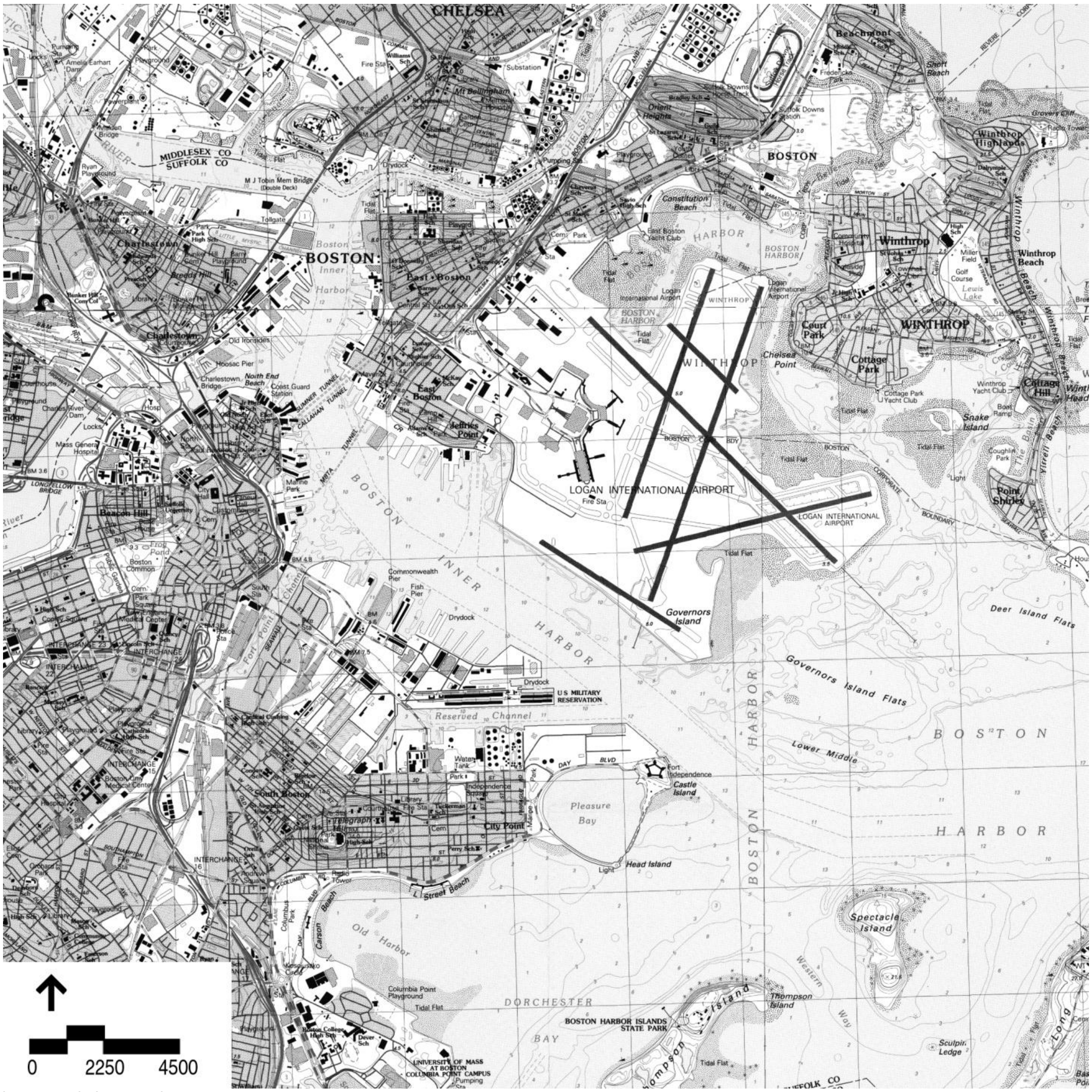
The Airport boundary encompasses approximately 2,400 acres in East Boston and Winthrop, including 700 acres underwater in Boston Harbor. Logan Airport, shown in Figures 1-1 and 1-2, is one of the most land-constrained airports in the nation and is surrounded on three sides by Boston Harbor.

Logan Airport is close to downtown Boston and is accessible by public transit and a well-connected roadway system. The airfield comprises six runways, approximately 15 miles of taxiway, and approximately 240 acres of concrete and asphalt apron. Logan Airport has four passenger terminals (Terminal A, B, C, and E), each with its own ticketing, baggage claim, and ground transportation facilities. Massport continues to evaluate and implement enhancements to Logan Airport's security, operational efficiency, and accessibility to and from the Boston metropolitan area, while carefully monitoring the environmental effects of Logan Airport operations.

Figure 1-1 Aerial View of Logan Airport

Source: Aerial photo, Massport.

Figure 1-2 Logan Airport and Environs



Source: U.S. Geological Service.

Highlights and Accomplishments

This section provides a brief overview of key events and accomplishments at Logan Airport in 2011 and a prediction of 2030 environmental conditions where appropriate. Additional information concerning Airport activities is provided in subsequent chapters. Massport's efforts to further sustainability through specific projects and initiatives are highlighted with a sustainability leaf.

Activity Levels

Highlights in aviation activity at Logan Airport in 2011 include the following:

- The total number of air passengers at Logan Airport increased by 5.4 percent to 28.9 million, compared to 27.4 million in 2010 (see Figure 1-3). Previously, annual air passengers at the Airport increased by 7.5 percent between 2009 and 2010. Passenger levels in 2011 represent a new record, exceeding the 2007 peak of 28.1 million annual air passengers. In 2000, Logan Airport accommodated 27.7 million air passengers.
- The total number of aircraft operations[6] grew from approximately 352,640 in 2010 to 368,990 in 2011, an increase of 2.1 percent. Aircraft operations at Logan Airport in 2011 remained well below the 487,996 operations peak in 2000 and the historic peak achieved in 1998. Passenger aircraft operations, which accounted for 91 percent of total aircraft operations, increased by 0.8 percent compared to 2010 levels.
- General aviation[7] (GA) operations, which accounted for 8 percent of total operations, increased by 92.3 percent over 2010 levels. This marked a strong recovery in GA activity at Logan Airport as a result of improving economic conditions, following steep declines in GA operations from 2008 to 2009 due to the economic recession. The 28,230 GA operations in 2011 were still below the GA levels in 2000, which totaled 35,233 GA operations.
- There were 6,270 dedicated air cargo operations at Logan Airport in 2011, which represents a decline of 0.1 percent compared to the previous year. All-cargo operations have fallen by nearly 50 percent since 2000 when Logan Airport accommodated 12,282 air cargo operations.
- The number of air passengers per aircraft operation continued to increase, climbing from an average of 77.8 passengers per aircraft operation in 2010 to an average of 78.3 passengers per aircraft operation in 2011, reflecting even greater efficiency. This compares to 56.8 passengers per operation in 2000.
- Legacy air carriers maintained tight capacity discipline, while low-cost carriers (LCCs) increased operations. Legacy carriers continued to reduce domestic operations slightly in 2011, eliminating less profitable routes. In contrast, LCC operations have steadily increased. LCCs accounted for 32.5 percent of domestic operations at Logan Airport in 2011, compared to 28.6 percent in 2010, 9.0 percent in 2003 prior to JetBlue Airways' entry, and just 2.9 percent in 2000.
- Air cargo volumes, including shipments transported in the belly compartments of passenger aircraft, decreased from 572 million pounds in 2010 to 555 million pounds in 2011, a decline of 3.1 percent. In comparison, Logan Airport's air cargo volume exceeded 1 billion pounds in 2000. Table 1-2 provides a snapshot of the changes in air passengers, aircraft operations, and cargo and mail volume levels from 2000 to 2011.

6 An aircraft operation is defined as one arrival or one departure.
7 General Aviation (GA) is defined as all aviation activity other than commercial airline and military operations.

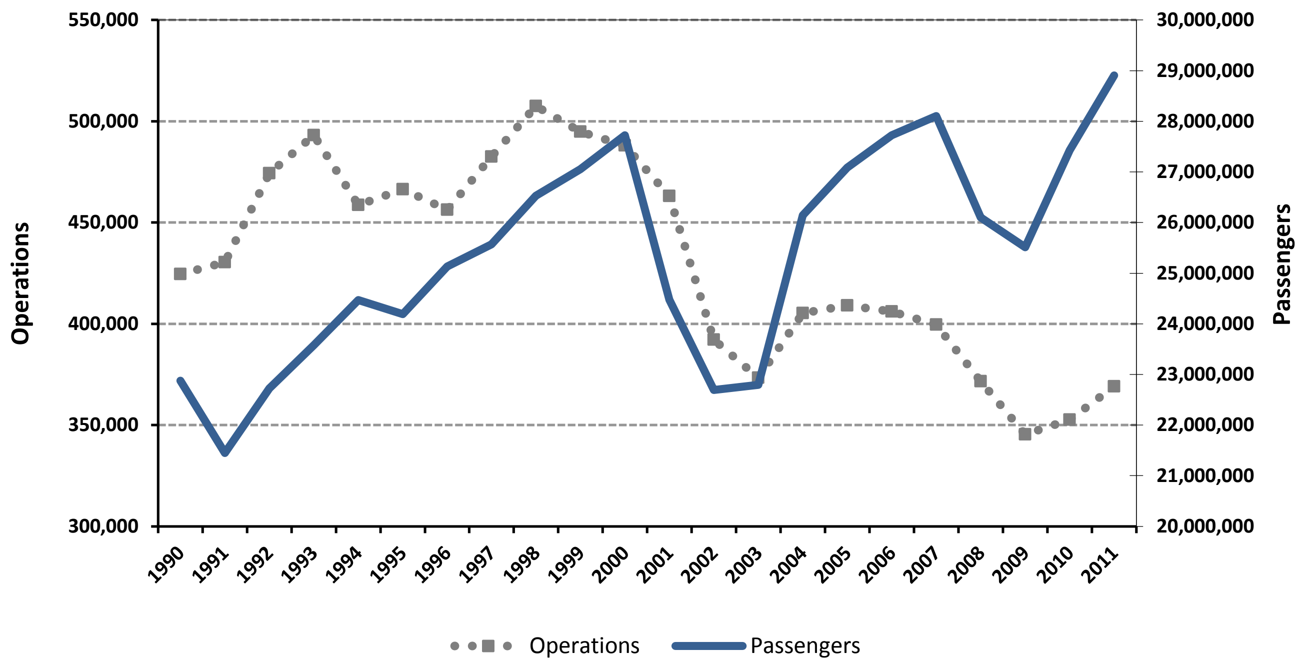
Table 1-2 Air Passengers, Aircraft Operations, and Cargo and Mail Volume, 2000 to 2011

	2000	2001	2002	2003	2004	2005	2006
			Air Passengers by Market Segment				
Domestic	23,100,645	20,070,039	18,725,422	18,890,079	21,830,294	22,728,788	23,556,382
International	4,513,192	4,301,250	3,882,257	3,815,987	4,201,638	4,237,105	4,049,595
General Aviation	112,996	103,641	88,462	85,103	110,584	122,012	119,466
Total Passengers	27,726,833	24,474,930	22,696,141	22,791,169	26,142,516	27,087,905	27,725,443
			Aircraft Operations by Market Segment				
Total Aircraft Operations	487,996	463,124	392,079	373,304	405,259	409,067	406,119
Total Passenger Operations	440,481	423,067	356,469	335,022	364,434	367,502	365,684
Total GA Operations	35,233	28,739	25,596	28,660	31,236	32,652	31,444
Total Cargo Operations	12,282	11,318	10,014	9,622	9,589	8,913	8,991
			Cargo and Mail Volume (lbs.)				
Total Volume	1,047,249,667	871,251,376	855,452,835	802,595,280	807,686,996	785,245,722	716,337,833

	2007	2008	2009	2010	2011	Pct. Change (2000-2011)	Avg. Annual Growth (2000-2011)
			Air Passengers by Market Segment				
Domestic	23,837,727	22,032,246	21,767,086	23,688,471	24,831,068	4.8%	0.7%
International	4,153,442	3,977,297	3,696,336	3,681,739	3,962,454	7.6%	(1.2%)
General Aviation	111,286	93,108	48,664	58,752	114,416	94.7%	0.1%
Total Passengers	28,102,455	26,102,651	25,512,086	27,428,962	28,907,938	5.4%	0.4%
			Aircraft Operations by Market Segment				
Total Aircraft Operations	399,537	371,604	345,306	352,643	368,987	4.6%	(2.5%)
Total Passenger Operations	362,298	339,115	326,406	331,687	334,487	0.8%	(2.5%)
Total GA Operations	28,632	23,820	12,242	14,682	28,230	92.3%	(2.0%)
Total Cargo Operations	8,607	8,669	6,658	6,274	6,270	(0.1%)	(5.9%)
			Cargo and Mail Volume (lbs.)				
Total Volume	658,293,141	621,283,399	546,359,548	572,283,608	554,618,648	(1.9%)	(16.9%)

Source: Massport.

Figure 1-3 Historical Passenger and Operations Activity Levels at Logan Airport, 1990-2011



Source: Massport.

The forecast aviation activity in 2030 includes the following highlights:

- The total number of air passengers at Logan Airport is projected to increase by 1.7 percent annually and reach 39.8 million in 2030. Domestic passengers are forecast to be 32.1 million, an increase of 1.4 percent per year, while international passengers are forecast to be 7.6 million, an increase of 3.5 percent per year.
- GA passenger traffic is forecast to remain relatively stable over the forecast period at approximately 108,000 passengers.
- Aircraft operations are forecast to increase at a slightly slower rate than passenger traffic, growing by 1.3 percent per year. By 2030, Logan Airport is forecast to accommodate 474,734 annual aircraft operations. Passenger airlines are expected to account for nearly 93 percent of total aircraft operations at Logan Airport in 2030.
- In 2000, there were 487,996 operations with 27.7 million passengers as compared to projected operations of 474,734 and annual passengers of 39.8 million in 2030.
- The projected fleet mix for Logan Airport reflects a continuation of airline industry fleet trends that include movement into larger capacity jet aircraft, a reduction in small regional jet (RJ) aircraft and increases in larger RJs and turboprops, which have more favorable operating costs in a high fuel price environment. At Logan Airport, the passenger airline aircraft fleet mix is expected to shift towards larger capacity jet aircraft. As a result of the expected shifts in the fleet mix and slightly higher passenger load factors, the average number of passengers per passenger airline operation is predicted to rise from 78 in 2011 to 84 in 2030.

Planning

The status of Airport projects in 2011 and 2012 is provided below.

- **Southwest Service Area (SWSA) Redevelopment Program (EEA 14137).** Massport completed the permitting for redeveloping the SWSA at Logan Airport, including a new consolidated rental car facility (ConRAC). Consolidation of the rental car operations and their shuttle buses into a single coordinated shuttle bus fleet operation will result in customer service improvements, environmental management enhancements, reduced vehicle miles traveled (VMT) and the associated reductions in air emissions. ConRAC construction began in July 2010, starting with various enabling phases of construction and will be completed in 2014.
- **Logan Runway Safety Area (RSA) Improvements Project at Runway Ends 33L and 22R (EEA 14442).** The safety improvements are required to enhance the RSAs, to the extent feasible, to be consistent with the FAA's current airport design criteria for RSAs and to enhance rescue access in the event of an emergency. As an older airport, Logan Airport was constructed before many of the current safety standards were developed and several of the runways currently end at the water's edge. The RSAs enhancements that are currently under construction are safety improvements and do not extend runways; nor they do have any effect on normal runway operations, runway capacity or types of aircraft that can use the runways. Construction of the Runway 33L RSA improvements commenced in June 2011 and was completed ahead of schedule in November 2012. The Runway 22R RSA improvements will be completed by the end of 2015. The status of mitigation for the RSA projects is provided in *Chapter 9, Project Mitigation Tracking*. As of this filing, mitigation efforts associated with Runway 33L safety improvements are underway.
- **Logan Runway 33L Light Pier Replacement Project (EEA 14442).** In January 2012, Massport submitted a Notice of Project Change (NPC) to the RSA Project (noted above) to include full replacement of the Runway 33L Light Pier, including all sections not already replaced by the Runway 33L RSA Project. All local, state and federal permits were secured in 2012 and the replacement was completed in November 2012 coinciding with the completion of the Runway 33L RSA Project. As part of this project, the Runway 33L Instrument Landing System (ILS) approach was upgraded from CAT I to CAT III. FAA approved and published the aRea NAVigation (RNAV) procedure on March 7, 2013.
- **Green Bus Depot (EEA 14629).** Design of a bus maintenance facility for Massport's clean fuel fleet buses in the North Service Area (NSA) began in 2009. The Green Bus Depot will help to minimize bus traffic on local streets by serving as a central location for bus maintenance on Airport property rather than traveling for service at the off-site bus maintenance location in Chelsea. The Green Bus Depot is used to maintain the expanded clean fuel shuttle bus fleet that replaced Logan Airport's compressed natural gas (CNG) bus fleet and will maintain the rental car company diesel shuttle buses when the ConRAC opens. Construction was completed in September 2012 and the facility is now in operation.
- **East Boston-Chelsea Bypass Project (EEA 14661).** The Bypass is a limited access roadway between Logan Airport and the new Chelsea Street Bridge. The Bypass roadway is designed to improve commercial vehicle access to the Airport, as well as reduce congestion on local East Boston streets in the vicinity of Day Square, Eagle Square, and the Neptune Road corridor by directing Airport-related commercial traffic to the new Bypass roadway. Construction was substantially completed in November 2012 and the roadway is open to Airport-related commercial service. The road was named the "Martin A. Coughlin" Bypass Road for the late Martin A. Coughlin, an East Boston resident. The project includes the use of high efficiency light-emitting diode (LED) lighting and incorporates bio-swales for stormwater retention and drainage.

- **Logan Airport Economy Parking Garage Project.** Construction of the Economy Parking Garage began in the summer of 2010 and was completed and fully opened to the public in early 2011. Sustainable features installed as part of this project included: solar panel "trees" on the garage roof, energy-efficient lighting, and trellis plantings with vines on the public edge of the garage façade.
- **North Service Area (NSA) Roadway Corridor Project.** The NSA Roadway Corridor extends approximately from the State Police building up to and including Neptune Road. This corridor improvement project is intended to unify the existing roadway with new landscape and urban design elements along this highly visible roadway corridor, providing an important public edge along the corridor. Massport recently installed a WindWheel Sculpture by William Wainwright on a parcel southwest of Neptune Road. Construction of the NSA Roadway Corridor Project began in 2010 and was completed in the spring of 2012.
- **Greenway Connector Project.** The Greenway Connector is a pedestrian/bicycle path connecting the Bremen Street Park path to the City of Boston pedestrian/bicycle path that begins at the Greenway Overlook and continues to Constitution Beach. When completed, the Greenway and the City of Boston Link will provide a continuous pedestrian/bicycle path from Piers Park to Constitution Beach. Construction of the Greenway Connector is planned to begin in the spring of 2013.
- **Hangar Upgrade Projects.** Architectural designs commenced in December 2010 for two hangar upgrades in the North Cargo Area (NCA) and are scheduled for completion in 2013. The renovated JetBlue Airways hangar opened in 2012.
- **Renovations and Improvements at Terminal B.** This project includes renovations to Terminal B, Pier A. By modifying and expanding existing facilities to meet airlines' needs and providing a connection between Piers A and B, the project improves and simplifies the passenger traveling experience. With initial renovations beginning in June 2012, the project is expected to be completed by 2014.
- **Terminal B Garage Improvement Project.** Terminal B Garage repair and rehabilitation was completed in March 2012. In addition to overall upgrades, sustainable features were also installed including 32 solar panel trees (200 kilowatt (kW)) on the top floor, LED lighting throughout the garage, and two rainwater harvesting collection tanks to store and later recycle stormwater.

Regional Transportation

Overall, aviation activity at New England's regional airports increased in 2011, as the regional airports experienced a modest recovery after the 2008/2009 Economic Recession. Highlights for the regional airports and the status of long-range regional transportation planning efforts in the region which are relevant to Massport's three airports as well as the regional transportation network are provided below.

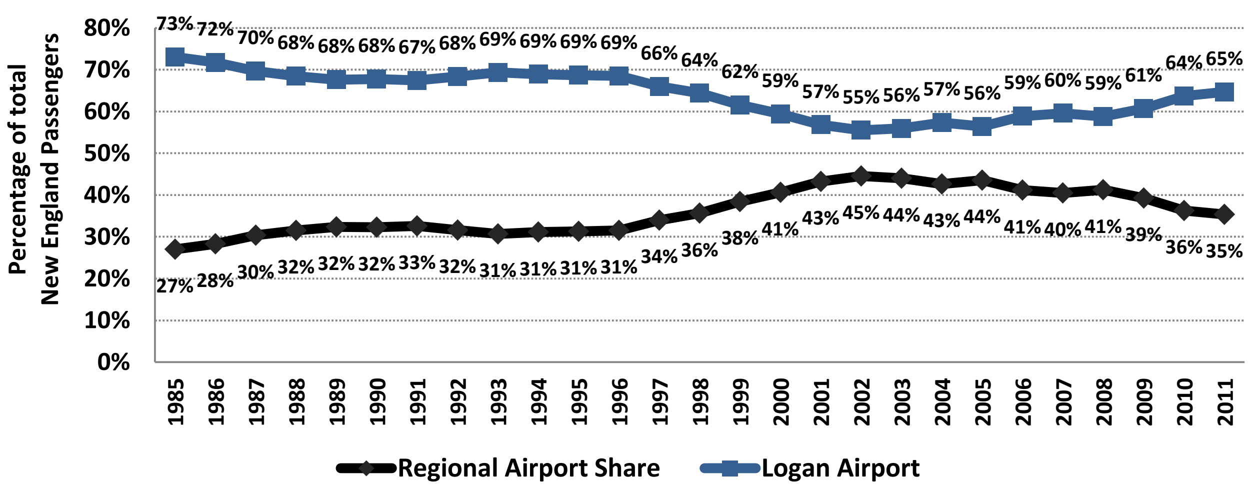
- The total number of air passengers utilizing New England's commercial service airports, including Logan Airport, increased from 43.1 million in 2010 to 44.7 million annual air passengers. This represents an annual increase of 3.8 percent, which exceeds the overall average increase of 1.7 percent in the U.S. passenger market in 2011.[8] In comparison, the total number of air passengers utilizing New England's commercial service airports was 46.7 million in 2000 and 45.6 million in 2004. The decline in passenger traffic at the regional airports reflects the challenging operating environment facing U.S. airlines since the global economic downturn that began in 2008 and is consistent with the national trend at secondary and tertiary airports.
- The challenging airline operating environment has continued to affect smaller communities disproportionately. Within the region, Logan Airport passenger traffic grew considerably faster than air passenger levels at the other regional airports. Of the 44.7 million air passengers using New England's commercial service airports in 2011, 64.7 percent of air passengers (28.9 million) used Logan Airport

8 Airports Council International, 2011 Worldwide Air Traffic Report.

compared to a low of 55.5 percent (22.7 million) in 2002 (see Figure 1-4). Despite the recent increases in Logan Airport's regional share, it remains well below a high of 73 percent in 1985.[9] Passenger levels at the regional airports increased by 1.1 percent (0.2 million) in 2011, compared to an increase of 5.4 percent at Logan Airport. This trend reflects a slow recovery at the regional airports following the recent service cuts by legacy air carriers and LCCs in these smaller secondary markets. Growth at Logan Airport has been driven by the continued expansion of LCC service, in particular JetBlue Airways.

- Aircraft operations in the New England region increased by 2.1 percent, from 1.07 million operations in 2010 to 1.09 million operations in 2011. Commercial airline operations remained largely flat, increasing by 0.8 percent (4,932 operations), while GA increased by 4.3 percent (17,827 operations) due primarily to a recovery in GA activity since the 2008/2009 economic recession. Military operations decreased by 1.4 percent (483 operations). While aircraft operations in the region increased slightly in 2011 compared to 2010, aircraft operations have declined significantly since 2000. Total regional aircraft operations fell by nearly one third, from 1.6 million in 2000 to 1.1 million in 2011.
- Massport continued to engage in metropolitan cooperative planning efforts including GreenDOT, the Healthy Transportation Compact, and the Boston Metropolitan Planning Organization (Boston MPO).[10,11]
- Massport is participating in the development of MassDOT's first statewide strategic multi-modal, long-range transportation plan known as *weMove Massachusetts*.[12] The goal of *weMove Massachusetts* is to build action-oriented policies based on stakeholder feedback to implement priorities for the present and future needs of the Massachusetts transportation system.
- Massport is cooperating with MassDOT's efforts to expand Boston's South Station to meet the current and future demand for rail mobility within Massachusetts and along the Northeast Corridor.

Figure 1-4 Regional Airports' Share of New England Passengers, 1985-2011



Source: Massport and individual airport data reports.

9 Based on airport passenger statistics from 1985 to 2011.
10 Massachusetts Department of Transportation, www.eot.state.ma.us/default.asp?pgid=content/releases/pr060210_GreenDOT&sid=release, June 2, 2010.
11 Massachusetts Department of Transportation, www.massdot.state.ma.us/main/healthytransportationcompact.aspx.
12 Using an analytical approach developed for the *WeMove Massachusetts* process, MassDOT can prioritize transportation investments for different planning scenarios based on national standards and available funds. *WeMove Massachusetts* provides performance measures of critical transportation investments. Massachusetts Department of Transportation, Office of Transportation Planning. http://www.massdot.state.ma.us/wemove/ (Accessed November 2012).

Ground Access to and from Logan Airport

Key findings for on-Airport transportation include:

- The total number of annual air passengers at Logan Airport increased 5.4 percent to 28.9 million, compared to 27.4 million in 2010. During the same period, average daily traffic on Airport roadways increased by 5.6 percent from 94,179 vehicles per day in 2010 to 99,449 vehicles per day in 2011 (refer to Table 1-3). Even with almost a million additional passengers, traffic volumes remained lower than those experienced in the mid-decade years. In 2007, which was the most comparable year to 2011 in terms of overall Airport passengers activity levels in the last decade, the average daily traffic was 110,690 vehicles per day, or 10 percent higher than 2011 levels.[13]
- Massport began using an updated, more detailed, micro-simulation tool to model, calculate and analyze VMT on the Airport roadway system. The new model (VISSIM) calculated a VMT increase of 2.9 percent from 2010 to 2011. Using the previous model would have shown a 5.7 percent increase in VMT. This difference can be attributed to the new model having better calibration of on-Airport mode share among different users and reflecting more accurate roadway geometry.
- Similar to the trend in traffic volumes, VMT has shown an overall decline in comparison to the number of air passengers at Logan Airport. The average weekday VMT was 7 percent higher in 2007 than 2011 levels, although there were 800,000 fewer air passengers using the Airport in 2007.[14]
- The number of vehicles that parked on-Airport (measured by the revenue parking exits) increased by nearly 4 percent from 2,582,453 in 2011 compared to 2,494,019 in 2010, but remained well below historic high levels. (In the past 12 years, the highest level was recorded in 2000 at 3,423,118 parked vehicles.) Massport was in compliance with the Logan Airport Parking Freeze throughout 2011.

Key findings for ground access activity include:

- Massachusetts Bay Transportation Authority (MBTA) Silver Line bus boardings at the Airport continued to grow, increasing by over 8 percent in 2011, while Blue Line transit boardings at Airport Station remained relatively level compared to 2010. MBTA ridership on the Blue and Silver Lines has been increasing steadily over the past several years, increasing over 50 percent since 2007.
- 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 during the summer and increased public transportation signs and wayfinding.) The promising results of this program showing reduced dwell times and faster travel times through the terminal area, which resulted in extension of the free-fare program through June 1, 2013.
- In 2011, ridership on all types of water transportation to the Airport increased by about 3 percent in comparison to the previous year. However, ridership on the MBTA ferry has been decreasing steadily over the last several years. Overall ridership on water transportation has decreased 16 percent since 2007 with most of the ridership loss occurring on the MBTA ferry service, while there has been a slight increase in water taxi use since 2007.
- In 2011, air passenger ridership using Logan Express bus service increased about 1 percent compared to 2010 levels, whereas employee use of Logan Express increased by almost 15 percent, from 467,020 in 2010 to 536,513 employee passengers in 2011. Since 2007, there has been a decrease in air passenger ridership on Logan Express (147,921 fewer passengers or a 19 percent decrease). However, this has been counter-balanced by increased employee use (132,291 more employees or a 33 percent increase) keeping

13 In 2007, there were 28,102,455 air passengers at Logan Airport, approximately 800,000 fewer than in 2011, in which there were 28,907,938 air passengers.
14 Comparison of 2007 and 2011 used the previous VMT model for year over year comparison accuracy.

overall Logan Express ridership steady since 2007. Employee ridership now accounts for about 45 percent of the service's total ridership.

- Limousine/shared-ride van ridership increased by an estimated 10 percent, and taxi dispatches increased 6 percent in 2011 compared to 2010. After showing some declines in limousine ridership during the Economic Recession of 2008/2009, it has since rebounded, showing an overall increase of 8 percent since 2007 levels.

Table 1-3 Logan Airport Gateways: Annual Average Daily Traffic, 2000 - 2011

	AADT		AWDT		AWEDT		Annual Air Passengers	
Year	Volume	Percent Change	Volume	Percent Change	Volume	Percent Change	Level of Activity	Percent Change
2000	95,058	3.8%	101,446	3.9%	78,358	2.1%	27,412,926	1.3%
2001	86,811	(8.7%)	91,588	(9.7%)	74,911	(4.4%)	24,474,930	(11.7)%
2002	84,927	(2.2%)	89,731	(2.0%)	73,398	(2.0%)	22,696,141	(7.3%)
2003 [1,2]	88,978	4.8%	*93,680*	4.4%	*77,239*	5.2%	22,787,169	0.4%
2004	100,206	12.6%	106,278	13.4%	84,950	10.0%	26,142,516	14.7%
2005	106,000	5.8%	112,600	6.0%	89,400	5.2%	27,087,905	3.6%
2006 [3]	NA	NA	NA	NA	NA	NA	27,725,443	2.4%
2007	110,690	4.4%	119,200	5.9%	91,320	2.1%	28,102,455	1.4%
2008	96,187	(13.1%)	100,107	(16.0%)	80,797	(11.5%)	26,102,651	(7.1%)
2009	89,575	(6.9%)	93,670	(6.4%)	78,905	(2.3%)	25,504,845	(2.3%)
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%**

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 Ted Williams Tunnel.
AADT Annual average daily traffic.
AWDT Annual average weekday daily traffic.
AWEDT Annual average weekend daily traffic.
NA Information Not Available.

Key findings for ground transportation mode shares include:

- The *2010 Logan Airport Air Passenger Ground-Access Survey* indicates that share of high-occupancy vehicles (HOV) modes to the Airport has returned to 2004 levels (at 30 percent HOV mode share). This represents a 2 percent increase in share from the levels reported in the *2007 Air Passenger Ground Access Survey*.
- Logan Airport continues to rank among the top U.S. airports with respect to HOV/transit/shared-ride mode share. It is useful to note, however, that there is no standard aviation industry definition with respect to categorizing ground access modes as HOV versus SOV. While some modes (e.g., Logan Express and the Silver Line) clearly fall into the HOV mode category, the proper category for a limo or taxi is less clear. For example, if Logan Airport ground access mode shares were recalculated using the same category definitions as are used by San Francisco International Airport (SFO), the Logan Airport HOV mode share would exceed 40 percent, ranking Logan Airport higher than SFO for HOV mode share.
- Moreover, many private passenger vehicles arrive at Logan Airport with several occupants. In fact, the 2010 survey indicates that 69 percent of private vehicles carried two or more air passengers, for an average of 2.3 air passengers per private vehicle. Thus, to be consistent with current transportation planning practice, vehicle occupancy would serve as a more representative measure of ground access activity and mode

choices. If access mode shares were defined based on occupancy, Logan Airport's HOV share of access trips would be 71 percent.

Key findings for the 2030 VMT and parking demand projections include:

- Annual air passenger levels are predicted to increase 37.8 percent or to 39.8 million by 2030. A 20 percent increase in VMT is projected by 2030. This is compared to a nearly 9 percent decrease in VMT realized over the past 10 years (even as annual air passenger levels in 2000 and 2010 were about the same.
- Peak parking demand (the number of spaces needed to accommodate parked vehicles on the peak day of the year) at Logan Airport is already at practical parking capacity level. Thus, as air passenger levels increase, as suggested by the 2030 forecasts, Massport will not be able to accommodate the potential additional parking demand on-Airport with the existing Logan Airport Parking Freeze in place. Much of this travel demand to the Airport will have to occur via other modes. The challenge is how to influence a shift so that the passengers generating the excess parking demand are encouraged to use sustainable HOV transportation modes rather than increasing taxi or private vehicle drop-off and pick-up activity that would generate unacceptable levels of curbside congestion (and associated emissions). Recent analyses suggest that by constraining parking at Logan Airport, vehicle trips to the Airport would increase in the form of curbside drop-offs by taxis and private vehicles. This is a key planning issue that Massport will address in future airport-wide strategic planning efforts.

Noise Abatement

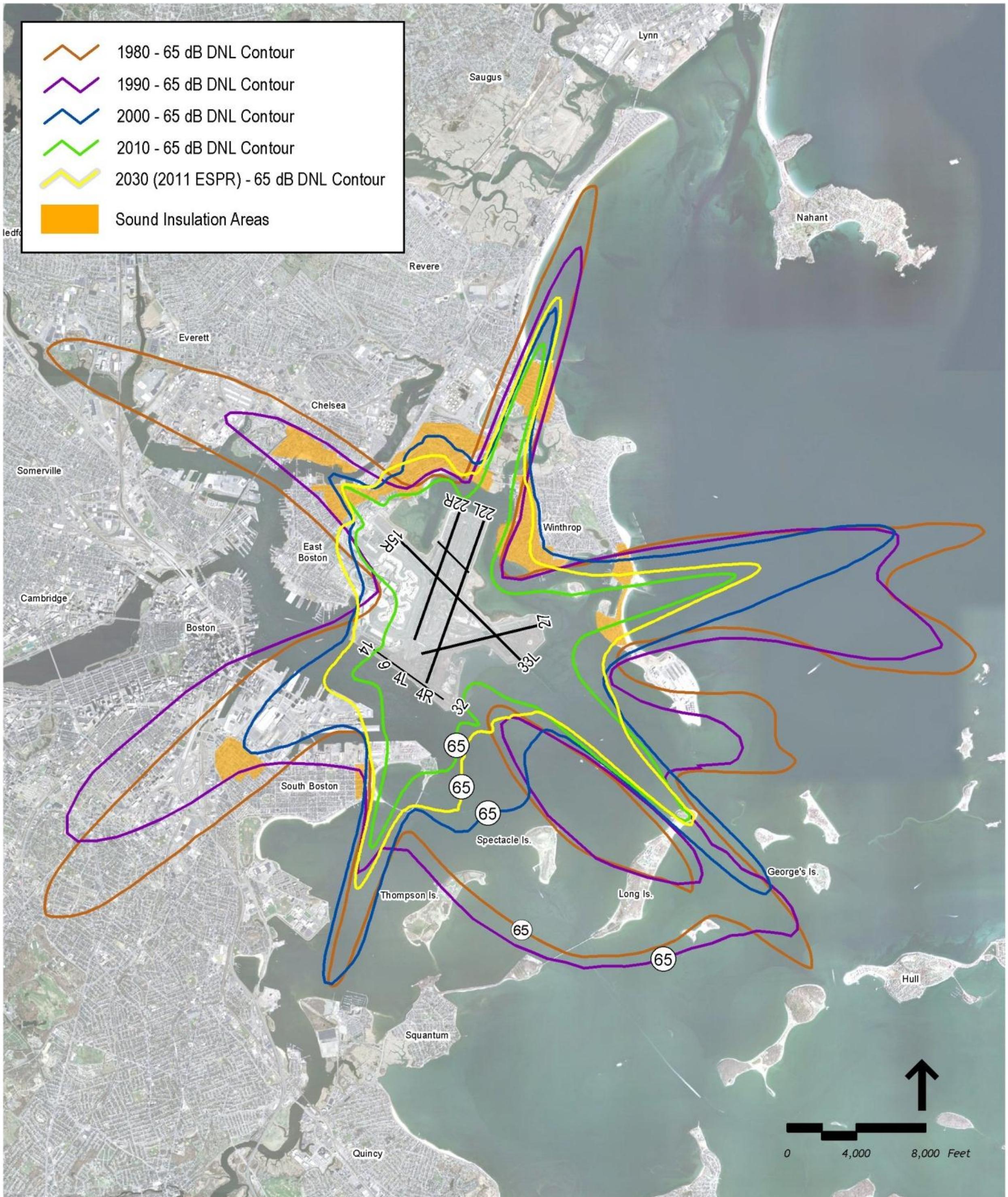
In 2011, the following changes occurred in the Airport noise environment:

- Compared to 2010, the 2011 DNL decibel (dB) contours were smaller in East Boston and over Boston Harbor toward Hull. The DNL 65 dB contour was slightly larger in Revere, South Boston, and in most of Winthrop for 2011. There are several factors that influenced the contour changes, including:
  - Runway 15R-33L, which is the nighttime noise abatement runway, was temporarily closed from July through September and during the daytime in June, October and November of 2011 to allow for construction of the enhanced Runway 33L RSA. 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.
  - During the Runway 15R-33L closure period, night operations primarily used Runway 22R and Runway 9 for departures and Runway 4R and 22L for arrivals.
  - The Runway 15-33L closure resulted in the reduction in noise levels in East Boston and the slight increase in noise levels in Revere and Winthrop.
- The overall number of people exposed to DNL values greater than 65 dB increased to 3,947 people in 2011 from 3,830 people in 2010 (an increase of 117 people).[15] The number of people residing within the DNL 70 dB contour remained at 130 people. These levels are well below the numbers 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.
- In 2011, Massport provided sound insulation to 114 homes, 84 percent of which were in Chelsea. The focus of the program in Chelsea was to fulfill federal and state mitigation commitments related to the opening of Runway 14-32. Since the inception of Massport's residential sound insulation program (RSIP), 11,333 homes have received sound insulation treatment in East Boston, South Boston, Winthrop, Revere, and Chelsea.

15 Population data was derived from the most recent 2010 United States (U.S.) Census.

Based on the 2030 forecast of aircraft operations and expected aircraft fleet mix, the following conditions are expected in 2030:

- There is forecast to be a larger number of operations and a higher percent jet fleet than in 2011. The higher level of operations is not a capacity challenge as the Airport has operated in the past with over 1,300 operations per day. For example, there were 1,355 operations per day in 2000 when there were only five runways instead of the current six.
- The 2030 fleet mix consists of 81 percent commercial jets whereas the 2011 fleet mix consists of 78 percent commercial jets. The 2000 fleet mix had a lower proportion of commercial jets at 62 percent of the fleet.
- Total operations are expected to increase by 29 percent or 290 operations per day from 2011 to 2030, from 1,011 operations per day in 2011 to 1,301 operations per day in 2030. Compared to 2000, which is the last year that Logan Airport had over 1,300 daily operations, 2030 is forecasted to have 54 fewer daily operations (1,355 in 2000 and 1,301 in 2030). Daytime commercial operations are projected to increase by 254 operations per day from 819 in 2011 to 1,073 in 2030, however this is still fewer than the 1,142 daytime operations in 2000. Nighttime commercial operations are projected to increase from 114 in 2011 to 154 in 2030. This is an increase compared to 2000 when 126 daily operations occurred at night.
- Daytime GA operations are projected to decrease slightly from 71 per day in 2011 to 67 per day in 2030 (a decrease of 6 percent) and nighttime GA operations are projected to also decrease slightly from 6.7 in 2011 to 6.5 in 2030 (a decrease of 3 percent). In 2000, daytime GA operations were significantly higher at 82 daily operations with nighttime GA daily operations slightly lower at 5.7 operations.
- The 2030 forecast assumes the continued use of the highest capacity runway configurations (Runway 4L and 4R for arrivals and Runway 9 for departures and Runway 27 for arrivals and Runway 22L and 22R for departures) consistent with today's runway use. The same higher capacity runway combinations were used in 2000 (78 percent of the arrivals used Runways 4L, 4R, 22L and 27 with 68 percent of the departures on Runways 9, 22L and 22R).
- The 2030 operations forecast produced a larger set of DNL noise contours with the number of people exposed to noise levels greater than DNL 65 dB increasing from 3,947 in 2011 to 12,211 people in 2030. This is still significantly fewer than the number of people exposed in 2000 (17,745 people). The number of people within the DNL 70 dB is also projected to increase from 130 in 2011 to 352 people in 2030 but still remaining well below the 1,551 people within the DNL 70 dB in 2000. All of the residences within the forecasted 2030 DNL 65 dB contour are in areas where Massport has implemented its sound insulation program. Figure 1-5 presents the DNL 65 dB noise contours from every decade starting with 1980 for historical context.



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

Comparison of Historical and Forecast 65 dB DNL Contours - 1980, 1990, 2000, 2010, and 2030

Figure 1-5

Air Quality/Emissions Reduction

Air quality conditions in 2011 are described, as follows:

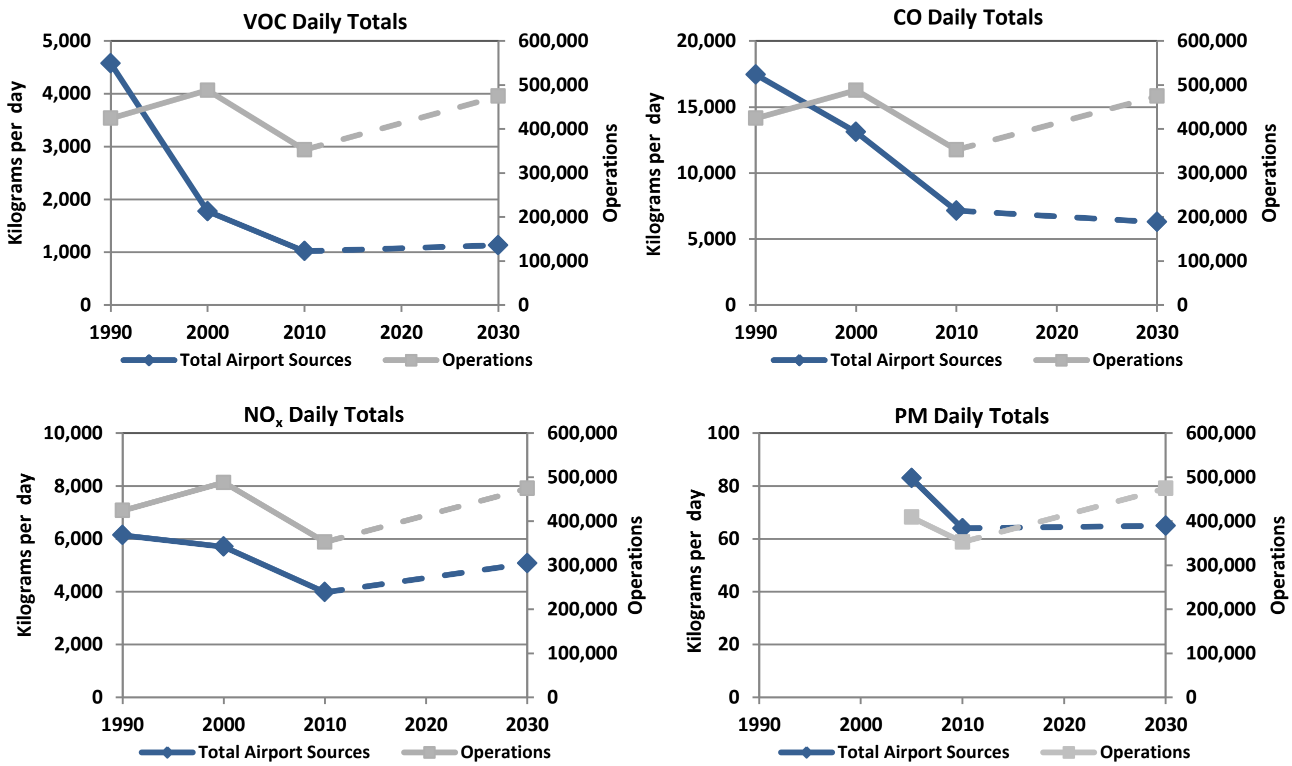
- Total volatile organic compounds (VOC) emissions were 1,109 kilograms per day (kg/day), or 9 percent higher than 2010 levels, but still follow a long-range (i.e., a period of over 20 years) downward trend decreasing by almost 76 percent since 1990. This one-year increase is primarily due to the increase in landing and takeoff operations (LTOs) when compared to 2010 (176,322 LTOs in 2010 and 184,494 LTOs in 2011).
- Total emissions of oxides of nitrogen (NO_X) were 4,077 kg/day, or 2 percent higher than 2010 levels. In 2011, total NO_x emissions at Logan Airport were approximately 29 percent lower than 2000 levels. Also, total NO_x emissions in 2011 were 707 tons per year (tpy) lower than Massport's 1999 Air Quality Initiative (AQI) benchmark. This represents an overall decrease of 30 percent in NO_x emissions since 1999.
- Total emissions of carbon monoxide (CO) were 6,919 kg/day, or 3 percent lower than 2010 levels and 53 percent lower than 2000 levels; following the same long-range downward trend as VOCs and NO_x.
- Total emissions of particulate matter ($PM_{10}/PM_{2.5}$) associated with Logan Airport increased in 2011 by approximately 5 percent to 67 kg/day compared to 2010 levels, but still following a long-range downward trend decreasing by 19 percent since 2005 (2005 is the first year that $PM_{10}/PM_{2.5}$ emissions were reported). This one-year increase is mostly attributable to the corresponding increase in stationary source use, particularly snow melters in conjunction with the unusually heavy snowfall in early 2011.
- Since 1999, there has been a continuing trend of decreasing nitrogen dioxide (NO_2) concentrations at both the Massport and Massachusetts Department of Environmental Protection (MassDEP) monitoring sites located in the vicinity of Logan Airport. In addition, the annual NO_2 concentrations at all monitoring locations in 2011 continued to be well within the National Ambient Air Quality Standards (NAAQS) for NO_2. The NO_2 monitoring program was discontinued in 2012.
- Massport's Air Quality Monitoring Study is now complete, having collected data on a variety of ambient air pollutants over a two-year period as a means of assessing any air quality changes attributable to the operation of the Centerfield Taxiway which was completed in 2009. The findings from this Study will be submitted to MassDEP in 2013, and reported in the next Logan Airport EDR.
- This reporting year, 2011, marks the fifth consecutive year in which Massport has voluntarily prepared a greenhouse gas (GHG) emissions inventory for the EDR/ESPR. The 2011 GHG emission inventory was prepared following methodological guidance by the Transportation Research Board's (TRB) Airport Cooperative Research Program (ACRP).[16] The 2011 inventory assigns GHG emissions based on ownership or control (whether it is controlled by Massport, the airlines or other airport tenants, or the general public). Total Logan Airport GHG emissions in 2011 were 5 percent higher than 2010 levels primarily due to the increase in aircraft operations and passenger vehicles accessing the Airport. Massport-related emissions represent only 12 percent of total GHG emissions at the Airport, tenant-based emissions represent approximately 68 percent, electrical consumption represents 14 percent; and passenger vehicle emissions represent 6 percent. This inventory is one of the three GHG emissions inventories Massport prepares annually; however, the other two only comprise stationary sources of GHGs and are filed with MassDEP and the U.S. Environmental Protection Agency (EPA) respectively.

16 Transportation Research Board, Airport Cooperative Research Program, ACRP Report 11, Project 02-06, *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*. See http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf for the full report.

The emission trends for VOCs, NOx, CO, and PM from 1990 to 2030 are shown in Figure 1-6 and operational levels at the Airport are also shown for comparative purposes. The findings for the 2030 air quality emissions inventory include:

- Since the current version of the FAA's Emissions and Dispersion Modeling System (EDMS) used for this *2011 ESPR* air quality emissions inventory does not reflect the anticipated significant design and operational improvements in aircraft engine technologies, alternative fuels, and aircraft operational measures, the estimated emission totals for 2030 are expected to be measurably less for all pollutants than the values predicted for 2030. Technology changes are likely to lead to lower fuel use, improved combustion efficiencies and lower emissions.
- Total emissions of NO_x in 2030 are predicted to be 11 percent lower than in 2000 but 24 percent higher than in 2011. This increase is almost entirely a result of the changing aircraft fleet (i.e., greater use of quieter Stage 3, higher NO_x-emitting aircraft) and the forecasted increase in operations at the Airport. However, compared to the AQI, NO_x emissions in 2030 are still shown to be 13 percent lower than 1999 levels– the benchmark for these emissions. The number of aircraft operations in 1999 was 494,816, about 4 percent higher than is predicted in 2030.
- Total emissions of VOCs in 2030 are predicted to be 36 percent lower than in 2000; however it is 2 percent higher compared to 2011. This small increase is mostly attributable to the forecasted increase in aircraft operations and anticipated increase in the number of vehicle trips of passengers, employees and other airport users.
- Total emissions of CO in 2030 are predicted to be 52 percent lower than in 2000 and 11 percent lower compared to 2011. This overall reduction is due to anticipated decreased aircraft taxi times and likely tighter emission controls for motor vehicles and off road-vehicles such as ground service equipment (GSE).
- Total emissions of $PM_{10}/PM_{2.5}$ in 2030 are predicted to be 22 percent lower than 2005 levels (2005 is the first year that $PM_{10}/PM_{2.5}$ emissions were reported), and 3 percent lower than 2011. This decrease since 2011 is mostly due to the lower emissions from GSE over this timeframe.
- Total emissions of GHG in 2030 are predicted to be 11 percent higher than 2011 levels due, in part, to the predicted 29 percent increase in aircraft operations associated with a 38 percent forecast increase in passenger traffic, and an anticipated 3 percent increase in terminal space area and utilization. The GHG calculation includes consideration of greater efficiency in aircraft movements and improvements in combustion efficiency of motor vehicles and GSE.

Figure 1-6 Long-Range Emissions Trends of VOCs, NO_X, CO, and PM at Logan Airport, 1990-2030[1]



Note: The dashed lines represent projected values.

1 PM emissions were not estimated until 2005.

Water Quality/Environmental Compliance and Management

- In 2011, there were 12 oil and hazardous material spills that required reporting to MassDEP, five of which involved a storm drainage system.[17] Further details on spills can be found in the *Fuel Use and Spills* section of *Chapter 8, Water Quality/Environmental Compliance.*
- One outfall sample out of a total of 19 samples at the Maverick Street Outfall and one outfall sample out of a total of 23 samples at the North Outfall exceeded the regulatory limits of the National Pollutant Discharge Eliminations System (NPDES) Permit for the North, West, and Maverick Street Outfalls. These exceedances were reported in April and November 2011, respectively, as required.

17 State environmental regulations require that oil spills of 10 gallons or more in volume be reported to MassDEP.

Sustainability at Logan Airport

Massport is committed to a robust sustainability program. Sustainability is often defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[18] All aspects of Massport's sustainability program are based upon this foundational definition of sustainable development and the "triple bottom line" approach to applied sustainability. The internationally recognized triple bottom line approach measures success not only by financial performance (the traditional bottom line), but by balanced achievements in environmental stewardship, economic growth, and social responsibility. The triple bottom line is achieved when an integrated solution is found that simultaneously achieves excellence in these components, as opposed to finding tradeoffs among these areas. Massport has a commitment to implementing environmentally sustainable practices authority- and airport-wide, and continues to make progress on a range of initiatives. Massport has a dedicated Sustainability Program Manager with responsibility to coordinate and fulfill this commitment across all lines of business.

The following sections describe how sustainability is incorporated into Massport's activities: goals and commitments; planning design and construction; operations and maintenance. Many of the long-term and multifaceted sustainability initiatives undertaken by Massport are described in individual chapters of this *2011 ESPR* where appropriate, and are listed in Table 1-8.

Sustainability Goals

Logan Airport is a complex of interconnected buildings, transportation facilities, utility infrastructure, natural environments, and management systems. The long-range planning, ongoing development, and day-to-day operations present opportunities to adopt sustainable practices that mirror Massport's long-standing environmental goals and demonstrate its leadership within New England and the aviation industry. In October 2000, the Massport Board approved an Authority-wide Environmental Management Policy, which articulates Massport's commitment to protect the environment and to implement sustainable design principles.[19]

Massport Goals
In October 2004, Massport prepared the *Massachusetts Port Authority Sustainability Plan* which presents Massport's long-term and short-term sustainability goals (Table 1-4). It also identifies the actions necessary to achieve the goals, the staff members responsible for each sustainability goal, and the timeline for achieving the goals. The short-term goals set out in the Sustainability Plan are described below. Massport participated in the 2010 Environmental Benchmarking Survey sponsored by Airports Council International-North America (ACI-NA) to assess solar power, purchase of renewable energy, availability of low emission ground transportation, recycling and environmentally preferred purchasing.

With funding provided by a grant from the FAA, Massport will be embarking on the development of the Logan Airport Sustainability Management Plan in 2013. While Massport has many sustainability initiatives across the Airport, this planning effort will provide the necessary framework for Massport to coordinate all the separate initiatives under one comprehensive program. The status of this planning effort will be reported on in the *2012/2013 EDR.*

18 Brundtland Report, United Nations. "Report of the World Commission on Environment and Development." General Assembly Resolution 42/187, December 11. 1987.
19 The Environmental Management Policy can be viewed on Massport's website at: www.massport.com/environment/Pages/EnvironmentalManagementPolicy.aspx

Table 1-4 Sustainability Goals

Massport Sustainability Goals

- Develop a policy that states that new development projects obtain certification under the U.S. Green Building Council Leadership in Energy and Environmental Design® (LEED) Green Building Rating System™ and include LEED accredited professionals on the design team. LEED is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings.
- Establish and implement an Alternative Fuel Vehicle Policy (AFV) Policy that requires key personnel to review and consider AFVs when there is a request for a new or replacement vehicle and to select AFVs unless there is a compelling reason not to.
- Increase construction waste recycling and reuse.
- Implement a process to consider environmental impacts when making purchases.

Logan Airport Specific Sustainability Goals

- Establish a recycling program in Airport terminals.
- Retrofit or purchase heavy-duty equipment with diesel oxidation catalysts or particulate filters.

State Goals – Leading by Example

The Massachusetts' Governor's *Leading by Example – Clean Energy and Efficient Building Program* (known as the Leading by Example program) was established in 2007 under Executive Order 484.[20] The program's goals cover many specific measures covering a variety of topics, but there are three key areas which guide Massport's sustainability programs: energy intensity, percentage of renewable energy, and GHG reductions. Part of the Leading by Example Executive Order calls for state agencies to procure 15 percent of their electricity from renewable resources by 2012. The Leading by Example program has influenced Massport's own operations including its offices, heating plants, and garages leading to Massport receiving the Leading by Example award in 2008. As part of the Leading by Example Executive Order, all new construction and major renovations over 20,000 square feet by Commonwealth agencies must meet the Massachusetts LEED Plus green building standard established by the Massachusetts Sustainable Design Roundtable. The Massachusetts LEED Plus standard includes:

- Certification by the U.S. Green Building Council LEED program for all new construction and major renovation projects over 20,000 square feet;
- Energy Performance 20 percent better than the Massachusetts Energy Code;
- Independent third party commissioning;
- Reduction of outdoor water consumption by 50 percent and indoor water consumption by 20 percent relative to standard baseline projections; and
- Conformance with at least 1 of 4 identified smart growth criteria.

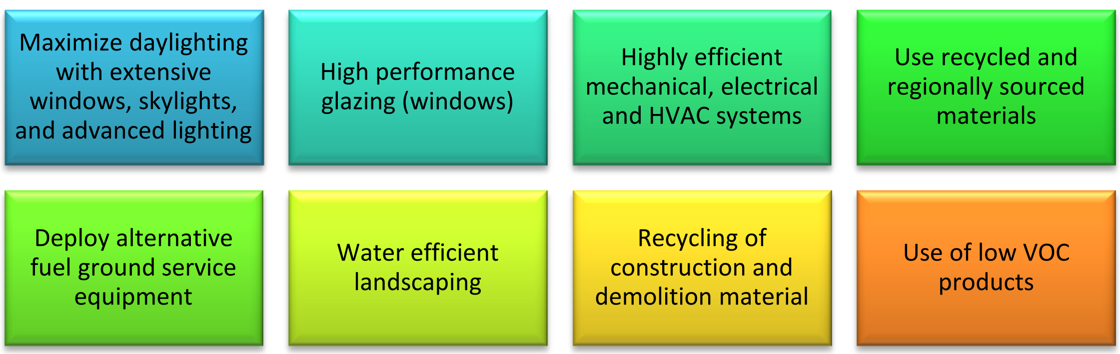
20 Deval Patrick, Executive Order 484: April 18, 2007.

Sustainability in Planning, Design and Construction

The following section outlines Massport sustainability achievements in the planning, design and construction of projects.

LEED Green Buildings
The U.S. Green Building Council's (USGBC) LEED Green Buildings rating system is the most widely recognized third-party green building certification system in North America. Massport is striving to achieve LEED certification for new and substantial rehabilitation of building projects over 20,000 square feet. For smaller building projects and non-building projects, Massport uses Sustainable Design Standards and Guidelines (SDGS) described in the next section. LEED-certified building elements are featured in Figure 1-7.

Figure 1-7 Common Elements of LEED-Certified Buildings at Logan Airport



Sustainable Design Standards and Guidelines (SDSG)
In 2009, Massport developed the SDSG for use by architects, engineers, and planners working on capital improvement projects at Massport facilities. The SDGS, revised and reissued in March 2011, provides a green building framework for design and construction both new construction and rehabilitation projects for both building and non-building projects, such as pavement projects.

The SDSG applies to a wide range of project-specific criteria, such as site design, project materials, energy management and efficiency, air emissions, water management quality and efficiency, indoor air quality, and occupant comfort. The new standards have been used to guide over $200 million in capital projects Massport-wide between fiscal years 2010 to 2013, including over $30 million for maritime projects.

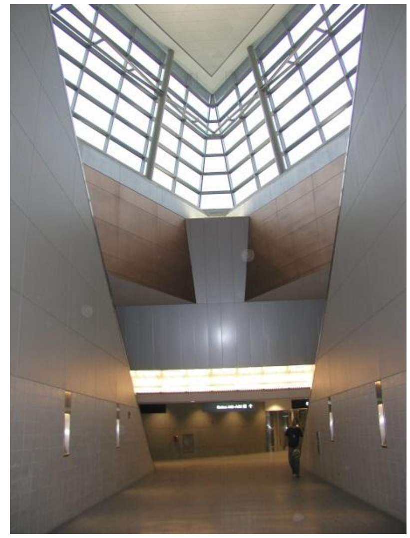
International Standards Organization (ISO) 14001 standard
The ISO 14001 standard for environmental management systems (EMS) is used to minimize harmful effects on the environment caused by an organization's processes and activities. The goal of Massport's EMS is to achieve continual improvement of an organization's environmental performance. An EMS is different from LEED or the SDSG because its focus is on organizational operations and processes within a building as opposed to the design and materials used to construct buildings. Massport recently expanded its Logan Airport EMS to cover a broader range of activities and buildings. ISO 14001 certification for Logan Airport Facilities II (vehicle maintenance, landscaping, and snow removal) was completed in December 2006 and recertified in December 2009. ISO Certification for Facilities I (Central Heating and Cooling Plant) and Facilities III (Electrical and Structural) was completed in 2011.

Certified Green Buildings at Logan Airport

Table 1-5 lists the sustainability features for the green buildings at Logan Airport that have been constructed or are under construction.

Table 1-5 Green Buildings at Logan Airport

Terminal A (LEED Certified) ■ Priority curb locations for high occupancy vehicles (HOV) and bicycles ■ Retrofitting with solar panels on the Terminal A roof ■ Stormwater filtration ■ Reflective roof ■ Water use reduction features ■ Natural daylighting paired with advanced lighting technologies for energy efficiency ■ Use of recycled and regionally sourced materials ■ Measures to enhance indoor air quality	Constructed 2005/2006
Signature Flight Support General Aviation Facility (LEED Certified) ■ Mechanisms to reduce water use ■ Natural day lighting paired with advanced lighting technologies for energy efficiency ■ Window glazing and sunshades to maximize daylight and minimize heat build-up ■ Recycled and regionally sourced materials ■ Measures to enhance indoor air quality	Constructed 2007/2008
Green Bus Depot (LEED Silver Eligible) ■ Sustainably grown, harvested, produced and transported building materials ■ Rooftop solar panels ■ Water and energy saving features ■ Vehicle miles traveled (VMT) reduction ■ New shuttle fleet including 50 clean diesel/electric hybrid buses and CNG buses	Completed 2012
Consolidated Rental Car Facility (Targeting LEED Silver) ■ Green building materials ■ Alternative energy sources (such as solar and wind) ■ Bike and pedestrian access and connections ■ Natural day lighting paired with advanced lighting technologies for energy efficiency ■ Use of recycled and regionally sourced materials ■ Enhanced indoor air quality ■ Plug-in stations for electric vehicles and other alternative fuel sources such as E-85 (ethanol) ■ Rental car fleets which include hybrid/alternative fuel/low emitting vehicles ■ Pedestrian connections ■ Bicycle facilities and employee showers/changing ■ Water reclamation for vehicle wash water, and use of stormwater for non-potable uses such as vehicle washing and landscaping irrigation ■ VMT reduction	Anticipated by 2013/2014
Facilities II (ISO 14001 certification) ■ Vehicle maintenance, landscaping, and snow removal	Completed 2006; Recertification 2009
Facilities I and III (ISO 14001 certification) ■ Central Heating and Cooling Plant ■ Electrical and Structural	Completed 2011



Use of natural day lighting in Terminal A. Source: Massport.

In 2006, the U.S. Green Building Council awarded LEED Certification to the new Terminal A, becoming the first LEED certified airport terminal in the world. The Signature Flight Support GA Facility in the NCA, which opened in June 2007, was the first LEED certified GA facility in the U.S. Experience gained at Logan Airport is serving as a model for new Signature Flight Support GA facilities around the U.S., including at Chicago O'Hare International Airport. Terminal A is currently being retrofitted with new solar panels.

The new ConRAC in the SWSA began construction in 2010 and will be completed in 2014. It will meet the Commonwealth of Massachusetts LEED Plus requirements and strive for LEED Silver level certification or better. At least 2.5 percent of the proposed program's overall electricity needs will be met with solar or wind power, or another form of renewable energy.

The Green Bus Depot in the NSA, recently completed in 2012 and currently operating, will also strive for LEED Silver Certification. The Green Bus Depot shifts bus maintenance operations on-Airport from an off-Airport location. This reduces bus trips and unnecessary emissions on congested neighborhood roadways. Reduced VMT for the bus fleet will have air quality benefits. Further details are available in *Chapter 3, Airport Planning*.

Sustainability in Operations and Maintenance

Massport has several programs in place that contribute to the environmentally sustainable operation and maintenance of Logan Airport and its facilities, which is further described in this section.

Energy
Massport continues to make strides in reducing energy use at the Airport. In 2010, the Massport Board approved a comprehensive Energy Master Plan for all Massport facilities. Further, the Board allocated funding for a capital project to implement energy efficiency improvements targeted at achieving energy and renewable energy targets as defined by the Governor's Executive Order 484 - *Leading by Example*. As part of the implementation of the Energy Master Plan, Massport is striving to achieve three Leading by Example Clean Building Energy Targets: a 25 percent reduction in GHG emissions; a 20 percent reduction in overall energy consumption; and a 15 percent of energy consumption from renewable sources, all of which are to be achieved by the end of fiscal year 2012.

Massport has been actively incorporating renewable and alternative energy features on key building projects. During fiscal year 2011 alone, 244,000 kilo-watt hours (kWh) of renewable electricity (close to 2 percent of Massport's total electricity consumption, excluding airfield and tenant electricity consumption) were generated at Logan Airport by solar panels and wind turbines. This is expected to increase as several new solar installations come online in the next several years. Table 1-6 provides a list of all current and planned renewable energy facilities.

Logan Office Center
As a demonstration project, Massport installed twenty 10-foot-tall wind turbines on the roof of Logan Office Center in March 2008. The wind turbines were designed to generate approximately 100,000 kWh annually, or about 2 percent of the building's monthly energy use. This represents an annual savings of $13,000 a year in energy costs, and a payback period of ten years, and about one ton of avoided carbon emissions annually. Logan Airport was the first commercial airport to generate clean energy using wind.

Terminal B Garage Renovations
In 2009, Massport began a four-year rehabilitation of the Terminal B parking garage that includes structural repairs and the installation of solar panels on the top parking deck. In addition, the garage, roadways and walkways were retrofitted with energy-efficient LED lighting to further maximize efficiency. The project was completed in March 2012. During 2010, the energy-related upgrades were completed. The motion-detecting LED fixtures use approximately 50 percent less electricity than the previous lighting fixtures.

Table 1-6 Terminal B Solar Photovoltaic (PV) Panel Lifetime Data

Electricity Produced	571,473	kWh
CO_2 avoided	986,363	lbs
NO_x avoided	1,434	lbs
SO_2 avoided	4,320	lbs

Note: Recorded as of September, 2012.
Real-time power generation reporting for the solar panels as well as historical numbers and bar charts are available at: http://siteapp.fatspaniel.net/siteapp/detailView.jsf?eid=386776).

Each of the 32 solar panels is a single structure design with a stem and steel frame that uses solar panels as a roof over parked cars. These are mounted on an air ventilation unit on the roof of the garage and do not affect parking operations or the number or spaces available to travelers. As shown in Table 1-6, data recorded to date show that the Terminal B solar installation has produced about 570,000 kWh of electricity (238,000 kWh in fiscal year 2011 alone). In fiscal year 2011, the solar panel installation generated 22 percent of total annual electricity consumption for the garage.

Solar Panels on the roof of Terminal B Garage. Source: Massport.

While not directly related to energy use, Massport also set two rain collection water storage tanks as part of the Terminal B garage improvements. Massport is currently exploring options to re-use rainwater collected in the tanks to supplement such needs as landscape watering and street sweeping.

Economy Parking Garage
Massport installed 18 solar trees at the newly constructed Economy Parking Garage in 2011. These solar trees will provide 2 to 6 percent of the energy needs for the new facility, which also uses energy efficient LED lighting throughout.

Terminal A
Massport coordinated with a third-party developer to design and install solar panels on the roofs of both the Terminal A and the Terminal A Satellite Buildings. After receiving a grant for a portion of the installation costs, the remaining costs will be recovered by the developer through a long term power purchase agreement (PPA) with Massport for the purchase of electricity by the solar generation stations. Total annual power production will average approximately 453,000 kWh from both sites over the term of the PPA. Construction on both Logan Terminals was completed in December 2011.

Hanscom Field

Massport installed 222 solar panels on the Civil Air Terminal Building to produce clean renewable energy for Hanscom Field in 2011. The solar panels are located along the south-facing side of the building and include a series of wall-mounted panels along the building's façade. The 51.2 kW-rated photovoltaic panel system is expected to produce 57,233 kWh of electricity annually, or 10 percent of the building's total annual consumption.

Table 1-7 shows the rated capacity of Logan Airport actual and planned renewable energy installations.

Table 1-7 Rated Capacity of Renewable Energy Installations at Massport-owned Facilities

Solar PV	ConRAC	140 kW	Planned
	Green Bus Depot	50 kW	Planned
	Economy Parking Garage	81 kW	Completed
	Hanscom Field	50 kW	Completed
	Terminal A	300 kW	Completed
	Terminal A Satellite	93 kW	Completed
	Terminal B Garage	200 kW	Completed
Wind	Logan Office Center	20 kW	Completed

In addition to its renewable energy projects, Massport has also been exploring the purchase of renewable energy certificates (RECs) for some of its electricity needs to supplement its on-airport renewable generation.

Massport also operates a central heating and cooling system on Logan Airport, which is an efficient method of providing heating and cooling to multiple buildings in a large campus setting. The function of the central heating plant (CHP) is to provide both heating and cooling to the terminals and high temperature hot water to West Garage, Logan Office Center, Facilities I, and Hangars 8, 9, and 16. The CHP is also a centralized location for emergency power for Terminal E and Pier A of Terminal C. As part of Massport's Energy Master Plan, Massport is investigating ways to improve further the efficiency of the CHP therefore realizing even more benefits from this efficient energy management system.

Clean Technologies

Massport utilizes advanced technology whenever possible to encourage energy efficiency and reduce GHG emissions:

- Massport has equipped all jet bridges with 400 Hz power and/or pre-conditioned air (PCA), which reduces use of on-board gas powered auxiliary power units (APUs) and their associated air emissions. With the completion of the Terminal B improvements in 2014, all Logan Airport gates will have both 400 Hz power and PCA.
- Logan Airport was the first airport in the U.S. to use warm mix asphalt for its airfield pavement. The outer edges of Runway 4R-22L were repaved using this material in 2008; Runway 9-27 and the Centerfield Taxiway were both paved using this material in 2009. Warm mix is heated to a lower temperature than hot mix asphalt, which saves energy, resulting in 20 percent lower GHG emissions than hot mix asphalt. On Runway 9-27, this equated to a reduction of nearly 4,000 tons of CO_2, a savings of about 400,000 gallons of diesel fuel, and an energy savings of about 53 billion British Thermal Units (BTUs). Warm mix manufacturing reduces dust and NOx emissions on site and at the manufacturing plant, and combined with its lower temperature, results in a better working environment for installation crews. Warm mix asphalt contains about 20 percent recycled material, and can be applied in a thicker layer, requiring fewer passes with construction vehicles and fewer emissions of associated pollutants.

- Massport is testing an innovative automated system to retrieve hazardous foreign object debris. While this is primarily a safety measure, it does save time, money, some daily driving on the part of Airport Operations, and provides environmental benefits by reducing emissions of air pollutants associated with vehicle trips to inspect the runways.
- Massport replaced larger, inefficient, and difficult-to-maintain lamps on one taxiway with smaller, more efficient and easier-to maintain LED lighting starting in 2005. The project has been so successful that it has been expanded to other taxiways on the airfield.

Alternative Fuel Vehicles (AFVs)
As part of its environmental management policy, Massport purchases new alternative fuel or hybrid power vehicles to replace conventional vehicles when feasible. Massport encourages programs and projects that promote the use of electric and AFVs by planning for and constructing the necessary infrastructure to support current and future generations of electric and AFVs. The following projects and programs support AFVs:

- Delta Airlines recently converted much of its fleet of GSE to an all electric fleet at Logan Airport. Massport collaborated with Delta Airlines on this project by financing a low-interest loan to Delta to purchase the electric fleet and associated infrastructure. Conversion of the GSE fleet to all electric reduces greenhouse gas emissions from ground equipment at the Airport.
- Massport installed 13 new electric vehicle charging stations to accommodate a total of 26 vehicles in the Central and Terminal B parking garages**.** Passengers can park their electric vehicles at these stations to plug in, leave for their trips, and come back to a fully re-charged vehicle. The ConRAC, described above, will also include the infrastructure necessary to accommodate plug-in stations for electric rental vehicles. When constructed, the new ConRAC will include charging stations which conform to the new North American fast-charging standard SAE J1772-2009 electrical connector. All new mass-produced electric vehicles available starting in 2010 use this connection configuration.
- In 2010, Massport was awarded a grant from the FAA's Voluntary Airport Low Emissions Program (VALE) program to fund 75 percent of the incremental cost for the purchase of a new hybrid bus fleet for the ConRAC facility. Massport spent $35 million for a fleet of 50 alternative fuel buses in 2012, including 32 60-foot long articulated buses with diesel-electric hybrid engines and 18 42-foot long CNG buses. When the ConRAC is completed and the new ConRAC unified bus system is operational, these cleaner more fuel efficient buses will replace the less fuel efficent 94 rental car buses currently being used and Massport's older CNG buses. Massport expects this new unified bus system to reduce CO_2 emissions by 1,840 tons, NO_x by 50 tons, and VOCs by 25 tons during the new buses' estimated 12 years lifecycle.
- The 2008 renovations to the existing public gas station in the NCA included installing an E85 fuel dispensing tank. E85 is a first-generation biofuel which helps reduce dependence on foreign sources of oil.
- One of the largest public CNG stations in New England is at Logan Airport. CNG is a cleaner fuel, producing significantly lower amounts of harmful emissions than other vehicle fuels.[21]
- Massport's "CleanAir Cab" incentive program for AFVs or hybrid taxis, started in 2007 in cooperation with the City of Boston, continues to be successful. These taxis are given head of the line privileges in the taxi queue and passengers can request an AFV or hybrid taxi from the taxi queue. As a result of a large increase in the number of hybrid taxis in Boston's taxi fleet since 2007, two hybrid taxis are now given priority as part of each 10-car dispatch group from the taxi queue. Massport provides a 50 percent reduction in ground access fees for alternative fueled limousines and hotel shuttles. Massport provides reserved parking spaces for hybrid and AFVs in Logan Airport's garages.

21 For more information on the cleaner burning performance of CNG vehicles visit the EPA's website: http://www.afdc.energy.gov/afdc/vehicles/natural_gas_emissions.html

- Massport has supported and sponsored the Boston GreenFest since 2009 and AltWheels Fleet Day since 2003. These are annual forums to promote alternative fuels and sustainable transportation modes. Massport has been a financial sponsor of these events. Massport AFVs are exhibited on Fleet Day alongside an exhibit booth, and Massport's CNG buses transport attendees between event sites.

Waste, Recycling and Materials

Massport uses innovative practices to reduce material consumption and maximize recycling rates. All Airport vendors and airlines have access to recycling facilities, and contractors working on Airport construction projects are required to meet specific recycling standards. Highlights from Massport's waste and recycling program include:

- Massport implemented a single stream recycling program at Logan Airport consisting of the interior public areas of all of the terminals, both post-security and pre-security, as well as Logan Airport administrative offices. This includes collection of mixed paper (newspaper, cardboard and magazines), plastics, aluminum, and glass.
- For capital construction projects, Massport requires construction contractors to recycle the construction and demolition waste (C&D) generated by their projects. In May 2011, Massport began tracking the amount of materials recycled during capital construction projects. Between May and December 2011, Massport recycled almost all C&D materials from capital construction projects, 51,368 tons or 98 percent of C&D materials.
- Some concessionaires have their own corporate waste reduction and recycling programs supported by their own brand, and use biodegradable plastic bags, utensils, and takeout containers. Massport requires recycling through tenant leases, and all concessionaires have access to recycling.

Terminal Recycling Container. Source: Massport.

- Massport's environmentally preferred procurement policy requires purchase of environmentally preferrable versions of most products purchased by Massport. The policy covers items from recycled paper for Massport offices, to environmentally friendly cleaning supplies.
- In April 2011, Massport hosted a hazardous waste collection event at Logan Airport. Massport employees, along with employees of airlines and airport tenants, were encouraged to bring hazardous materials from their homes and workstations to Logan Airport for safe disposal and recycling. The event resulted in 10.3 tons of hazardous materials such as batteries, paints and solvents, pesticides, electronic waste, aerosol cans, and propane tanks being collected for safe disposal. Massport also hosted hazardous waste collection events at other Massport locations, such as Hanscom Field, in 2011.
- Massport SDSGs also aims to support the New England economy and support reuse of local materials and reduce transportation costs and emissions by providing a credit for Regional Materials. This credit requires that a project create a local purchasing goal that specifies the amount of materials to be extracted, harvested, recovered and /or manufactured within New England for the purposes of the project.
- Since 2005, Massport has been a member of the EPA's WasteWise Program, a national voluntary solid waste reduction program. Massport gains access to the best practices of over 1,000 members and strives to establish new waste prevention activities, expand or improve current recycling efforts, and purchase additional products with recycled content.

- Logan Airport supports a recycling program for waste vegetable oil produced by Airport restaurants and concessionaires through a third party. To better monitor this effort, Massport began tracking waste vegetable oil disposal and recycling in 2011.
- Massport provides all airlines with the facilities necessary to support in-flight recycling, but participation is determined by each individual airline, sometimes on a flight-by-flight basis. Delta Air Lines now recycles paper, plastic, and aluminum from all of its flights that land at Logan Airport.[22]

Sustainable Landscaping Programs
Logan Airport's landscape encompasses both marine and urban environments. Massport's landscaping program not only results in beautiful, naturalistic landscaping at the Airport, but includes the careful selection of native, drought tolerant plants and shrubs. Massport's landscaping program includes:

- Designs that are "naturalistic" rather than formal, as these typically require minimal care and maintenance, provide seasonal interest, and self-generate (an example of this is Sensitive and Royal Ferns).
- Selection of hardy plant materials, especially indigenous where appropriate, that thrive in specific airport landscapes, and are resistant to pests.
- Minimal use of lawn and extensive use of hardy groundcovers, especially those that demonstrate seasonal interest.
- Use of perennials instead of annuals in the Airport landscape.
- Use of mulch for shrub and perennial beds to retain moisture and reduce watering

Drought-resistant perennials at Logan Airport. Source: Massport.

In addition to sustainable landscaping design, Massport has been involved with cooperative efforts to expand the City of Boston's tree cover. Massport participates in the Grow Boston Greener Program, a City of Boston and Massachusetts Department of Conservation and Recreation sponsored initiative to increase Boston's tree cover from 29 percent to 35 percent by 2020. Boston Natural Areas Network (BNAN) was contracted to administer the Grow Boston Greener Program and the Boston Urban Forest Council (BUFC) is an advisory and advocacy group for the tree-tracking effort. This initiative includes the planting of at least 100,000 trees as well the creation of a record-keeping system for trees planted since 2008. In support of this program, Massport tracks and reports on an annual basis, the number, types, and locations of trees that Massport is planting on Logan Airport and Port properties within the City of Boston.

Internal Education and Training
Massport has a program that educates Massport staff on everyday ways to save energy and reduce waste while at work. Informational signs and flyers for staff contain details on the types of materials that can be recycled at work and strategies for saving energy on a daily basis by, for example, turning off lights when leaving a conference room or office, and turning computers off at night.

22 Due to U.S. Department of Agriculture (USDA) and U.S. Customs and Border Protection (USCBP) regulations, waste from international flights is considered regulated waste and must be separated and incinerated or sterilized at a special facility.

Additional Sustainability Programs and Initiatives

A selection of Massport's sustainability programs and initiatives, provided in Table 1-8, are further described in individual chapters of this *2011 ESPR*. They are highlighted in each chapter with a sustainability leaf

Table 1-8 Additional Sustainability Projects and Initiatives Documented in the ESPR

Sustainability Program or Initiative	Description	Reference in *2011 ESPR*
GreenDOT and Massachusetts Healthy Transportation Compact	Statewide transportation initiatives that balance the needs of all transportation users, improve public health, and reduce the environmental impact of transportation.	Chapter 4, Regional Transportation
Logan Transportation Management Association (Logan TMA)	The Logan TMA helps to reduce the number of Airport employees commuting by private automobile, to enhance commuter options, and to reduce traffic and parking demands at Logan Airport.	Chapter 5, Ground Access to and from Logan Airport
Pedestrian Facilities and Bicycle Parking	Sidewalks are available along most Airport roadways, overhead pedestrian bridges provide pedestrian connections to all terminals. Bicycle parking is also available at terminals.	Chapter 5, Ground Access to and from Logan Airport
Preferred Parking for Alternative Fuel Vehicles	Massport has preferred parking areas in garages, close to terminal entry points for alternative fuel or hybrid vehicles.	Chapter 5, Ground Access to and from Logan Airport
Logan Airport Silver Line and Blue Line Rapid Transit Service	Massport supports MBTA rapid transit service which serves all terminals at Logan Airport from South Station and Airport Station.	Chapter 5, Ground Access to and from Logan Airport
High occupancy vehicle (HOV) goals	The goal of Massport is to attain a 35.2 percent HOV ground access mode share at the 37.5 million air passenger annual level.	Chapter 5, Ground Access to and from Logan Airport
Cell Phone Waiting Lot	The recently expanded Cell Phone Waiting Lot has helped to reduce vehicle emissions by minimizing idling and vehicle miles traveled (VMT).	Chapter 5, Ground Access to and from Logan Airport
Logan Air Quality Initiative (AQI)	The AQI is a 15-year voluntary program with the goal of maintaining NOx emissions at, or below, 1999 levels.	Chapter 7, Air Quality/Emissions Reduction
Massport Alternative Fuel Vehicle Purchasing Policy	This is a policy to replace conventionally-fueled fleet with alternatively fueled or powered vehicles, when feasible.	Chapter 7, Air Quality/Emissions Reduction
Participation in statewide climate change related groups	Massport participates in working groups focused on achieving goals in the Global Warming Solutions Act, as part of the Commonwealth's Climate Change Adaptation Advisory Committee	Chapter 7, Air Quality/Emissions Reduction
Air Quality Studies	Massport participates in or has commissioned air quality related studies such as the Massachusetts Department of Public Health study, the Massport Air Quality Monitoring Study, and MIT research on single engine taxiing.	Chapter 7, Air Quality/Emissions Reduction
Energy Planning	Massport's Energy Master Plan is being implemented in phases to reduce Logan Airport's overall energy consumption.	Chapter 7, Air Quality/Emissions Reduction

Sustainability Awards

Table 1-9 highlights some of the most recent environmental sustainability-related awards Massport has received. Massport has repeatedly been recognized as an environmental leader by national and international organizations in various industries.

Table 1-9 Selected Sustainability Awards

Year	Awarding Organization	Name of Award	Subject
2010	Construction Management Association of America (CMAA)	CMAA Infrastructure Award of the Year	This award was for the rehabilitation of Runway 9-27 with warm mix asphalt. Warm mix asphalt uses less energy to produce and results in fewer greenhouse gas emissions.
2009	American Association of Port Authorities	Comprehensive Environmental Management Award	This was awarded for Massport's Sustainable Design Standards and Guidelines
2008	American Institute of Aeronautics and Astronautics (AIAA), the American Association of Airport Executives (AAAE), and the Airports Consultants Council (ACC)	Jay Hollingsworth Speas Airport Award	The award recognizes the environmental benefits achieved by Terminal A at Boston Logan International Airport, the world's first LEED certified airport terminal.
2008	Commonwealth of Massachusetts	Leading by Example Awards	The Leading by Example Awards recognize outstanding efforts among Commonwealth agencies, public colleges and universities, and municipalities which have established and implemented policies and programs resulting in significant and demonstrable environmental benefits.
2008	Airports Council International –North America (ACI-NA)	Environmental Management Award	Logan Airport's Air Quality Program / Emissions Reduction Program
2007	Business travel website Aviation.com.	"Easiest Airport to Get To"	Logan Airport is among the closest airports in the country to the Central Business District of a major city with a five-minute drive or 15-minute rapid transit ride to downtown Boston, reducing emissions associated with accessing the airport, when compared to peer airports.

Organization of the *2011 ESPR*

The remainder of this *2011 ESPR* is organized as follows:

- ***Chapter 2, Activity Levels***, presents aviation activity statistics for Logan Airport in 2011 and compares activity levels to the prior year. The specific activity measures discussed include air passengers, aircraft operations, fleet mix, and cargo/mail volumes. This chapters also provides Massport's long-range 2030 aviation forecast for Logan Airport
- ***Chapter 3, Airport Planning***, provides an overview of planning, construction, and permitting activities that occurred at Logan Airport in 2011. It also describes known future planning, construction, and permitting activities and initiatives.
- ***Chapter 4, Regional Transportation***, describes activity levels at New England's regional airports in 2011 and updates recent regional planning activities.
- ***Chapter 5, Ground Access to and from Logan Airport***, reports on transit ridership, roadways, traffic volumes, and parking for 2011. It also provides forecsts for traffic volumes, parking, and VMT for the year 2030.

- ***Chapter 6, Noise Abatement***, updates the status of the noise environment at Logan Airport in 2011, and describes Massport's efforts to reduce noise levels. It also provides noise contours population counts for 2030.
- ***Chapter 7, Air Quality/Emissions Reduction***, provides an overview of Airport-related air quality issues in 2011 and efforts to reduce emissions. It also predicts emission levels for 2030.
- ***Chapter 8, Water Quality/Environmental Compliance and Management***, describes Massport's ongoing environmental management activities including NPDES compliance, stormwater, fuel spills, activities under the Massachusetts Contingency Plan (MCP), and tank management.
- ***Chapter 9, Project Mitigation Tracking***, reports on Massport's progress in meeting its MEPA Section 61[23] mitigation commitments for specific Airport projects.

Supporting appendices include:

- **MEPA Appendices**: The Secretary of EEA's Certificate on the *2010 EDR*, comment letters received on the *2010 EDR* and responses to those comments, Secretary of EOEEA's Certificates on the annual reports issued for reporting years 2004 through 2009, a list of reviewers to whom the *2011 ESPR* was distributed, and a proposed scope for the *2012/2013 EDR*.
- **Technical Appendices**: These include detailed analytical data and methodological documentation for the various environmental analyses presented in and conducted for this *2011 ESPR*.

23 Massachusetts General Law, Chapter 30, Section 61 (M.G.L. c. 30, § 61).

This Page Intentionally Blank

2

Activity Levels

Introduction

This chapter reports on annual air traffic activity at Logan Airport in 2011, including air passengers, aircraft operations, aircraft fleet mix, and cargo volumes. Air traffic activity levels at Logan Airport form the basis for the evaluation of vehicle miles traveled (VMT), noise, and air quality impacts associated with the Airport. The 2011 activity levels at the Airport are compared to 2010 levels, and historical passenger and operation trends at Logan Airport since 2000 are reviewed. This *2011 Environmental Status and Planning Report (ESPR)* also provides an opportunity to revisit previous forecasts completed in 2003 and documented in the *2004 ESPR*, and revise them based on current and predicted conditions. This chapter includes a discussion of national aviation trends since 2000 and the updated 2030 long-range forecast of aviation activity levels at Logan Airport. The updated planning year, 2030, includes consideration of changes in aircraft fleet mix, anticipated airline industry trends, and likely destinations to be served by Logan Airport air carriers. Similar to other ESPRs, the document provides an overview of Massachusetts Port Authority's (Massport) updated forecasts for future passenger, aircraft and cargo activities. The future forecasts will again be revisited during the next ESPR cycle (approximately five years after this *2011 ESPR*), if necessary.

The chapter specifically describes 2011 activity levels, historical trends, and the 2030 forecast activity levels for:

- Air passengers and aircraft operations at Logan Airport
- Cargo and mail volumes at Logan Airport
- Airline service at Logan Airport

Key Findings

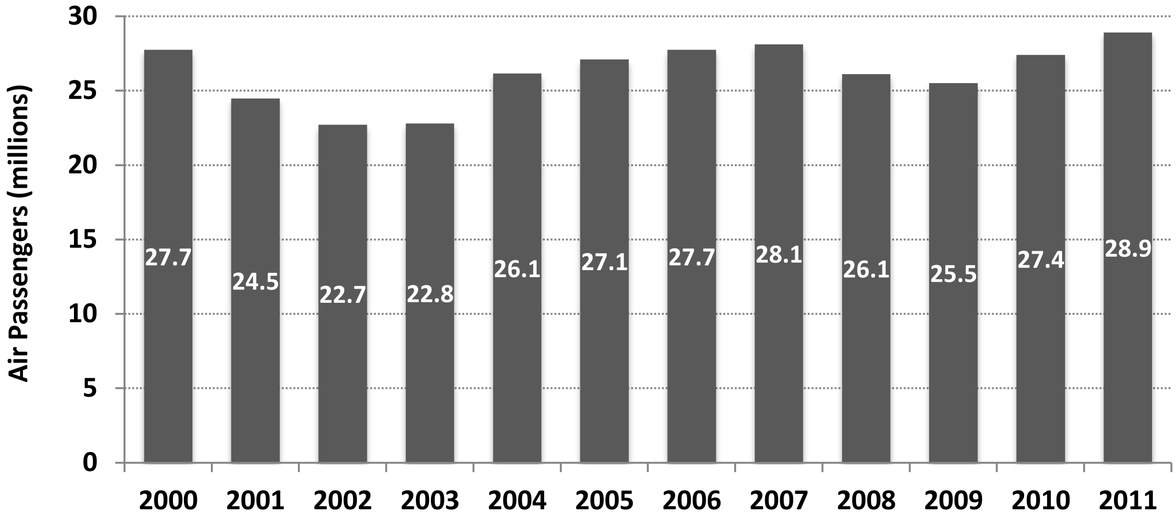
Logan Airport saw an overall increase in passengers and aircraft operations in 2011. The trend of increasing activity levels at the Airport marked a continued recovery from high fuel prices and the economic recession that depressed traffic levels across the U.S. in 2008 and 2009. Air traffic increases at Logan Airport have been driven primarily by the growth of low-cost carriers (LCCs), including JetBlue Airways and Southwest Airlines, over the past decade. JetBlue Airways in particular has continued to expand rapidly at the Airport in recent years, even as many legacy carriers reduced services and consolidated operations. In 2011, passenger levels at Logan Airport reached a new peak, exceeding the previous 2007 historic peak. Aircraft operations at the Airport have grown at a slower pace than passenger traffic, as legacy carriers have restricted growth in aircraft operations, leading to higher load factors, and a move towards larger, more fuel-efficient aircraft in the new high-cost fuel environment.

Notable changes in passenger, operations and cargo activity at Logan Airport in 2011 included the following:

- The total number of air passengers at Logan Airport increased by 5.4 percent to 28.9 million, compared to 27.4 million in 2010 (Figure 2-1). Previously, annual air passengers at the Airport increased by 7.5 percent between 2009 and 2010. Passenger levels in 2011 represent a new record, exceeding the 2007 peak of 28.1 million annual air passengers. In 2000, Logan Airport accommodated 27.7 million air passengers.
- The total number of aircraft operations[1] grew from approximately 352,640 in 2010 to 368,990 in 2011, an increase of 2.1 percent. Aircraft operations at Logan Airport in 2011 remained well below the 487,996 operations peak in 2000 and the historic peak achieved in 1998. Passenger aircraft operations, which accounted for 91 percent of total aircraft operations, increased by 0.8 percent compared to 2010 levels.
- General aviation[2] (GA) operations, which accounted for 8 percent of total operations, increased by 92.3 percent over 2010 levels. This marked a strong recovery in GA activity at Logan Airport as a result of improving economic conditions, following steep declines in GA operations from 2008 to 2009 due to the economic recession. The 28,230 GA operations in 2011 were still below the GA levels in 2000, which totaled 35,233 GA operations.
- There were 6,270 dedicated air cargo operations at Logan Airport in 2011, which represents a decline of 0.1 percent compared to the previous year. All-cargo operations have fallen by nearly 50 percent since 2000 when Logan Airport accommodated 12,282 air cargo operations.
- The number of air passengers per aircraft operation continued to increase, climbing from an average of 77.8 passengers per aircraft operation in 2010 to an average of 78.3 passengers per aircraft operation in 2011, reflecting even greater efficiency. This compares to 56.8 passengers per operation in 2000.
- JetBlue Airways continued to expand service rapidly at Logan Airport, increasing its total operations by 22.3 percent compared to 2010. In 2011, the number of JetBlue Airways' operations exceeded those of US Airways to become the largest carrier in terms of aircraft operations at Logan Airport. JetBlue Airways, already the largest carrier in terms of passengers, overtook both American Airlines and Delta Air Lines in 2010. JetBlue Airways accounted for 19.1 percent of aircraft operations and 22.8 percent of total passengers at Logan Airport in 2011.
- Legacy air carriers maintained tight capacity discipline, while LCCs increased operations. Legacy carriers continued to reduce domestic operations slightly in 2011, eliminating less profitable routes. In contrast, LCC operations have steadily increased. LCCs accounted for 32.5 percent of domestic operations at Logan Airport in 2011, compared to 28.6 percent in 2010, 9.0 percent in 2003 prior to JetBlue Airways' entry, and just 2.9 percent in 2000.
- Air cargo volumes, including shipments transported in the belly compartments of passenger aircraft, decreased from 572 million pounds in 2010 to 555 million pounds in 2011, a decline of 3.1 percent. As shown in Table 2-6, the largest volume decrease occurred in the freight segment. In comparison, Logan Airport's air cargo volume exceeded 1 billion pounds in 2000.

1 An aircraft operation is defined as one arrival or one departure.
2 General Aviation (GA) is defined as all aviation activity other than commercial airline and military operations.

Figure 2-1 Passenger Activity Levels at Logan Airport, 2000-2011



Source: Massport.

Periodically, Massport updates its long-range planning forecasts for the three Massport airports (Logan Airport, Worcester Regional Airport, and Hanscom Field) to reflect the current status of the airline industry and emerging trends that are expected to influence future aviation activities. In 2011, Massport updated the Logan Airport long-range forecast using 2010 as the base year and 2015, 2020, and 2030 as the forecast years. Three scenarios were also developed (Low, Moderate, and High). Massport views the Moderate forecast scenario as the most likely forecast of future activity levels at Logan Airport. Highlights for the long-range Moderate forecast for 2030 include:

- The total number of air passengers at Logan Airport is projected to increase by 1.7 percent annually and reach 39.8 million in 2030. Domestic passengers are forecast to be 32.1 million, an increase of 1.4 percent per year, while international passengers are forecast to be 7.6 million, an increase of 3.5 percent per year.
- GA passenger traffic is forecast to remain relatively stable over the forecast period at approximately 108,000 passengers.
- Aircraft operations are forecast to increase at a slightly slower rate than passenger traffic, growing by 1.3 percent per year. By 2030, Logan Airport is forecast to accommodate 474,734 annual aircraft operations. Passenger airlines are expected to account for nearly 93 percent of total aircraft operations at Logan Airport in 2030.
- In 2000, there were 487,996 operations with 27.7 million passengers as compared to projected operations of 474,734 and annual passengers of 39.8 million in 2030.
- The projected fleet mix for Logan Airport reflects a continuation of airline industry fleet trends that include movement into larger capacity jet aircraft, a reduction in small regional jet (RJ) aircraft and increases in larger RJs and turboprops, which have more favorable operating costs in a high fuel price environment. At Logan Airport, the passenger airline aircraft fleet mix is expected to shift towards larger capacity jet aircraft. As a result of the expected shifts in the fleet mix and slightly higher passenger load factors, the average number of passengers per passenger airline operation is predicted to rise from 78 in 2011 to 84 in 2030.

- The total volume of cargo at Logan Airport is forecast to increase by 2.6 percent per year from 529 million pounds in 2011 to 867 million pounds in 2030. While the cargo volume has declined overall since 2000, the decline was mainly the result of a modal shift as FedEx and United Parcel Service (UPS) began to rely more on trucking to move their less time-sensitive packages. More recently, the 2008/2009 Economic Recession and slow pace of recovery have depressed cargo activity at Logan Airport. The modal shift has largely occurred and is not expected to affect cargo in the future. Economic growth is expected to be the main driver of cargo demand over the long-range planning horizon.

Air Passenger Levels in 2011

The following section provides an overview of air passenger levels in 2011 for Logan Airport.

Logan Airport Passengers

Passenger traffic at Logan Airport totaled 28.9 million in 2011, compared to 27.4 million in 2010. This represents an increase of 1.5 million passengers or 5.4 percent between 2010 and 2011. Previously, passenger traffic had increased by 7.5 percent between 2009 and 2010. The passenger traffic level in 2011 represents a historic high for Logan Airport, exceeding the previous record of 28.1 million in 2007. Passenger growth at Logan Airport continues to outpace overall U.S. passenger growth. Total scheduled passenger traffic in the U.S. increased by only 1.7 percent in 2011.[3] Factors that contributed to the strong passenger growth at Logan Airport in 2011 included:

- The continued robust expansion of JetBlue Airways at Logan Airport, and
- A return to modest economic growth for the U.S. economy, resulting in a gradual recovery in air travel demand across the nation.

As shown in Table 2-1, domestic air passengers, which represent Logan Airport's largest market segment at 85.9 percent of total passengers, increased by 4.8 percent over 2010 levels. JetBlue Airways' continued expansion at Logan Airport was the main contributor to this growth. JetBlue Airways carried 6.2 million domestic passengers in 2011, an increase of 1.4 million passengers over 2010. Figure 2-2 shows the annual passengers for the five dominant airlines at Logan Airport and highlights the rapid expansion of JetBlue Airways since 2004. Overall, the tremendous LCC growth at the Airport over the past decade – with JetBlue Airways' entry in 2004 and Southwest Airlines' entry in 2009 in particular – has exceeded consolidation and contraction among legacy carriers.[4] Domestic passenger activity levels have recovered after the events of September 11, 2001, climbing to 23.8 million in 2007, and reaching a new peak of 24.8 million in 2011.

3 Bureau of Transportation Statistics, 2011.

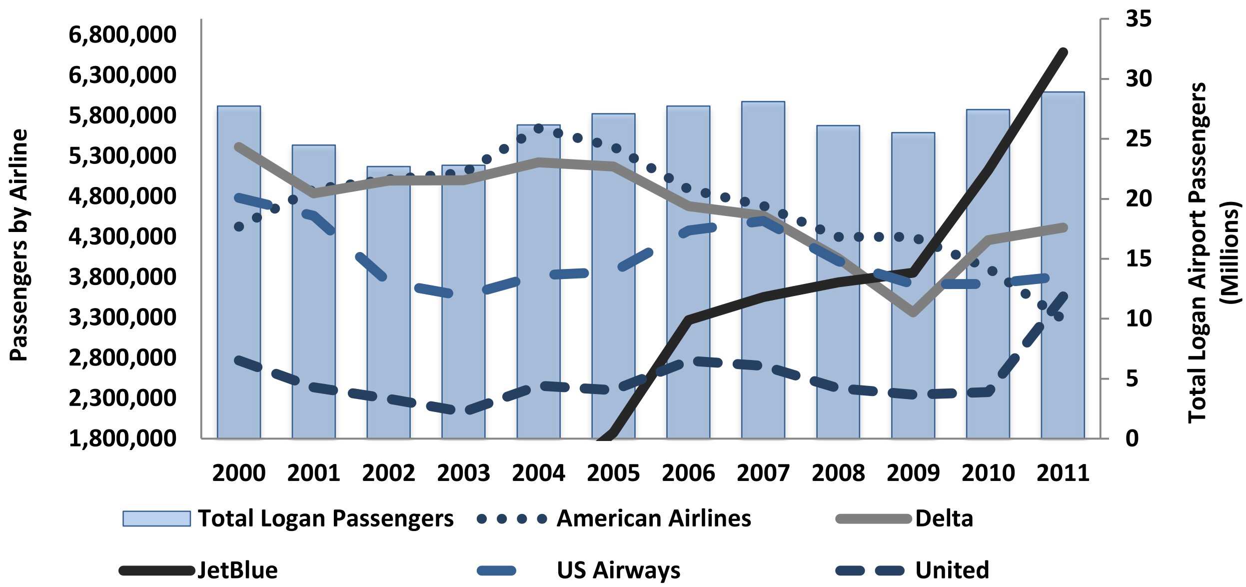
4 Delta Air Lines and Northwest Airlines merged in 2009, and United Airlines and Continental Airlines merged in 2010. At Logan Airport, total passengers carried by the consolidated Delta Air Lines decreased 10.7 percent in 2010, followed by a modest increase of 3.6 percent in 2011. Total Logan Airport passengers carried by the consolidated United Airlines decreased by 0.3 percent in 2011.

Table 2-1 Air Passengers by Market Segment, 2000-2011

	2000	2001	2002	2003	2004	2005	2006
Domestic	**23,100,645**	**20,070,039**	**18,725,422**	**18,890,079**	**21,830,294**	**22,728,788**	**23,556,382**
International	**4,513,192**	**4,301,250**	**3,882,257**	**3,815,987**	**4,201,638**	**4,237,105**	**4,049,595**
Europe/ Middle East	2,948,452	2,661,471	2,469,822	2,435,997	2,590,225	2,629,823	2,599,382
Canada	833,669	733,559	670,457	564,018	622,098	682,904	621,185
Bermuda/ Caribbean	693,620	905,962	728,992	786,574	911,757	845,863	784,477
Asia/Pacific	37,451	258	0	0	0	0	0
Central/South America	0	0	12,986	29,398	77,558	78,515	44,551
General Aviation	**112,996**	**103,641**	**88,462**	**85,103**	**110,584**	**122,012**	**119,466**
Total Passengers	**27,726,833**	**24,474,930**	**22,696,141**	**22,791,169**	**26,142,516**	**27,087,905**	**27,725,443**
	2007	**2008**	**2009**	**2010**	**2011**	**Pct. Change (2010-2011)**	**Avg. Annual Growth (2000-2011)**
Domestic	**23,837,727**	**22,032,246**	**21,767,086**	**23,688,471**	**24,831,068**	**4.8%**	**0.7%**
International	**4,153,442**	**3,977,297**	**3,696,336**	**3,681,739**	**3,962,454**	**7.6%**	**(1.2%)**
Europe/ Middle East	2,754,427	2,687,693	2,605,825	2,672,635	2,939,226	10.0%	(0.0%)
Canada	581,178	552,745	453,430	518,088	573,660	10.7%	(3.3%)
Bermuda/ Caribbean	807,094	731,946	636,719	486,911	447,650	(8.1%)	(3.9%)
Asia/Pacific	0	392	0	0	0	0.0	-
Central/South America	10,743	4,521	362	4,105	1,918	(53.3%)	-
General Aviation	**111,286**	**93,108**	**48,664**	**58,752**	**114,416**	**94.7%**	**0.1%**
Total Passengers	**28,102,455**	**26,102,651**	**25,512,086**	**27,428,962**	**28,907,938**	**5.4%**	**0.4%**

Source: Massport.
Notes: Subject to revised domestic and Caribbean passenger numbers from Massport.
Numbers in parenthesis () indicate negative number.

Figure 2-2 Annual Passengers at Logan Airport Among Top Five Airlines, 2000-2011

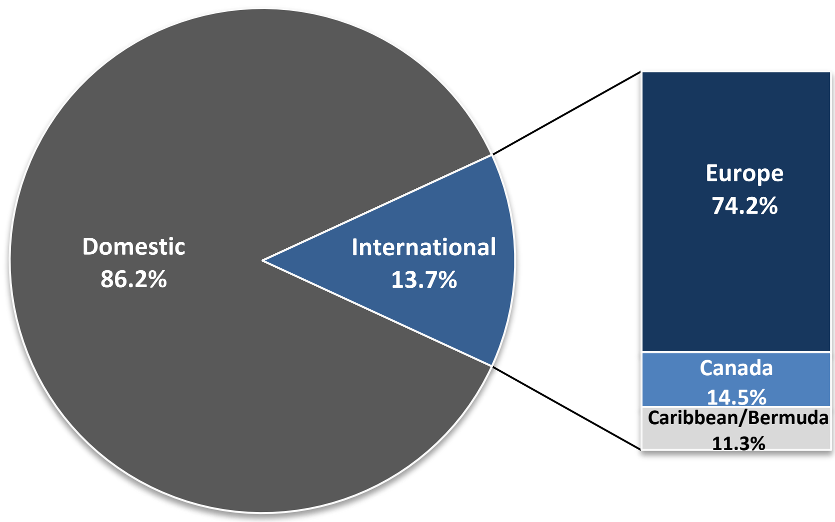


Source: Massport.
Note: United Airlines totals in this chart include Continental Airlines beginning in 2011 (following 2010 merger), Delta Air Lines totals include Northwest Airlines beginning in 2010 (following 2009 merger), and US Airways include America West Airlines beginning in 2005 (following 2005 merger). Totals for American Airlines, Delta Air Lines, United Airlines and US Airways include Delta Shuttle, US Airways Shuttle, and contract carriers doing business as Delta Connection, United Express, US Airways Express, American Eagle, or American Connection.

The number of international air passengers also increased in 2011, following declines in the previous three years. International demand had been negatively impacted by the global 2008/2009 economic recession and is only recently beginning a modest recovery. International passenger traffic at Logan Airport increased by 7.6 percent in 2011, compared to a decline of 0.4 percent in 2010 from 2009 levels. Total international passengers at 4.0 million in 2011 remain below the 4.5 million international passenger level reached in 2000.

Figure 2-3 shows the distribution of Logan Airport passengers by market segment. Europe was the dominant international destination market, accounting for 74.2 percent of international traffic and 10.2 percent of total traffic at Logan Airport. Passenger traffic to Europe was up 10.0 percent from 2010 levels, compared to an increase of 2.6 percent between 2009 and 2010. Canada and the Bermuda/Caribbean region accounted for 14.5 percent and 11.3 percent of international passengers respectively in 2011. Travel to Canada increased by 10.7 percent compared to an increase of 14.3 percent in 2010. Traffic to the Bermuda/Caribbean market continued to decline, decreasing by 8.1 percent in 2011, following a 23.5 percent decline in 2010. This was the result of Caribbean service cuts and passenger reductions by American Airlines and US Airways.

Figure 2-3 Distribution of Logan Airport Passengers by Market Segment, 2011



Source: Massport.
Note: GA accounted for 0.4 percent of Logan Airport Passengers in 2011.

Aircraft Operation Levels in 2011

This section reports on aircraft operations levels for Logan Airport, including passenger aircraft operations, GA operations, all-cargo aircraft operations, and aircraft load factors for 2011.

Logan Airport Aircraft Operations

The total number of aircraft operations at Logan Airport (including passenger, GA and all-cargo) increased from 352,643 operations in 2010 to 368,987 operations in 2011. This represents an increase in aircraft operations of 4.6 percent in 2011 (Table 2-2), compared to an increase of 2.1 percent in 2010. Aircraft operations continued to increase at a slower rate than passenger levels, as a result of passenger load factors continuing to increase. Figure 2-4 depicts passengers and operations data since 1990, and shows how passenger levels have grown at Logan Airport while overall aircraft operations have decreased to levels prior to 1990. This trend reflects reductions in the use of small aircraft since 2000 and tighter capacity control and increased efficiencies on the part of airlines.

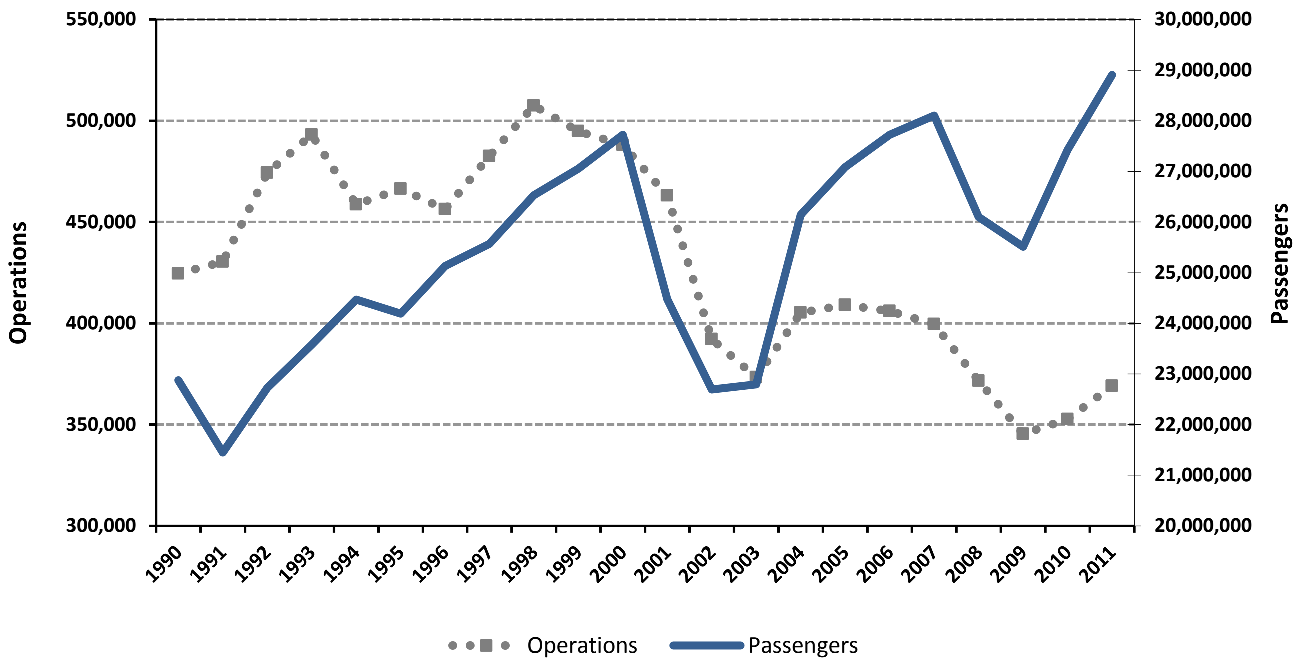
Table 2-2 Logan Airport Aircraft Operations, 2000-2011

Category	2000	2001	2002	2003	2004	2005	2006
Total Aircraft Operations	**487,996**	**463,124**	**392,079**	**373,304**	**405,259**	**409,067**	**406,119**
Operations by Type and Aircraft Class							
Passenger Jet	254,968	233,431	202,313	185,166	212,723	201,502	206,467
Passenger Regional Jet	37,600	70,533	93,493	100,336	102,039	113,886	110,554
Passenger Non-Jet	147,913	119,103	60,663	49,520	49,672	52,114	48,663
Total Passenger Operations	**440,481**	**423,067**	**356,469**	**335,022**	**364,434**	**367,502**	**365,684**
GA Jet Operations	20,595	15,056	16,586	20,480	23,085	25,806	26,566
GA Non-Jet Operations	14,638	13,683	9,010	8,180	8,151	6,846	4,878
Total GA Operations	**35,233**	**28,739**	**25,596**	**28,660**	**31,236**	**32,652**	**31,444**
Cargo Jet	11,788	11,156	10,012	9,620	9,589	8,913	8,493
Cargo Non-Jet	494	162	2	2	0	0	498
Total Cargo Operations	**12,282**	**11,318**	**10,014**	**9,622**	**9,589**	**8,913**	**8,991**

Category	2007	2008	2009	2010	2011	Percent Change (2010-2011)	Percent Change (2000-2011)
Total Aircraft Operations	**399,537**	**371,604**	**345,306**	**352,643**	**368,987**	**4.6%**	**(2.5%)**
Operations by Type and Aircraft Class							
Passenger Jet	220,135	209,931	205,341	214,307	223,083	4.1%	(1.2%)
Passenger Regional Jet	88,500	80,589	70,198	66,498	61,704	(7.2%)	4.6%
Passenger Non-Jet	53,663	48,595	50,867	50,882	49,700	(2.3%)	(9.4%)
Total Passenger Operations	**362,298**	**339,115**	**326,406**	**331,687**	**334,487**	**0.8%**	**(2.5%)**
GA Jet Operations	22,925	17,750	8,988	11,430	21,129	84.9%	0.2%
GA Non-Jet Operations	5,707	6,070	3,254	3,252	7,101	118.3%	(6.4%)
Total GA Operations	**28,632**	**23,820**	**12,242**	**14,682**	**28,230**	**92.3%**	**(2.0%)**
Cargo Jet	8,084	8,149	5,431	5,332	5,053	(5.2%)	(7.4%)
Cargo Non-Jet	523	520	1,227	942	1,217	29.2%	8.5%
Total Cargo Operations	**8,607**	**8,669**	**6,658**	**6,274**	**6,270**	**(0.1%)**	**(5.9%)**

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.

Figure 2-4 Logan Airport Historical Air Passenger and Aircraft Operations, 1990-2011



Passenger Operations

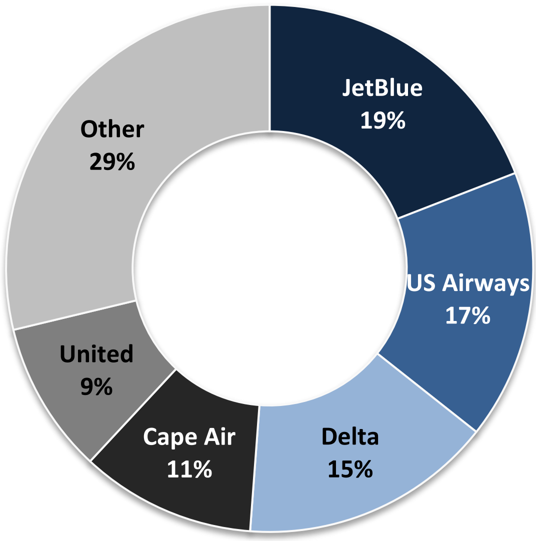
Passenger aircraft operations, which represented 90.7 percent of total aircraft operations at Logan Airport, increased by 0.8 percent in 2011 compared to 2010. The dominant carriers at Logan Airport based on the number of aircraft operations are shown in Figure 2-5. Passenger RJ operations (jet aircraft with fewer than 100 seats) and passenger non-jet operations continued to decrease. RJ operations, which have declined annually since 2006, dropped another 7.2 percent in 2011.[5] Passenger operations in non-jet aircraft (turboprop or piston aircraft) declined by 2.3 percent in 2011. Passenger jet operations increased 4.1 percent from 214,307 operations in 2010 to 223,083 operations in 2011. The change in the aircraft mix of passenger flights at Logan Airport over the past eleven years is shown in Figure 2-6. RJs accounted for 18 percent of total passenger operations in 2011, compared to 31 percent at the peak level in 2005. Similarly, non-jets have declined from 34 percent in 2000 to 15 percent in 2011.

The decrease in RJ and non-jet passenger operations at Logan Airport was a result of continued service cutbacks by legacy carriers such as Delta Air Lines, American Airlines, and US Airways. While the legacy carriers also implemented significant cuts in passenger jet operations, these cuts were more than offset by increases associated with JetBlue Airways' and Southwest Airlines' service expansion.

With RJ operations, there has been a trend of airlines retiring the smaller RJs with 30 to 50 seats, which have not proven to be cost-effective in the current high fuel price environment, and a trend of increasing use of larger RJs or turboprops with 60 to 90 seats. In recent years, the use of larger RJs with 60 to 90 seats has increased steadily at Logan Airport from approximately 1.1 percent share of total RJ operations in 2000 to 50.6 percent in 2010.

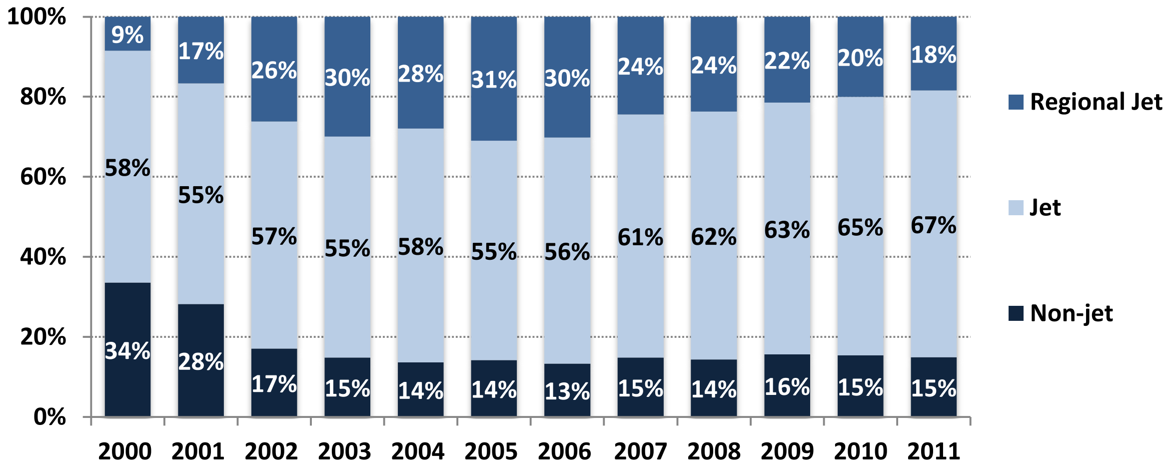
5 In this report, the term regional jet refers to small jet aircraft with fewer than 90 seats. The Embraer-190, operated by JetBlue Airways and U.S. Airways at Logan Airport, carries up to 100 and 99 passengers respectively, and is considered a jet.

Figure 2-5 Dominant Passenger Carriers at Logan Airport by Aircraft Operations, 2011



Notes: United Airlines figure includes Continental Airlines (2010 merger).
Totals for American Airlines, Delta Air Lines, United Airlines and US Airways include all regional affiliates and contract carriers.
"Other" category includes all other carriers which have a smaller portion of aircraft operations at Logan Airport. This category includes but is not limited to United Airlines, Southwest, Continental, AirTran, Air Canada, Porter Airlines, British Airways and Lufthansa, which provide year-round and seasonal service to Logan Airport.

Figure 2-6 Passenger Aircraft Operations at Logan Airport by Aircraft Type, 2000-2011



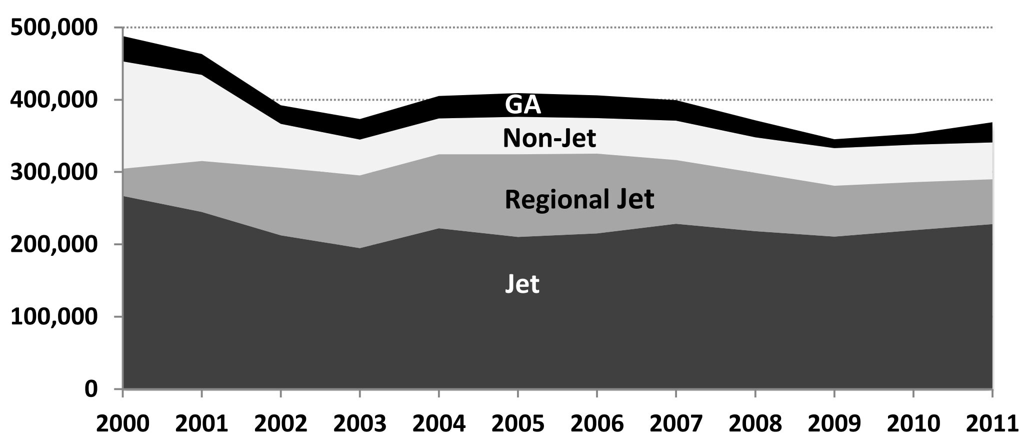
Source: Massport

JetBlue Airways, US Airways, Delta Air Lines, Cape Air, and the new consolidated United Airlines/ Continental Airlines were the dominant carriers at Logan Airport in 2011 based on the number of aircraft operations.[6] JetBlue Airways accounted for approximately 63,910 operations in 2011, overtaking US Airways in annual operations at Logan Airport. US Airways accounted for 55,338 operations and Delta Air Lines ranked third with 51,955 operations. Cape Air and United Airlines ranked 4th and 5th, with 35,940 operations and 31,181 operations respectively.

General Aviation Operations

GA is defined as all aviation activity other than commercial airline and military operations. It encompasses a variety of aviation activities including corporate/business aviation, private business jet charters, law-enforcement, and emergency medical/air ambulance services at Logan Airport. GA operations are conducted with a diverse group of aircraft ranging from gliders and single-engine piston driven aircraft, to high-performance, long-range business jet aircraft. GA activity began to rebound at Logan Airport in 2010 following a steep decline during 2008-2009 due to high fuel prices and economic recession. Businesses increased their travel and use of GA transportation as the economy improved. GA operations grew 92.3 percent in 2011, following a 19.9 percent increase in 2010. GA operations totaled 28,230 operations in 2011, up from 14,682 operations in 2010, but still below the 2005 level of 32,650 GA operations. In 2011, GA operations accounted for 7.7 percent of aircraft activity at Logan Airport. In comparison, Hanscom Field accommodated 160,840 GA operations in 2011, with GA activity accounting for 99 percent of Hanscom's aircraft activity. Hanscom Field remains the primary GA airport for the Greater Boston region, accommodating close to six times the number of GA operations than at Logan Airport. Figure 2-7 depicts changes in Logan Airport aircraft operations by category since 2000.

Figure 2-7 Aircraft Operations at Logan Airport by Aircraft Class, 2000-2011



Source: Massport.
Notes: Jet, regional jet, and non-jet operations are associated with commercial passenger and all-cargo airlines.
GA operations also include jet and non-jet aircraft, but are associated with private charter and corporate use.

6 Airline rank is based on total number of a carrier's operations for carrier "families," including activity for all code share partners and regional subsidiaries.

All-Cargo Operations

All-cargo operations, which are also strongly linked to the economy, showed little change with a decrease of 0.1 percent in 2011. This compares to a decline of 5.8 percent in 2010. The all-cargo segment represents less than 2 percent of aircraft activity at Logan Airport with approximately 6,270 operations in 2011.

Passengers Per Aircraft and Load Factors

The average number of passengers per aircraft operation increased in 2011, continuing the trend seen over the past decade. The average number of passengers per aircraft operation can be an indicator of the average size of aircraft using Logan Airport, and/or an indicator of changes in average aircraft load factor. In 2011, Logan Airport operations accommodated an average of 78.3 passengers per flight compared to 77.8 passengers in 2010 (Table 2-3). The average number of passengers per flight has risen by 37.9 percent since 2000, when the average number of passengers per flight was 56.8. The increasing number of passengers per flight is a reflection of the airlines' continued emphasis on restrained capacity growth, a shift away from smaller aircraft, and increasing passenger load factors. Load factors are the percentage of seats occupied by passengers, and are a common industry indicator of how occupied an aircraft is compared to the available seats. The average load factor for flights from Logan Airport has historically tracked below the national average. In 2011, Logan Airport's average domestic load factor increased to 77.5 percent, up from 76.8 percent in 2010. The national average domestic load factor also increased, rising to 78.8 percent in 2011, compared to 78.0 percent in 2010.[7] Changes in passengers per operation and load factor are shown in Figure 2-8.

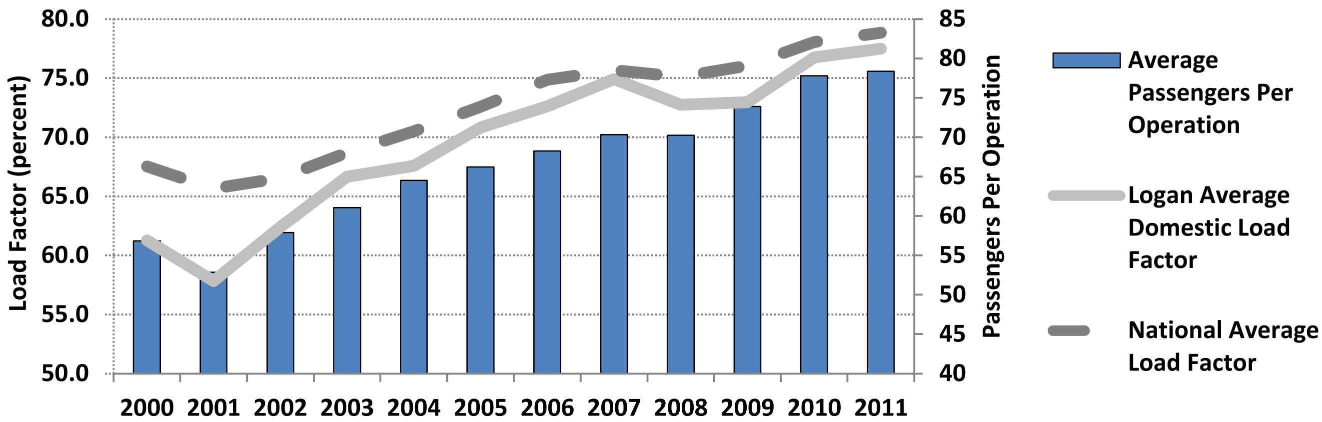
Table 2-3 Air Passengers and Aircraft Operations, 2000-2011

Year	Air Passengers	Percent Change from Previous Year	Aircraft Operations	Percent Change	Average Number of Passengers per Operation	Net Change from Previous Year	Logan Average Domestic Load Factor	Net Change from Previous Year
2000	27,726,833	2.5%	487,996	(1.4%)	56.8	2.1	61.3%	0.4
2001	24,474,930	(11.7%)	463,125	(5.1%)	52.8	-4.0	57.8%	-3.4
2002	22,696,141	(7.3%)	392,079	(15.3%)	57.9	5.0	62.4%	4.6
2003	22,791,169	0.4%	373,304	(4.8%)	61.1	3.2	66.6%	4.2
2004	26,142,516	14.7%	405,258	8.6%	64.5	3.5	67.6%	0.9
2005	27,087,905	3.6%	409,066	0.9%	66.2	1.7	70.8%	3.2
2006	27,725,443	2.4%	406,119	(0.7%)	68.3	2.1	72.6%	1.6
2007	28,102,455	1.4%	399,537	(1.6%)	70.3	2.1	74.9%	2.3
2008	26,102,651	(7.1%)	371,604	(7.0%)	70.2	(0.1)	72.8%	(2.2)
2009	25,512,086	(2.3%)	345,306	(7.1%)	73.9	3.6	73.0%	0.2
2010	27,428,962	7.5%	352,643	2.1%	77.8	3.9	76.8%	3.8
2011	28,907,938	5.4%	368,987	4.6%	78.3	0.6	77.5%	0.7

Sources: Massport; U.S. Department of Transportation (DOT), T100 Database
Note: Numbers in parenthesis () indicate negative number.

7 U.S. DOT, T100 Database.

Figure 2-8 Passengers per Aircraft Operation and Load Factor, 2000-2011



Airline Passenger Service in 2011

Airlines can adjust service at an airport or on a specific route in two ways: changing the number of flights operated, or changing the size of the aircraft. Changes in flight frequency and changes in aircraft size both affect the number of seats available to passengers, also known as seat capacity. Airline services are therefore typically discussed in terms of seat capacity as well as the number of flight departures.[8] This section examines changes in airline departures and seat capacity at Logan Airport in 2011 and provides an overview of new and discontinued routes.

Service Developments at Logan Airport

In 2011, twenty-eight airlines provided scheduled passenger service from Logan Airport to 102 non-stop destinations. The major changes in Logan Airport's scheduled passenger services in 2011 are described below. The average non-stop stage length (the average length of non-stop flights) of scheduled domestic flights from Logan Airport changed varied slightly in 2011 to 751 miles from 752 miles in 2010. The average non-stop stage length of scheduled international flights increased from 1,620 miles in 2010 to 1,699 miles in 2011.

Changes in Domestic Passenger Service

As shown in Table 2-4, the total number of domestic flights at Logan Airport increased by only 0.5 percent in 2011. Scheduled domestic jet carrier flights, which account for 70 percent of domestic flights, increased 3.1 percent from 2010. Domestic regional/commuter flights fell by 5.2 percent in 2011, and domestic charter flights increased 1.2 percent.

LCC operations at Logan Airport grew by 14.6 percent in 2011, increasing from 85,200 operations in 2010 to 97,620 operations in 2011. LCCs now account for 46.6 percent of scheduled domestic jet operations and 32.6 percent of total domestic operations. JetBlue Airways, the dominant LCC at Logan Airport, continued its robust expansion, increasing its domestic operations by 21.5 percent from 49,980 operations in 2010 to 60,745 operations in 2011. Southwest Airlines also continued to expand, growing 26.9 percent from 13,730 operations in 2010 to 17,410 operations in 2011.[9]

8 A departure is an aircraft take-off at an airport. While aircraft operations include both departures and arrivals, airline services are typically described in terms of departures, as the number of scheduled departures generally equals the number of scheduled arrivals. Changes in departures translate to changes in overall operations.

9 Southwest Airlines began service at Logan Airport in August 2009.

Table 2-4 Domestic Air Passenger Operations by Airline Category, 2000-2011							
Category	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Total Jet Operations	**233,993**	**208,703**	**179,388**	**162,252**	**193,599**	**190,991**	**199,281**
Legacy Carriers	222,564	198,057	166,941	135,607	146,411	137,422	141,704
Low-Cost Carriers	11,429	10,646	12,447	26,645	47,188	53,569	57,577
Regional/Commuter	**160,041**	**167,631**	**137,037**	**134,108**	**130,272**	**137,203**	**130,298**
Charter Carriers	**1,008**	**769**	**609**	**467**	**423**	**324**	**369**
Total Domestic	**395,042**	**377,103**	**317,034**	**296,827**	**324,294**	**328,519**	**329,948**
Category	**2007**	**2008**	**2009**	**2010**	**2011**	**Percent Change (2010-2011)**	**Avg. Annual Growth (2000-2011)**
Total Jet Operations	**198,879**	**189,739**	**184,181**	**203,081**	**209,377**	**3.1%**	**(1.0%)**
Legacy Carriers	143,465	136,285	124,147	117,877	111,761	(5.3%)	(6.1%)
Low-Cost Carriers	55,414	53,454	60,034	85,204	97,616	14.6%	21.5%
Regional/Commuter	**124,014**	**112,881**	**107,615**	**94,535**	**89,586**	**(5.2%)**	**(5.1%)**
Charter Carriers	**570**	**582**	**412**	**501**	**507**	**1.2%**	**(6.1%)**
Total Domestic	**323,463**	**303,202**	**292,208**	**298,117**	**299,470**	**0.5%**	**(2.5%)**

Source: Massport.
Notes: LCCs serving Logan Airport in 2011 included AirTran, Frontier, JetBlue Airways, Southwest Airlines, Spirit Airlines, Sun Country Airlines, and Virgin America.
Numbers in parenthesis () indicate negative number.

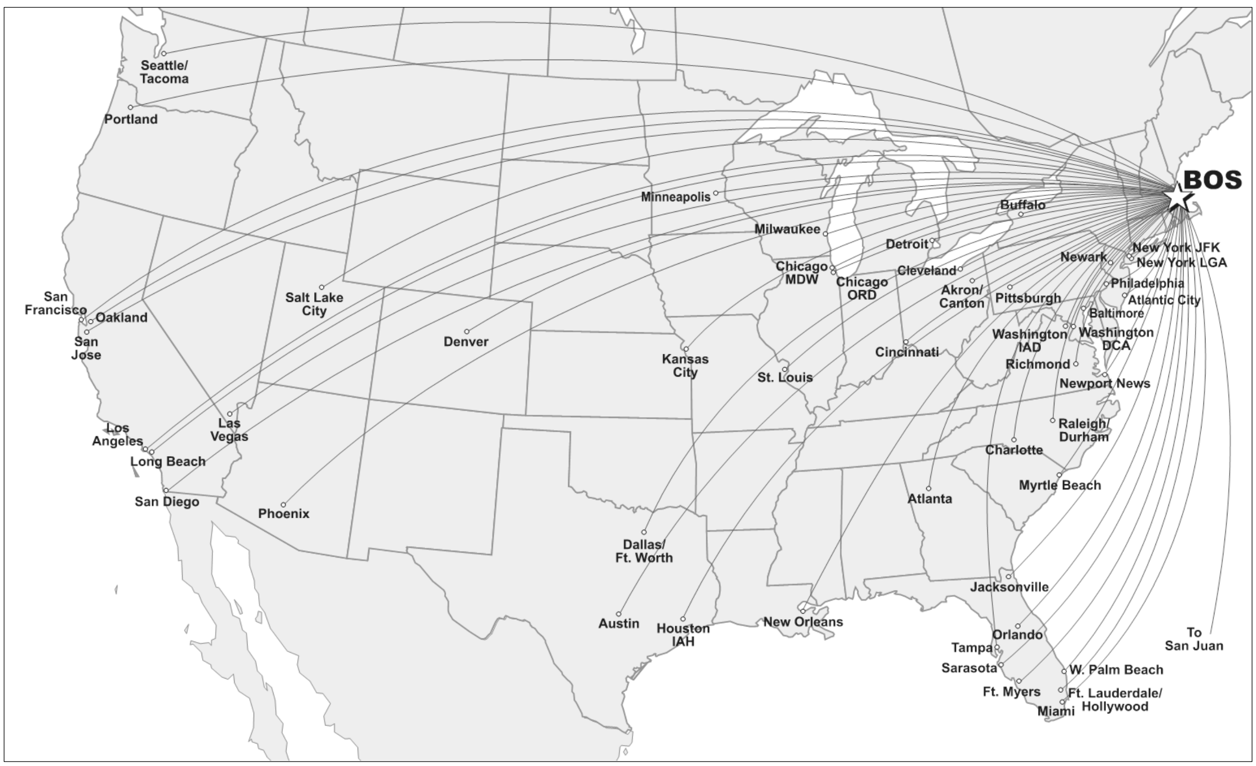
New non-stop service in a number of domestic markets balanced service cutbacks to other domestic markets in 2011. New service was introduced from Logan Airport to the following markets:

- JetBlue Airways continued its rapid expansion at Logan Airport, introducing new three times daily Embraer E-190 service to Newark, NJ. JetBlue also began summer seasonal service to Portland, OR in May 2011.
- In April 2011, Delta Air Lines introduced non-stop RJ service to Norfolk, VA and Pittsburgh, PA. Delta RJ service to Kansas City, MO was introduced in June 2011.
- Spirit Airlines began daily non-stop service to Chicago's O'Hare International Airport in August 2011.
- Notable domestic service increases at Logan Airport in 2010 that contributed to a rise in passenger levels in 2011 included the following:
  - JetBlue Airways increased scheduled services to several markets including Washington National Airport, Orlando, FL and Raleigh/Durham, NC.
  - Logan Airport continued to benefit from Southwest Airlines' high-frequency services to Philadelphia, PA, launched in the summer of 2010. Southwest Airlines also increased flight frequencies to Baltimore, MD.
  - US Airways increased narrow-body capacity in the Philadelphia, PA market, in addition to providing high-frequency Embraer 70 to 100 seat jet services.
- While JetBlue Airways and other LCCs expanded service at Logan Airport, legacy carriers continued to tighten capacity in 2011.

- American Airlines discontinued service to four markets earlier in 2010: Columbus, OH, Raleigh/Durham, NC, St. Louis, MO, and Washington National Airport.
- Following its merger with Northwest Airlines, Delta Air Lines consolidated operations at Logan Airport, discontinuing service to three Florida destinations in 2010: Fort Myers, Tampa, and West Palm Beach. The carrier kept capacity largely flat in other markets and reduced frequencies to New York's JFK International Airport and Nevada's Salt Lake City International Airport.

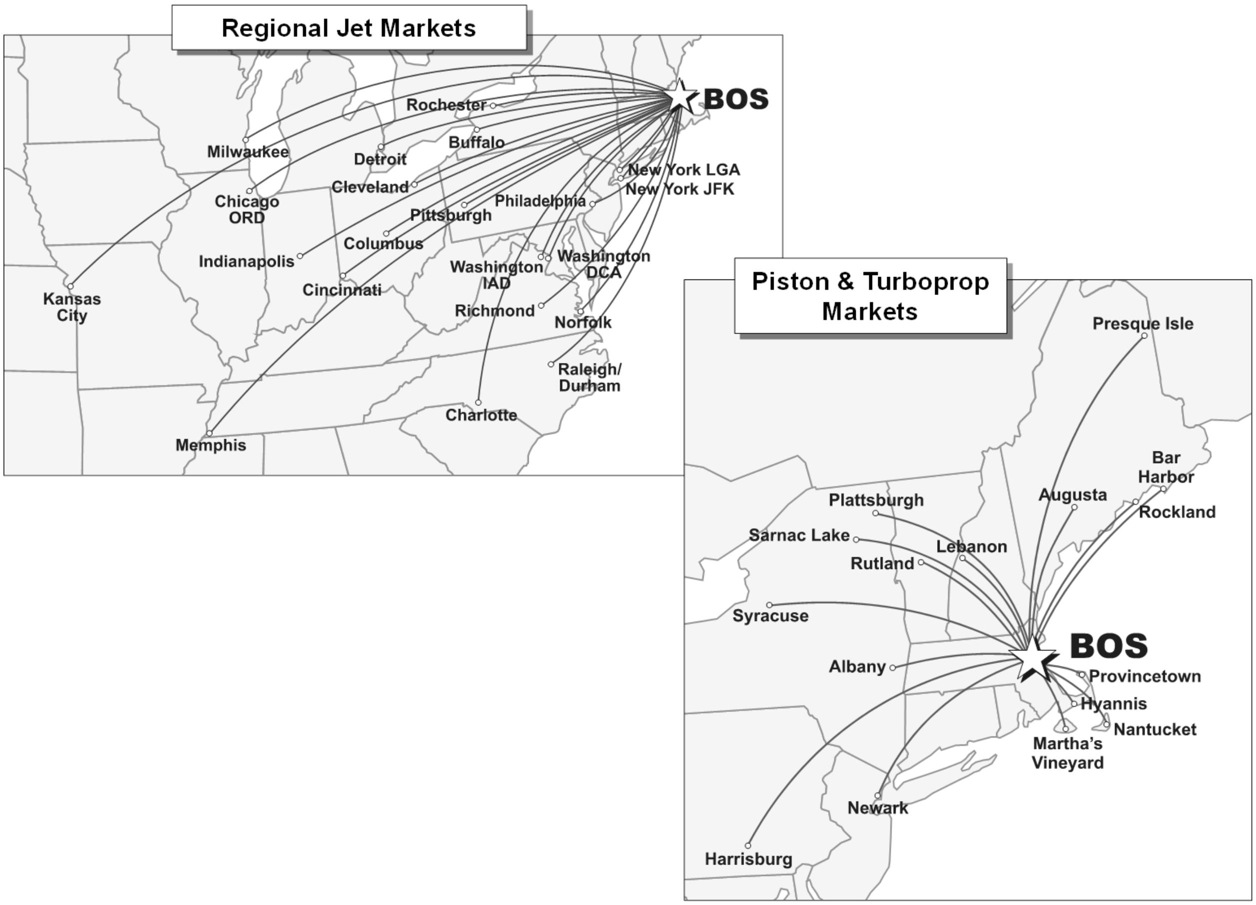
A complete listing of all changes in scheduled departures by domestic destination is in *Appendix E, Activity Levels*. Logan Airport's scheduled domestic large jet and domestic regional services in 2011 are illustrated in Figure 2-9 and Figure 2-10.

Figure 2-9 Domestic Non-stop Large Jet Markets Served from Logan Airport, August 2011



Source: Official Airline Guide Market Files.

Figure 2-10 Domestic Passenger Non-stop Regional Markets Served from Logan Airport, August 2011



Source: Official Airline Guide Market Files.

Changes in International Passenger Service

Total international passenger operations at Logan Airport increased 5.5 percent in 2011, compared to a decline of 1.8 percent in 2010. This marked the first year of international passenger operation growth after declines over the past three years. International passenger operations totaled 35,420 operations in 2011, as summarized in Table 2-5 (for details on the changes in operations by carrier, see *Appendix E, Activity Levels*). Passenger operations to the Europe/Middle East market increased by 15.9 percent in 2011. The Europe/Middle East market remains the second largest international market in terms of operations and the largest in passengers. The Canadian market, Logan Airport's largest international destination region in terms of aircraft operations, decreased slightly by 0.7 percent. Operations to the Bermuda/Caribbean market declined by 1.7 percent. Logan Airport's scheduled international air service markets are shown in Figure 2-11.

Table 2-5 International Passenger Operations by Market Segment, 2000-2011

Category	2000	2001	2002	2003	2004	2005	2006
Scheduled	**43,021**	**44,060**	**38,217**	**36,882**	**38,588**	**37,575**	**35,003**
Europe/Middle East	13,435	13,206	12,278	11,408	12,085	12,206	11,954
Canada	26,067	24,898	20,750	19,332	18,639	18,914	16,893
Bermuda/Caribbean[1]	3,205	5,956	5,035	5,808	6,838	5,594	5,710
Central/South America	314	0	154	334	1,026	861	446
Non-Scheduled	**2,141**	**1,892**	**1,184**	**1,313**	**1,467**	**1,068**	**727**
Total	**45,162**	**45,952**	**39,401**	**38,195**	**40,055**	**38,643**	**35,730**

Category	2007	2008	2009	2010	2011	Percent Change (2010-2011)	Avg. Annual Growth (2000-2011)
Scheduled	**38,308**	**35,538**	**33,878**	**33,266**	**35,118**	**5.6%**	**(1.8%)**
Europe/Middle East	13,127	13,366	12,960	12,750	14,780	15.9%	0.9%
Canada	18,859	15,996	14,815	16,399	16,290	(0.7%)	(4.2%)
Bermuda/Caribbean[1]	6,191	6,176	6,103	4,116	4,046	(1.7%)	2.1%
Central/South America	131	0	0	0	0	–	–
Non-Scheduled	**527**	**375**	**320**	**305**	**300**	**(1.6%)**	**(16.4%)**
Total	**38,835**	**35,913**	**34,198**	**33,570**	**35,418**	**5.5%**	**(2.2%)**

Source: Massport.
Notes: Numbers in parenthesis () indicate negative number.
1 Includes Puerto Rico and U.S. Virgin Islands.

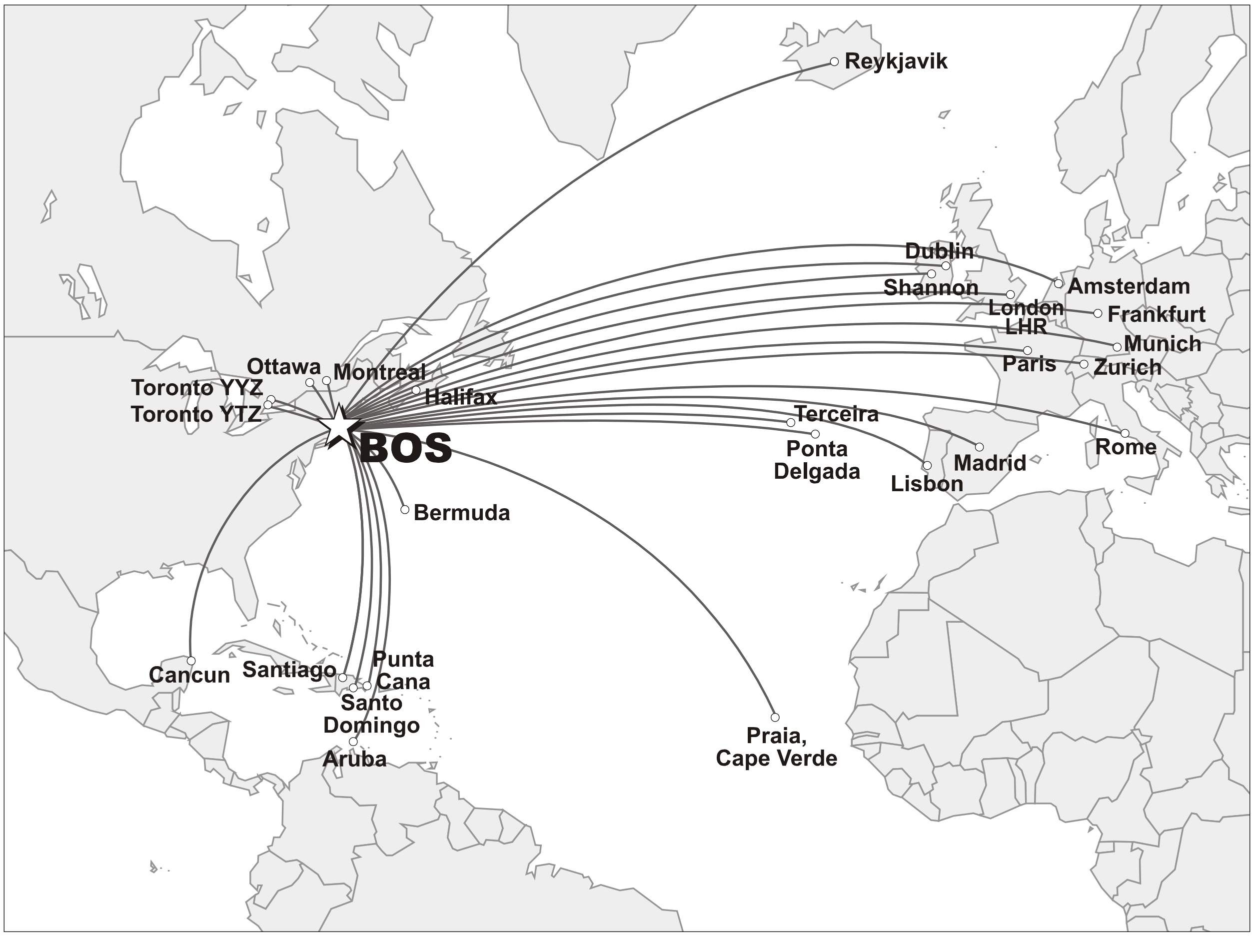
New and expanded international passenger service at Logan Airport in 2011 included the following:

- Delta Air Lines added significant international capacity at Logan Airport in 2011. Delta Air Lines entered the Boston-London Heathrow market in March 2011 with twice-daily non-stop service, adding to the non-stop service provided by British Airways and American Airlines. Delta also introduced seasonal summer service to Paris, beginning daily non-stop service in March 2011. The carrier also introduced RJ services to Toronto Pearson Airport in November 2011, returning to a route it has not served since the late 1990s.
- JetBlue Airways continued its expansion into the Caribbean markets, introducing non-stop service to Santiago (Dominican Republic) in June 2011. JetBlue Airways also initiated seasonal service to Saint Thomas (U.S. Virgin Islands), as well as seasonal service to Providenciales (Turks and Caicos Islands). JetBlue Airways further increased scheduled frequencies to San Juan, Puerto Rico.
- Iceland Express launched seasonal service to Reykjavik in June 2011.

Service cuts in the Caribbean markets were implemented by legacy carriers, even as JetBlue Airways expanded in the Caribbean, resulting in the overall decline in aircraft operations to the Caribbean in 2011. International service reductions at Logan Airport include the following:

- US Airways discontinued all of its international service from Logan Airport between 2010 and 2011, cutting service to Aruba, Grand Cayman, Montego Bay (Jamaica), Nassau (Bahamas), Providenciales, Punta Cana (Dominican Republic), Saint Thomas, and San Juan, Puerto Rico.
- American Airlines had discontinued seasonal service to Aruba and Providenciales in 2010. In 2011, the carrier also discontinued non-stop services to San Juan and Santo Domingo.

Figure 2-11 International Non-stop Markets Served from Logan Airport, August 2011



Source: Official Airline Guide Market Files.

Cargo Activity Levels in 2011

In 2011, Logan Airport ranked 25th among U.S. airports in total cargo volume.[10] Air cargo is carried in the belly compartments of passenger aircraft or by dedicated all-cargo carriers, such as FedEx, UPS, and DHL in all-cargo aircraft. The express/small package segment dominates Logan Airport cargo activity, accounting for 62.9 percent of the total non-mail cargo volume. Table 2-6 shows all-cargo aircraft operations and cargo volumes at Logan Airport since 2000.

10 Airports Council International, 2011 North American Air Traffic Report.

In 2011, the number of all-cargo operations at Logan Airport remained constant, decreasing by 0.1 percent from 2010. Total cargo volume, including mail, decreased by 3.1 percent in 2011 (Table 2-6). Overall, all-cargo operations at Logan Airport have declined by approximately 5.9 percent per year since 2000, while cargo volume has declined by approximately 5.6 percent per year since 2000. A number of factors are responsible for the decline in cargo shipments (including freight, express and non-express mail and packages) at Logan Airport, as well as nationally, over the past several years. Cargo carriers, particularly the integrators that provide door-to-door delivery services, have significantly increased their use of trucks to move cargo in shorter haul markets because it is more cost-effective than air transport. In addition, the greater acceptance and use of the internet and e-mail has greatly reduced mail volumes overall.

FedEx carried 44.9 percent of the total cargo volume through Logan Airport in 2011 and was the 14th largest air carrier at the Airport in terms of total flights. UPS was the next largest cargo operator and accounted for 13.8 percent of Logan Airport's cargo volume in 2011. Passenger airlines carried 37.8 percent, or 210 million pounds, of Logan Airport's cargo as belly cargo in 2011, compared to 345 million pounds that was shipped on all-cargo carriers. These numbers are presented in Figure 2-12.

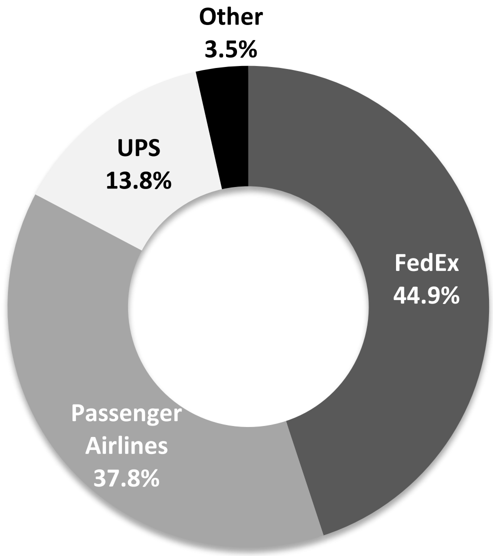
Table 2-6 Cargo and Mail Operations and Volume, 2000-2011

	2000	2001	2002	2003	2004	2005	2006
All-Cargo Aircraft Operations	12,282	11,318	10,014	9,622	9,589	8,913	8,991
Volume (lbs.)							
Express/Small Packages	484,490,143	428,066,158	465,138,432	474,271,444	478,584,154	472,605,966	422,173,699
Freight	367,857,011	316,731,138	324,471,576	272,566,843	280,690,836	268,911,342	256,894,390
Mail	194,902,513	126,454,080	65,842,827	55,756,993	48,412,006	43,728,414	37,269,744
Total	**1,047,249,667**	**871,251,376**	**855,452,835**	**802,595,280**	**807,686,996**	**785,245,722**	**716,337,833**

	2007	2008	2009	2010	2011	Percent Change (2010-2011)	Avg. Annual Growth (2000-2010)
All-Cargo Aircraft Operations	8,607	8,669	6,658	6,274	6,270	(0.1%)	(5.9%)
Volume (lbs.)							
Express/Small Packages	403,051,494	384,170,303	326,475,030	339,485,424	332,840,847	(2.0%)	(3.4%)
Freight	229,398,281	203,601,999	191,082,152	206,893,979	196,371,936	(5.1%)	(5.5%)
Mail	25,843,366	33,511,097	28,802,366	25,904,205	25,405,865	(1.9%)	(16.9%)
Total	**658,293,141**	**621,283,399**	**546,359,548**	**572,283,608**	**554,618,648**	**(3.1%)**	**(5.6%)**

Source: Massport.
Note: Numbers in parenthesis () indicate negative number.

Figure 2-12 Cargo Carriers – Share of Logan Airport Cargo Volume, 2011



Note: Passenger planes carry cargo as belly cargo (in the belly of planes).

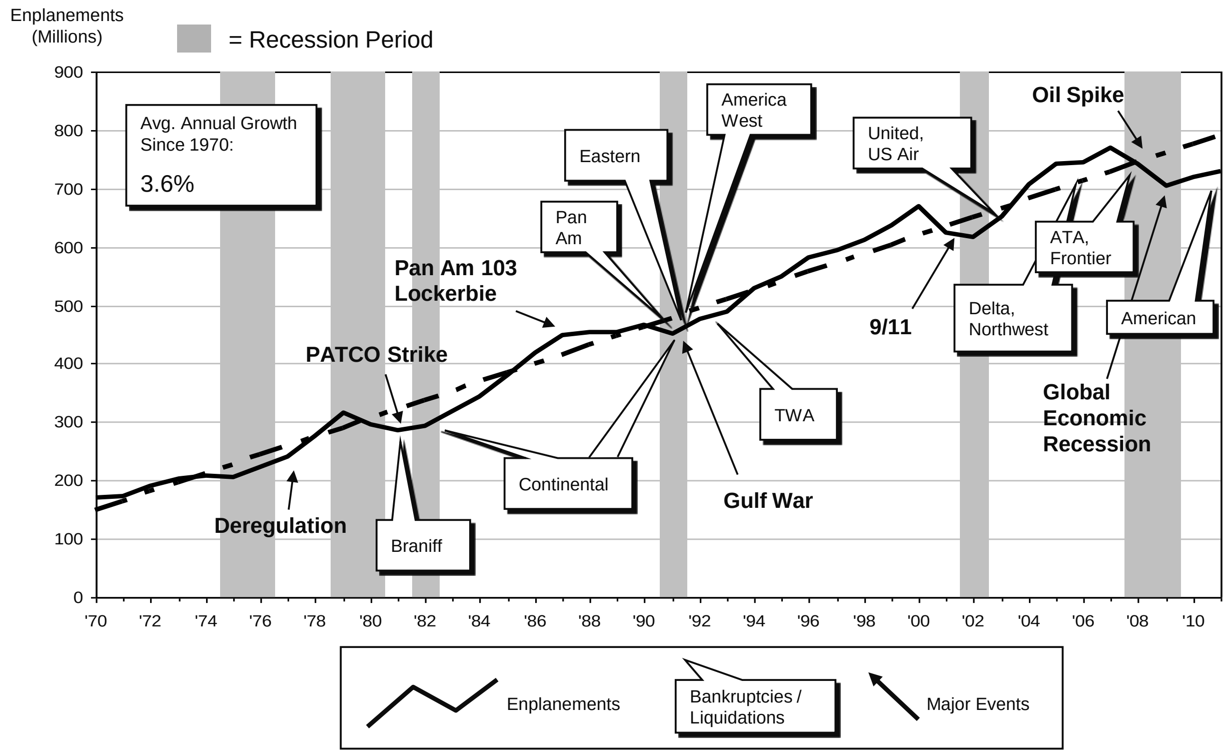
National Aviation Trends

The airline industry is extremely cyclical – constantly affected by economic and political events. Air traffic declines caused by economic recessions and other political "shocks" such as the events of September 11, 2001 have been followed by gradual recovery cycles. As shown in Figure 2-13, the airline industry has experienced significant turmoil since 2000, seeing a wave of airline bankruptcies and reorganizations, a spike in oil prices, as well as the global financial crises of 2008 to 2009. However, the industry continues to recover and growth in air passenger traffic has resumed. From 1970 to 2011, total domestic and international passenger enplanements in the U.S. increased at an average annual rate of 3.6 percent.

Logan Airport has also consistently rebounded from external shocks and periods of weak demand. After the events of September 11, 2001, similar to other airports across the U.S., Logan Airport was affected by significant capacity reductions associated with airline bankruptcy reorganizations and sharply rising fuel prices. Global recession also resulted in declining air travel demand and depressed traffic levels. However, the Airport recovered to achieve new passenger peaks in 2007 and 2011, attributed to a surge of LCC services.

Below are some major trends that have impacted the airline industry, as well as Logan Airport, over the past decade.

Figure 2-13 U.S. Total Passenger Enplanements, 1970-2011



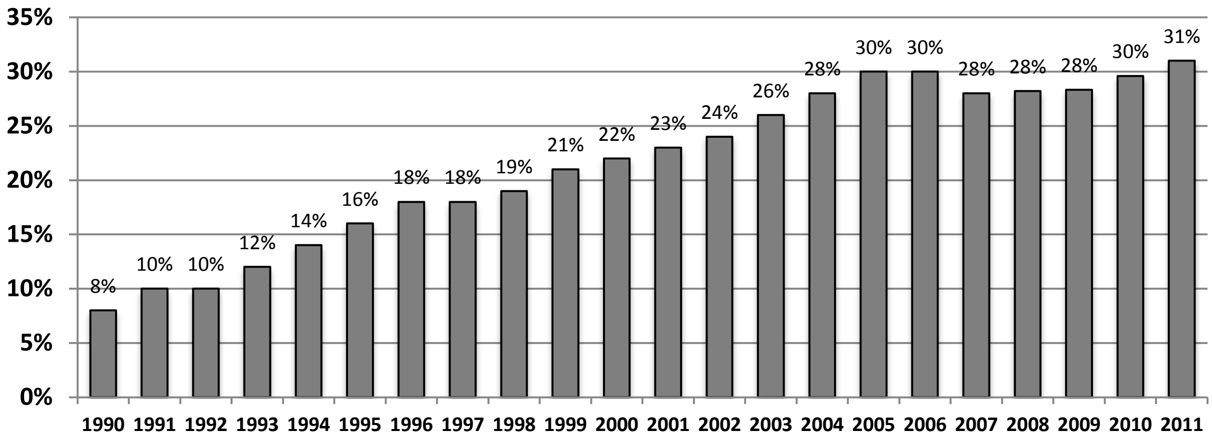
Source: Airlines for America (formerly Air Transport Association); U.S. DOT, T100

Low-Cost Carrier Boom

LCCs rose to prominence earlier this decade, expanding rapidly and gaining share in the domestic market. The formation of carriers, like JetBlue Airways, AirTran Airways, and Frontier Airlines, popularized the no frills, low-cost business model. As shown in Figure 2-14, LCCs provided only approximately 10 percent of domestic seat capacity in the U.S. in 1990. In 2011, LCCs accounted for approximately 31 percent of domestic seats. While rising fuel prices and the economic downturn forced legacy carriers to cut back on domestic capacity and focus on more profitable international flying, LCCs increased their domestic market share. Between 2003 and 2009, LCCs (including Southwest Airlines, JetBlue Airways, AirTran Airways, Frontier Airlines, Spirit Airlines, Virgin American, and Allegiant Air) added a total of approximately 84 billion domestic seat miles to their route systems.[11] In comparison, American Airlines, Delta Air Lines/Northwest Airlines, United Airlines, and US Airways saw a 20 percent average reduction in mainline domestic capacity over the same period for a combined reduction of 85 billion domestic seats miles.[12]

11 U.S. Department of Transportation, T100
12 Ibid.

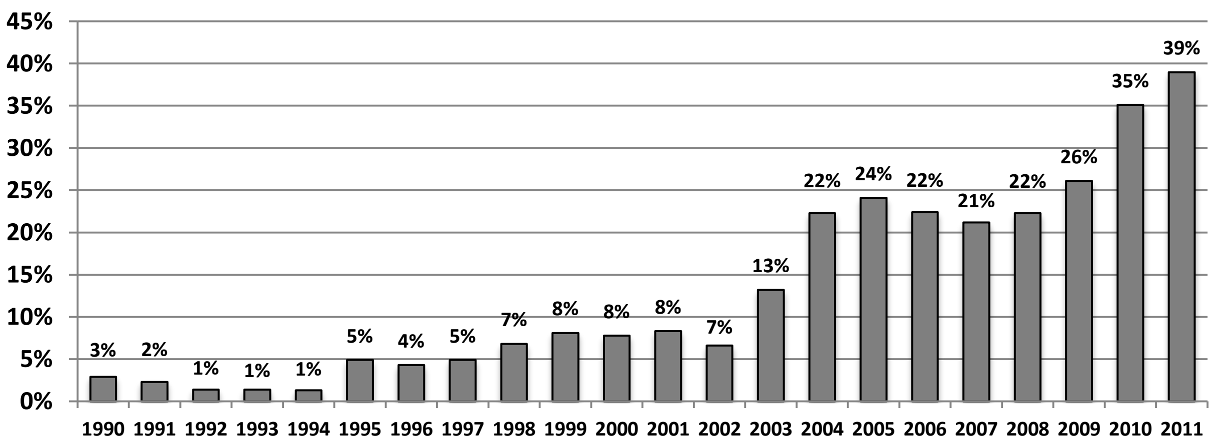
Figure 2-14 Low-Cost Carrier Share of Total U.S. Domestic Seats, 1990-2011



Source: OAG (August 1990 – August 2011)

As shown in Figure 2-15, the LCC market share at Logan Airport has risen dramatically. At the beginning of the last decade, LCCs had only a minimal presence at Logan Airport. At that time, Southwest Airlines served the Boston metropolitan area market through the secondary airports in Warwick, RI and Manchester, NH intentionally bypassing Logan Airport. In 2000, LCCs accounted for only 8 percent of Logan Airport's domestic seat capacity. When JetBlue Airways entered the Logan Airport market in 2004, the LCC domestic seat share rose to 22 percent. The slight decline in the LCC market share in 2006-2008 marked the cessation of Delta Song's operations in mid-2007 and other minor LCC contractions. In 2009-2010, there was another noticeable increase in the LCC share when Southwest Airlines and Virgin America initiated services at Logan Airport. Since then, the LCC market share climbed further as JetBlue Airways expanded by entering markets where mainline carriers reduced services.

Figure 2-15 Low-Cost Carrier Share of Logan Airport Domestic Seats, 1990-2011



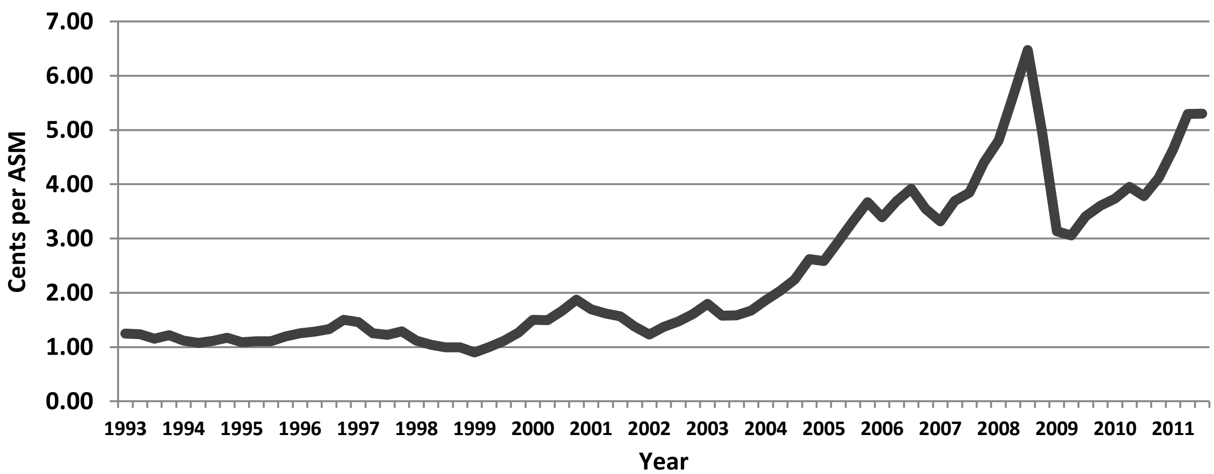
Source: OAG (August 1990 – August 2011)

The rapid growth of LCCs over the past decade was enabled by the lower operating cost advantage LCCs maintained over legacy carriers due to differences in network structure, overhead cost, and crew seniority between the two carrier groups. However, the lines between LCCs and legacy carriers are beginning to blur. The lowering of legacy carrier cost structures and consolidation of carrier networks has allowed legacy carriers to compete on a more equal footing with LCCs.

Rising Fuel Cost Impacts

Fuel cost per available seat mile (ASM) has more than tripled since 2002, rising from approximately 1.5 cents to 5.3 cents per ASM by the third quarter of 2011 (Figure 2-16). In 2008, a spike in crude oil prices drove up jet fuel prices to an unprecedented 6.5 cents per ASM in the third quarter of 2008. Increases in fuel price have offset a large portion of the progress airlines made in cost reduction and capacity optimization following September 11, 2001. Many carriers introduced fuel surcharges in 2008, dropping them as fuel prices fell again at the end of the year. In 2011, fuel prices rose again with unrest in the Middle East.

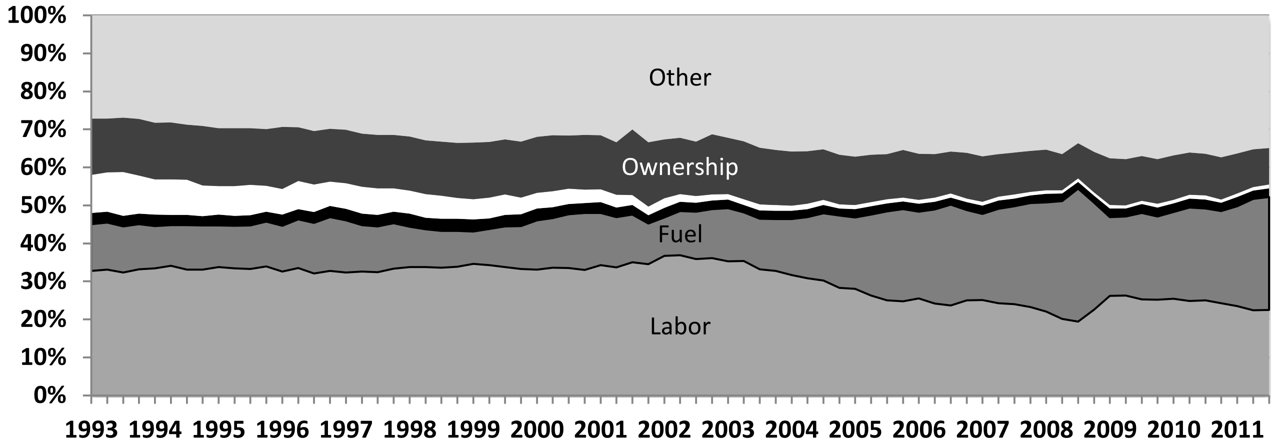
Figure 2-16 Fuel Cost per Available Seat Mile, 1993-2011



Source: U.S. DOT, Form 41

Fuel, as a percentage of costs, climbed from 10.2 percent in early 2002 to 29.7 percent in the third quarter of 2011. Historically throughout the 1990s, fuel accounted for only 11.0 to 12.0 percent of overall operating costs. As shown in Figure 2-17, fuel cost represents the largest airline cost component today, surpassing even labor. Labor represented the second largest component of operating costs at 22.5 percent in the third quarter of 2011, down significantly from 36.7 percent of overall costs in 2002. Aircraft ownership represents only 9.6 percent of current costs (down from approximately 15 percent in 2002) and has now been surpassed by the rising fuel costs.

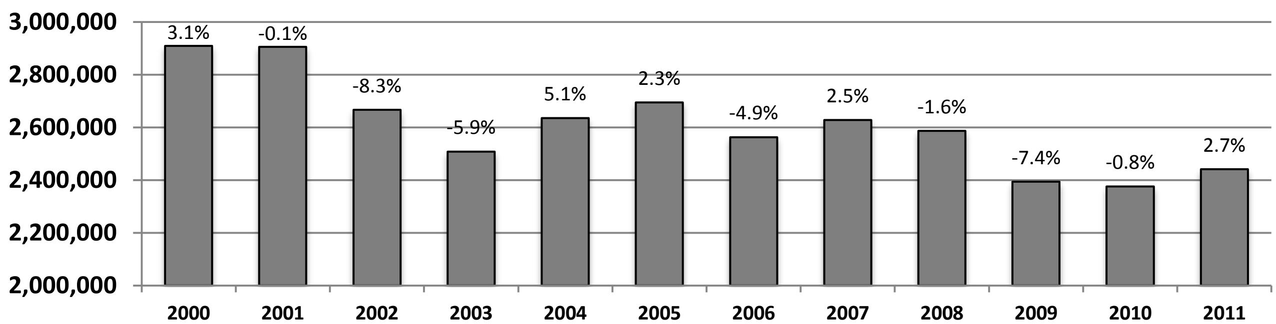
Figure 2-17 U.S. Airlines Operating Costs, 1993-2011



Source: U.S. DOT, Form 41

Capacity Discipline
Immediately after the events of September 11, 2001, airlines responded to weakened air travel demand and escalating operating costs by significantly curtailing capacity. While the airlines began to add back capacity in 2004, total capacity remained below the pre-September 11, 2001 levels in 2007. In 2009, a spike in fuel prices resulted in a steep increase in airline operating costs and sharp capacity cuts implemented by airlines. Though jet fuel prices fell again by the end of 2008, passenger demand continued to decline due to the ongoing economic recession. Carriers cut capacity in advance of declining demand. Seat capacity reductions slowed in 2010 as carriers responded to more favorable economic conditions. Capacity in 2011 has yet to recover to pre-2009 levels and remains about 17 percent below scheduled capacity at the beginning of the decade (July 2000) as shown in Figure 2-18.

Figure 2-18 U.S. Domestic Seats and Annual Change, 2000-2011

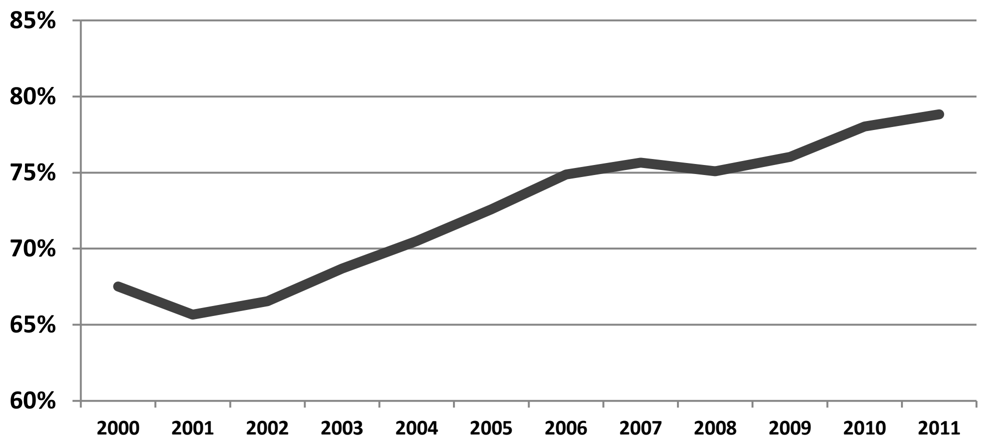


Source: Official Airline Guide (July 2000 – July 2011)

While airline service declines moderated in 2011, carriers are continuing to carefully monitor and control capacity. In the face of high fuel prices and slow economic recovery, the emphasis has shifted from seizing market share to careful management of supply-and-demand on routes. Carriers remained conservative on capacity expansion in 2011, continuing to cut service at smaller airports and in less profitable markets. Carriers are expected to maintain capacity discipline in the near-term, emphasizing cautious capacity growth and the use of right-sized aircraft to serve markets.

The drastic capacity cuts in 2009 and the current tight capacity control have pushed passenger load factors to an all-time high. Figure 2-19 shows the continuing upward trend in U.S. domestic airlines load factors over the past decade. Scheduled domestic load factors were at 68 percent in 2000. The dip in 2001 occurred as passenger traffic declined faster than airlines could reduce capacity due to the impacts of September 11, 2001. From that point forward, load factors rose steadily to approximately 79 percent in 2011. Continued rising load factors reflect reduced capacity and better revenue management on the part of the airlines.

Figure 2-19 U.S. Scheduled Passenger Operations Domestic Load Factors, 2000-2011



Source: U.S. DOT, T100

Aircraft Trends

Between 2001 and 2007, many airlines transferred a number of marginal jet routes to their regional carrier partners in order to cut costs. RJs replaced mainline jets on routes that mainline carriers could not operate profitably from Logan Airport. Trends at Logan Airport mirrored the national trend, with a rise in the number of regional operations.

However, beginning with the fuel spike in 2008, airlines began to cut back on the use of smaller 50-seat RJs. The recent trend has been the retirement of RJs and other less fuel efficient aircraft. The year 2011 saw a continued decline in the air carrier fleets of 37- to 50-seat RJs that were widely used in the first half of the decade as feed aircraft for network carriers. Carriers like Delta Air Lines, United Airlines/Continental Airlines, and American Airlines are expected to ground, scrap or sell hundreds of these small RJs in coming years. In the face of volatile fuel prices, airlines continued to move towards larger, more fuel efficient aircraft. Over the next decade, legacy carriers will continue to upgrade their fleets with new, fuel efficient aircraft, eliminating somewhat the fuel efficiency edge enjoyed by LCCs.

Airline Consolidation

The events of September 11, 2001 and the challenging operating environment resulting from high fuel prices, and the recent economic recession resulted in a number of airline bankruptcies over the past decade. Legacy carriers were forced to file for Chapter 11 protection and seek reorganization to lower costs. Between 2002 and 2005, US Airways, United Airlines, Northwest Airlines, and Delta Air Lines all filed for Chapter 11 protection. In 2011, American Airlines also filed for Chapter 11 protection. Other carriers such as ATA Airlines, Skybus Airlines, and Aloha Airlines discontinued passenger operations permanently.

The trend of industry consolidation through mergers and acquisitions has gained even more momentum in recent years. Delta Air Lines successfully acquired Northwest Airlines in 2008, becoming the world's largest carrier at that time. In 2011, Southwest Airlines' acquisition of fellow LCC AirTran Airways was approved, allowing Southwest Airlines to gain a strategically important market presence in Atlanta, GA. Other airline acquisitions and mergers are expected as airlines seek to reduce costs and increase their competitiveness in an increasingly challenging environment.

At Logan Airport, the merger of Delta Air Lines and Northwest Airlines resulted in substantial scheduled seat capacity reductions in 2010 as the consolidated carrier improved network efficiencies. Since that time, capacity has been added back to the market, and Delta Air Lines operations at the Airport saw a modest increase in 2011. The merged United Airlines and Continental Airlines kept operations flat at Logan Airport in 2011. Should the airline industry consolidate further, Logan Airport has a relatively low risk of losing passenger traffic, beyond some inevitable short-term disruptions, because of the underlying strengths of the Boston market. Logan Airport serves a market with a large local origin and destination (O&D) passenger base, above average income levels, a travel intensive economic base, and attractiveness as a destination market. In addition to these market fundamentals, JetBlue Airways has built a strong presence at Logan Airport and its growth over the past two years has offset any negative effects of recent airline consolidations.

Aviation Activity Forecasts for 2030

This section presents Massport's updated long-range planning forecasts for Logan Airport, as required by the Secretary of Environmental Affairs in the Certificate on the Logan Airport *2010 Environmental Data Report (2010 EDR)*. The methodology for the forecasts presented in this section is provided in Appendix E, *Activity Levels, Logan Airport Activity Forecast Methodology and Assumptions.* The forecasts are also compared to the previous planning forecasts that were presented in the *2004 ESPR*.

In 2011, Massport updated its long-range planning forecasts for Logan Airport, Worcester Regional Airport, and Hanscom Field to reflect the current status of the airline industry as well as emerging trends that are expected to influence aviation activities in the future. The base year for the forecasts was 2010 and the forecast years were 2015, 2020, and 2030. Three forecast scenarios were developed for Logan Airport: Low, Moderate and High. The strategic planning forecasts for Logan Airport included projections of passengers (domestic and international), cargo and aircraft operations (scheduled passenger, all-cargo, charter, and GA). The Moderate forecast scenario is viewed as the most likely forecast of future activity levels at Logan Airport and is used in this *2011 ESPR* to analyze future airport conditions and environmental impacts.

Updated Logan Airport Planning Forecast

Global and local economic and market conditions that have a bearing on aviation activity levels at Logan Airport continually evolve, requiring Massport to periodically reassess and update the planning forecasts. Since the *2004 ESPR*, there have been several developments that have affected aviation globally and within the New England region with implications for activity levels at Logan Airport. These include the following:

- A rapid increase in LCC services at Logan Airport following the entry of JetBlue Airways in 2004;
- Steep increases in fuel prices as the price of crude oil climbed more than doubled from an average of $42 per barrel in 2004 to $95 in 2011 (after reaching a record high of $145 in July 2008);
- An unprecedented global financial crisis and economic recession in 2008 to 2009 and a sluggish economic recovery;

- A shift in airline business models with increased focus on cost containment and profitability resulting in significant service reductions at smaller secondary airports;
- The retirement of large numbers of small RJ aircraft (50 or fewer seats) due to unfavorable operating economics in a high fuel price environment;
- Introduction of the Boeing 787 Dreamliner aircraft opening up new long-haul service markets for Logan Airport; and
- Airline industry consolidation leading to additional service rationalization.

Passengers

The region's economic growth is the primary driver of future air passenger growth at Logan Airport. The airport serves the seventh largest metropolitan area in the nation. Residents of the Boston metropolitan area have above average incomes and a high propensity for personal and business-related airline travel. Since no airline maintains a connecting hub operation at the Airport, Logan Airport is principally an O&D airport. Future passenger levels are therefore largely determined by underlying market demand and are not dependent on airline connecting passengers that transfer from one flight to another. The price of airline travel, which is inversely related to passenger growth, is another factor that affects passenger demand over the long-range. Real increases in the price of travel airline (i.e., adjusted for inflation) tend to moderate growth in airport passenger levels. Conversely, price reductions may lead to passenger growth as lower prices entice more people to travel. In the current and foreseeable future operating climate, the price of airline travel is strongly linked to fuel prices.

Historically, changes in air service levels and airfares at the closest regional airports, T.F. Green and Manchester Airports, have also had an impact on traffic levels at Logan Airport. From 1995 to 2002, Logan Airport's share of regional passengers began declining when Southwest Airlines introduced new nonstop services and lower airfares into the T.F. Green and Manchester markets, in 1996 and 1998, respectively. Traffic at Logan Airport grew more slowly than air traffic at the regional airports, and Logan Airport's share of the combined three airport market declined from 89 percent in 1995 to 72 percent in 2002. During this period, Logan Airport had very limited services from LCCs and a distinct fare disadvantage in many markets compared to T.F. Green and Manchester, coupled with the Central Artery/Tunnel project, which hampered Logan Airport's accessibility for many passengers in the region. However, the major portions of Central Artery/Tunnel project were completed in 2004 vastly improving access to the Airport, and LCC services grew rapidly at Logan Airport after the entry of JetBlue Airways in 2004. Following the increase in fuel prices and the 2008/2009 economic recession, airlines began sharply curtailing services at smaller secondary airports, including T.F. Green and Manchester Airports. As a result Logan Airport's passenger share climbed from a low of 72 percent to 81 percent in 2011. Over the forecast period, Logan Airport's percent share of the combined passengers at the three airports is assumed to increase slightly over the short-term to approximately 84 percent and then remain stable over the remainder of the forecast period.

The underlying forecast assumptions for long-range economic growth and changes in fuel prices and airline fares are summarized in Table 2-7. Total personal income for Massachusetts is assumed to increase at an average annual rate of 2.1 percent (excluding the effects of inflation) through 2030. The price of crude oil, the chief raw input for jet fuel, is forecast to increase to $123 per barrel in 2030, which in turn is assumed to increase the price of airline travel (measured in terms of airline yield, or ticket revenue per passenger mile flown) by 0.5 percent per year (excluding the effects of inflation).

Table 2-7 Major Forecast Assumptions	
Category	**Average Annual Change (2010-2030)**
MA Personal Income[1]	2.1%
Airline Yields[2]	0.5%
Category	**2030**
Price of Oil per Barrel (in 2009 dollars)	$123

Notes:
1 Adjusted for inflation
2 Excluding inflation.

The 2030 passenger forecast for Logan Airport is shown in Table 2-8. The Airport's total enplaning and deplaning passengers are forecast to increase by 1.7 percent annually reaching 39.8 million in 2030. Domestic passengers are forecast to grow by 1.4 percent per year, while international passengers are forecast to grow at a faster pace of 3.5 percent per year. Although international passenger traffic is forecast to grow more rapidly, domestic passengers are projected to represent 81 percent of Logan Airport's forecast passengers in 2030.

By 2030, Massport anticipates that Logan Airport will accommodate 7.6 million international passengers. Europe, one of Logan Airport's most mature international market segments, is forecast to grow at 2.9 percent per year. Passenger travel to and from Canada, another mature market, is forecast to remain relatively flat over the forecast period. Above average annual growth of 6.1 percent is forecast for the Caribbean market. More than a half million passengers are forecast for Asia and Latin America as a result of projected new non-stop services to destinations in these regions.

GA passenger traffic, which declined sharply during the 2008 to 2009 recession, and began a robust recovery in 2011, is forecast to remain relatively stable over the forecast period at approximately 108,000 passengers per year.

Table 2-8 Actual and Forecast Logan Airport Passengers, 2011 and 2030

Category	2011 Actual	2030 Forecast	Average Annual Growth (2011-2030)
Domestic	24,831,068	32,137,828	1.4%
Europe/Middle East	2,939,226	5,087,299	2.9%
Canada	573,660	568,805	0.0%
Caribbean/Bermuda	447,650	1,390,216	6.1%
Asia/Pacific	0	409,877	-
Central/South America	1,918	129,769	24.8%
Subtotal International	3,962,454	7,585,965	3.5%
GA	114,416	107,678	(0.3%)
Total	**28,907,938**	**39,831,471**	**1.7%**

Source: Massport
Notes: Totals may not add up due to rounding.
Numbers in parenthesis () indicate negative number.

Cargo

Cargo shipments handled at Logan Airport consist of heavy freight and express/small packages. The domestic market accounts for three-quarters of the cargo shipments at Logan Airport. Domestic cargo at Logan Airport is forecast to increase at approximately the same rate as the local economy. Approximately 83 percent of the domestic cargo at Logan Airport is carried by all-cargo airlines, primarily FedEx and UPS. Over the forecast period, the share of Logan Airport's cargo that is carried in all-cargo aircraft is assumed to increase to 86 percent in 2030, consistent with the FAA's assumption that all-cargo airlines will increase their share of the national domestic cargo market over the next 20 years. International cargo, which accounts for 24 percent of Logan's cargo shipments, is primarily carried in the belly compartments of international passenger aircraft and is a key contributor to the profitability of long-haul international passenger services. Future growth in international cargo is assumed to increase in proportion to the growth in international wide-body aircraft capacity at Logan.

As shown in Table 2-9, the total volume of cargo at Logan Airport is forecast to increase by 2.6 percent per year from 529 million pounds in 2011 to 867 million pounds in 2030. International cargo, which is predominantly carried in the belly compartments of passenger aircraft, is forecast to grow the fastest at 3.2 percent per year. Expected growth in international cargo is directly related to growth in wide-body belly capacity resulting from new long-haul international passenger services. The Express/All-Cargo segment, which is dominated by FedEx and UPS, is projected to increase by 2.6 percent a year. This segment of the cargo market is directly related to the local and national economies and is expected to increase at a slightly faster rate than the region's economic growth. Domestic belly cargo, the smallest segment of Logan Airport's cargo market, is forecast to increase by just 1.6 percent per year.

Table 2-9 Actual and Forecast Logan Airport Cargo (in pounds), 2011 and 2030

	2011 Actual	2030 Forecast	Average Annual Growth (2011-2030)
Domestic Belly	63,411,658	85,886,483	1.6%
International Belly	124,703,017	228,401,997	3.2%
Express All-Cargo	336,915,040	547,678,023	2.6%
Other All-Cargo	4,183,068	4,914,100	0.9%
Total	**529,212,783**	**866,880,603**	**2.6%**

Source: Massport
Notes: Totals may not add up due to rounding.
1 Includes regional jets with 100 or more seats.

Aircraft Operations and Fleet Mix

In 2011, Logan accommodated 28.9 million passengers, approximately 4 percent more passengers than in 2000, but with 119,000 fewer aircraft operations. The decline in aircraft operations over the last decade resulted from sharp reductions in the number of small aircraft flights (i.e., turboprops with 19 to 40 seats and RJs with 50 or fewer seats), increasing load factors, and fewer GA flights. These factors, however, are not expected to continue over the forecast period. Future declines in small aircraft flights (50 or fewer seats) will not be as significant, airline consolidation and high fuel prices will encourage the use of larger aircraft; load factors are high and cannot increase much further; and GA has rebounded from the steep declines stemming from the 2008 to 2009 economic recession.

Average load factor and aircraft size assumptions are summarized in Table 2-10. The average load factor for North America, the dominant market segment at Logan, is assumed to increase slightly from 77 percent in 2011 to 79 percent in 2030. Similarly, average aircraft size for North America is assumed to increase from 104 to 105 seats over the forecast period.

Table 2-10 Average Load Factor and Average Aircraft Size, 2011 and 2030

	Average Load Factors		Average Seats per Operation	
Region	2011	2030	2011	2030
North America	77%	79%	104	105
Europe	78%	82%	252	269
Asia	0%	80%	-	223
Latin America	-	79%	-	154

Aircraft operations are forecast to increase over the planning period at a slightly slower rate than passenger traffic, growing by 1.3 percent per year, as shown in Table 2-11. By 2030, Logan Airport is forecast to accommodate 474,734 annual aircraft operations. Passenger airline operations are expected to account for nearly 93 percent of total aircraft operations at Logan Airport in 2030.

The projected fleet mix for Logan Airport reflects a continuation of airline industry fleet trends, which include movement into larger capacity jet aircraft, a reduction in small RJ aircraft and increases in larger RJs and turboprops, which have more favorable operating costs in a high fuel price environment. At Logan Airport, the passenger airline aircraft fleet mix is expected to shift towards larger capacity jet aircraft. For example, large jets (100 or more seats)[13] accounted for 67 percent of passenger airline operations in 2011, and are forecast to represent 71 percent of 2030 operations. RJs (less than 100 seats) are expected to represent a declining share of the Logan Airport fleet mix falling from 18 percent of passenger airline operations on 2011 to 14 percent in 2030. The non-jet share will stay relatively stable at 14 percent in 2030 compared to 14.9 percent in 2011. Significant declines in the non-jet share are not expected over the forecast horizon primarily because airlines will continue to substitute larger turboprops (60 or more seats) for small RJs (50 or fewer seats) and Cape Air is expected to continue to operate over 30,000 annual flights with small piston-powered aircraft (9 seats). As a result of the expected shifts in the fleet mix and slightly higher passenger load factors, the average number of passengers per passenger airline operation is predicted to rise from 86 in 2011 to 90 in 2030.

Over the forecast period, all-cargo airlines are expected to acquire larger narrow-body and wide-body aircraft enabling them to carry more cargo per aircraft operation. As a result, Logan Airport's all-cargo aircraft operations are forecast to grow at 1.0 percent per year, more slowly than the projected 2.6 percent annual increase in Express All-Cargo volume.

After a robust recovery from steep declines in activity following the 2008/2009 Economic Recession, GA operations are forecast to remain relatively flat over the forecast period at approximately 27,000 operations.

13 Includes the Embraer-190 Regional Jet configured with 100 seats.

Table 2-11 Actual and Forecast Logan Airport Aircraft Operations, 2011 and 2030			
	2011 Actual	2030 Forecast	Average Annual Growth (2011-2030)
Passenger Service			
Jet (≥ 100 Seats)[1]	223,083	312,727	1.8%
Regional Jet (< 100 Seats)	61,704	65,480	0.3%
Non-Jet	49,700	61,982	1.2%
Subtotal	334,487	440,189	1.5%
All-Cargo	6,270	7,636	1.0%
GA	28,230	26,908	(0.3%)
Total	**368,987**	**474,734**	**1.3%**

Source: Massport
Notes: Totals may not add up due to rounding.
Numbers in parenthesis () indicate negative number.
1 Includes regional jets with 100 or more seats.

Comparison of Previous and Current ESPR Forecasts

Prior to this 2030 forecast, the last forecast prepared for Logan Airport was in 2003, and reported in the *2004 ESPR*. Conditions and trends have changed during that period, now reflected in the updated 2030 forecast. Table 2-12 compares the *2004 ESPR* planning forecast to the updated *2011 ESPR* planning forecast. The current forecast planning year is 2030, which is ten years beyond the 2020 planning horizon analyzed in the *2004 ESPR*. The current passenger forecast for 2030 is lower by 3 million passengers or 7 percent than the previous 2020 planning forecast of 42.8 million passengers. Similarly, the 2030 planning forecast for aircraft operations (475,000) is approximately 12 percent lower than the previous 2020 operations forecast (538,000). However, the number of aircraft operations projected to accommodate this higher passenger level (538,372 operations) is approximately 8 percent lower than the previous operations forecast (584,612 operations).

The current planning forecast has an average of 84 passengers per aircraft operation compared to 80 passengers per aircraft in the previous planning forecast. The increase in average passengers per flight is driven by an increase in average load factors and a shift in the fleet mix towards larger capacity aircraft. The 2030 aircraft fleet forecast has a higher percentage of large jet aircraft (100 seats or more) and reflects the next generation of narrow-body jets which have more seats than older models and growth in wide-body aircraft operations serving the long-haul international market. Similarly, the non-jet category reflects a shift to higher capacity turboprops, generally 60 to 70 seats compared to 30 seats for older models. In addition, the 2030 planning forecast has 53,000 fewer RJs. The reduction in RJs is primarily in smaller 30 to 50 seat models.

There will be opportunities to update the 2030 forecast based on the most current trends and data available during the next ESPR cycle (approximately 5 years after this *2011 ESPR*), if necessary.

Table 2-12 Comparison of Prior and Current Logan Airport Planning Forecast, 2020 and 2030

Activity	Prior Forecast[1] 2020	Current Forecast[2] 2030	Absolute Difference	Percent Difference
Passengers	42,823,810	39,831,471	(2,992,339)	(7.0%)
Operations				
Jet (≥100 Seats)[1]	338,190	312,727	(25,463)	(7.5%)
Regional Jet (<100 Seats)	118,501	65,480	(53,021)	(44.7%)
Non-Jet	28,080	61,982	33,902	120.7%
All-Cargo	11,387	7,636	(3,751)	(32.9%)
GA	42,213	26,908	(15,305)	(36.3%)
Total	538,372	474,734	(63,638)	(11.8%)
Percent of Total Operations				
Jet (≥100 Seats)[3]	62.8%	65.9%	3.1	
Regional Jet (<100 Seats)	22.0%	13.8%	(8.2)	
Non-Jet	5.2%	13.1%	7.9	
All-Cargo	2.1%	1.6%	(0.5)	
GA	7.8%	5.7%	(2.1)	
Total	100.0%	100.0%		
Passengers per Operation	80	84	4	

Source: Massport
Notes: Numbers in parenthesis () indicate negative number.
1 *2004 Environmental Status and Planning Report (ESPR)*
2 Moderate forecast.
3 Includes passenger charter operations and regional jets with 100 or more seats.

3

Airport Planning

Introduction

This chapter describes the status of projects underway or completed at Logan Airport in 2011 and provides an update through the filing of this report. This *2011 Environmental Status and Planning Report (ESPR)* also provides an analysis of anticipated future conditions in 2030 based on the likely passenger activity levels, aircraft operations, and aircraft fleet mix in 2030. For further information on the development of the 2030 long-range forecast, refer to *Chapter 2, Activity Levels.* Consistent with the environmental analyses for 2030 conditions provided in this *2011 ESPR,* this chapter also outlines known plans for future projects and planning concepts that are under consideration by the Massachusetts Port Authority (Massport) or its tenants through 2030.

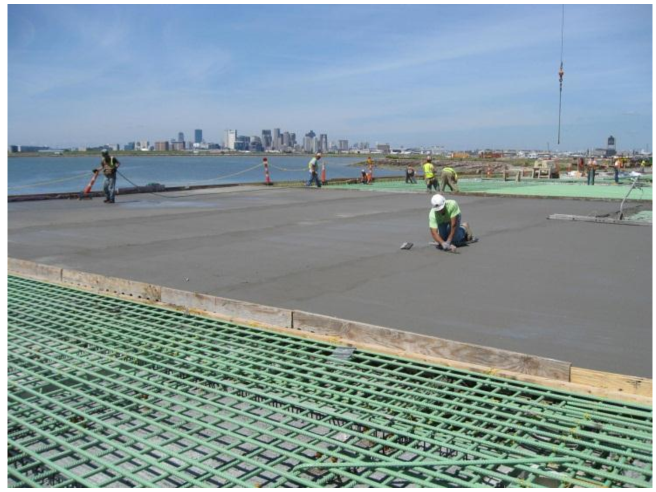
As discussed in *Chapter 1, Introduction/Executive Summary* of this *2011 ESPR*, any proposed project that triggers a threshold under the Massachusetts Environmental Policy Act (MEPA) or the National Environmental Policy Act (NEPA), will undergo the appropriate project-specific state and/or federal environmental review.

2011 Planning Highlights

Recent progress on individual projects at Logan Airport during 2011 and 2012 included:

- **Southwest Service Area (SWSA) Redevelopment Program (EEA 14137).** Massport completed the permitting for redeveloping the SWSA at Logan Airport, including a new consolidated rental car facility (ConRAC). Consolidation of the rental car operations and their shuttle buses into a single coordinated shuttle bus fleet operation will result in customer service improvements, stormwater system enhancements, reduced vehicle miles traveled (VMT), and the associated reductions in air emissions. ConRAC construction began in July 2010, starting with various enabling phases of construction, and will be completed in 2014.
- **Logan Runway Safety Area (RSA) Improvements Project at Runway Ends 33L and 22R (EEA 14442).** The safety improvements are required to enhance the RSAs, to the extent feasible, to be consistent with the Federal Aviation Administration's (FAA) current airport design criteria for RSAs and to enhance rescue access in the event of an emergency. As an older airport, Logan Airport was constructed before many of the current safety standards were developed and several of the runways currently end at the water's edge.

The RSAs enhancements that are currently under construction are safety improvements and do not extend runways; nor do they have any effect on normal runway operations, runway capacity or types of aircraft that can use the runways. Construction of the Runway 33L RSA improvements commenced in June 2011 and was completed ahead of schedule in November 2012. The Runway 22R RSA improvements are planned to be completed by the end of 2015. The status of mitigation for the RSA projects is provided in *Chapter 9, Mitigation Tracking*. As of this filing, mitigation efforts associated with Runway 33L safety improvements are underway.



Runway 33L Safety Improvements under Construction. Source: VHB.

- **Logan Runway 33L Light Pier Replacement Project (EEA 14442).** In January 2012, Massport submitted a Notice of Project Change (NPC) to the RSA Project (noted above) to include full replacement of the Runway 33L Light Pier, including all sections not already replaced by the Runway 33L RSA Project. All local, state and federal permits were secured in 2012 and the replacement was completed in November 2012 coinciding with the completion of the Runway 33L RSA project. As part of this project, the Runway 33L Instrument Landing System (ILS) approach was upgraded from CAT I to CAT III. FAA approved and published the aRea NAVigation (RNAV) procedure on March 7, 2013.
- **Green Bus Depot (EEA 14629).** Design of a bus maintenance facility for Massport's clean fuel fleet buses in the North Service Area (NSA) began in 2009. The Green Bus Depot will help to minimize bus traffic on local streets by serving as a central location for bus maintenance on Airport property rather than traveling for service at the off-site bus maintenance location in Chelsea. The Green Bus Depot is used to maintain the expanded clean fuel shuttle bus fleet that replaced Logan Airport's compressed natural gas (CNG) bus fleet and will maintain the rental car company diesel shuttle buses when the ConRAC opens. Construction was completed in September 2012 and the facility is now in operation.
- **East Boston-Chelsea Bypass Project (EEA 14661).** The Bypass is a limited access roadway between Logan Airport and the new Chelsea Street Bridge. The Bypass roadway is designed to improve commercial vehicle access to the Airport, as well as reduce congestion on local East Boston streets in the vicinity of Day Square, Eagle Square, and the Neptune Road corridor by directing airport-related commercial traffic to the new Bypass roadway. Construction was substantially completed in November 2012 and the roadway is open to Airport-related commercial service. The road was named the "Martin A. Coughlin" Bypass Road for the late Martin A. Coughlin, an East Boston resident. The project includes the use of high efficiency light-emitting diode (LED) lighting and incorporates bio-swales for stormwater retention and drainage.
- **Logan Airport Economy Parking Garage Project.** Construction of the Economy Parking Garage began in the summer of 2010 and was completed and fully opened to the public in early 2011. Sustainable features installed as part of this project included: solar panel "trees" on the garage roof, energy-efficient lighting, and trellis plantings with vines on the public edge of the garage façade.
- **North Service Area (NSA) Roadway Corridor Project.** The NSA Roadway Corridor extends approximately from the State Police building up to and including Neptune Road. This corridor improvement project is intended to unify the existing roadway with new landscape and urban design elements along this highly visible roadway corridor, providing an important public edge along the

corridor. Massport has installed a WindWheel Sculpture by William Wainwright on a parcel southwest of Neptune Road. Construction of the NSA Roadway Corridor Project began in 2010 and was completed in the spring of 2012.

- **Greenway Connector Project.** The Greenway Connector is a pedestrian/bicycle path connecting the Bremen Street Park path to the City of Boston pedestrian/bicycle path that begins at the Greenway Overlook and continues to Constitution Beach. When completed, the Greenway and the City of Boston Link will provide a continuous pedestrian/bicycle path from Piers Park to Constitution Beach. Construction of the Greenway Connector is planned to begin in the spring of 2013.
- **Hangar Upgrade Projects.** Architectural designs commenced in December 2010 for two hangar upgrades in the North Cargo Area (NCA) and are scheduled for completion in 2013. The renovated JetBlue Airways hangar opened in 2012.
- **Renovations and Improvements at Terminal B.** This project includes renovations to Terminal B, Pier A. By modifying and expanding existing facilities to meet airlines' needs and providing a connection between Piers A and B, the project improves and simplifies the passenger traveling experience. With initial renovations beginning in June 2012, the project is expected to be completed by 2014.
- **Terminal B Garage Improvement Project.** Terminal B Garage repair and rehabilitation was completed in March 2012. In addition to overall upgrades, sustainable features were also installed including 32 solar panel trees (200 kilowatt (kW)) on the top floor, high efficiency LED lighting throughout the garage, and two rainwater harvesting collection tanks to store and later recycle stormwater.
- **Landside Ground Access Operating Improvements.** The ConRAC, Green Bus Depot, East Boston-Chelsea Bypass Road, and the Economy Parking Garage are expected to yield substantial environmental benefits, particularly in the areas of ground access efficiencies and associated air quality emissions reductions on-Airport and in East Boston, as documented below.
  - The ConRAC project will reduce Airport VMT as well as improve roadway and intersection operations through three factors: 1) the consolidation of the rental car shuttle bus fleet and some Massport shuttle buses into a unified shuttle route system resulting in the elimination of eight rental car bus fleets (a net total of 66 buses would be eliminated); 2) intersection and roadway infrastructure improvements including signal coordination and dedicated ramp connections; and 3) creation of a Ground Transportation Operations Center (GTOC) enabling efficient planning and operation of Airport-wide transit activities.
  - The recently constructed Green Bus Depot (2012) serves as Logan Airport's on-Airport maintenance facility for Massport's new clean-fuel bus fleet. By shifting the bus maintenance operations out of the community, Massport is reducing bus traffic in East Boston and Chelsea.
  - The recently constructed East Boston/Chelsea Bypass (2012) is expected to reduce commercial traffic through East Boston by providing a direct link from Logan Airport's NSA to the Chelsea Street Bridge for Airport-related commercial vehicle trips.
  - The Economy Parking Garage simplifies and reduces traffic and transit VMT by consolidating multiple overflow parking lots throughout the Airport into a single location served by a single shuttle route. Overall traffic circulating throughout the Airport will likely decrease resulting in significant operational and environmental benefits.
  - The new bus fleet, comprising 18 CNG buses and 32 clean diesel/electric buses, will ultimately replace the entire fleet of diesel rental car shuttle buses once the ConRAC is operational in 2014.

As these facilities come on-line, future Environmental Data Report (EDR) and ESPR filings will report on the effects of more efficient operations and the predicted environmental benefits. Table 3-1 provides a summary of the status of each project and planning concept, as of December 31, 2012. Descriptions are provided in subsequent sections of this chapter.

Table 3-1 Logan Airport Short- and Long-Term Development Initiatives

	Status as of 2012	Completion Short Term	Completion Long Term
Terminal Area Projects/ Planning Concepts			
Terminal E, Phase 1 and Phase 2	C		
Terminal E, Future Phase (West Concourse)	D		✈
Massport Satellite FIS Facility Project	H		
Terminal B Renovations	U	✈	
Terminal B Walkway Extension	H		
Terminal B Garage Repair and Rehabilitation	C	✈	
Service Area Projects/ Planning Concepts			
Relocated CNG Station in the NCA	E		✈
Consolidated Maintenance Facilities in the NCA	C		
Replacement Cargo Facilities in the NCA	E		✈
Replacement American Airlines Hangar in the NCA	H		✈
Replacement Hangar Facilities in the NCA	H		✈
New/Replacement GSE Consolidated Facility in the NCA	E		✈
Green Bus Depot in the NSA	C		
Flight Kitchen Consolidation in the NSA	C		
SWSA Program (Consolidated Car Rental Facility)	U	✈	
Ground Transportation Operations Center	U	✈	
NSA Roadway Corridor Project	C		

	Status as of 2012	Completion Short Term	Completion Long Term
Airport Parking Projects/ Planning Concepts			
NSA Economy Parking Consolidation	X		
Logan Airport Economy Parking Project in the NCA	C		
Airside Area Projects/ Planning Concepts			
Runways 22R and 33L Runway Safety Area Improvements	C (RW 33L) U (RW 22R)	✈	
Logan Airside Improvements Planning Project			
Runway 14-32 Construction	C		
Taxiway D Extension and Realignment	C		
Taxiway N Realignment	E	✈	
Centerfield Taxiway	C		
Shift Runway 15L/33R 200 feet to the East	E	✈	
Governors Island Aircraft Parking	H		✈
Buffer Projects/ Open Space			
SWSA Buffer	C (Phase 1) U (Phase 2)	✈	
NSA Buffer	D	✈	
Greenway Connector	D	✈	
Navy Fuel Pier	C		
Bremen Street Park	C		
Airport-Wide Projects/ Planning Concepts			
Logan Airport Wayfinding System	U[1]		
East Boston-Chelsea Bypass	C		

Notes: Anticipated completion dates and status as of December 31, 2011 as denoted by ✈.
Short term projects are anticipated to be completed by 2015 and long term projects are anticipated to be completed by 2030.
Details of each project or planning concept are provided in the sections that follow.

C – Completed prior to or during 2012.
D – Project in design, or awaiting funding
E – Planning concepts undergoing evaluation and/or feasibility analysis
H – Project or planning concept on hold
R – Project undergoing MEPA, NEPA/Federal Aviation Administration (FAA), or other review
U – Project under construction
X – Project cancelled
1 – Design has been completed. At this time, the project is not funded; all Wayfinding Improvements are being achieved on a project by project basis.

FIS – Federal Inspection Services
CNG – Compressed Natural Gas
NCA – North Cargo Area
GSE – Ground Support Equipment
NSA – North Service Area
SWSA – Southwest Service Area

Terminal Area Projects/Planning Concepts

The terminal area accommodates most of the passenger functions at Logan Airport including the passenger terminals, terminal area roadways, central parking facilities, and the Hilton Hotel. Table 3-2 presents information on the status of each ongoing terminal area project. In addition, both Massport and its tenants are proposing projects or exploring planning concepts to modernize and carry out future improvements to the existing terminal facilities. These planning concepts are also detailed in Table 3-2. The location of the ongoing terminal area projects and the planning concepts are shown on Figure 3-1.

Figure 3-1 Location of Projects/Planning Concepts in the Terminal Area

Source: Massport
Note: See Table 3-2 for a description of the numbered projects
1 International Gateway Project
2 Massport Satellite FIS Facility Improvements Project
3 Renovations and Improvements at Terminal B
4 Terminal B Garage Repairs

Table 3-2 Description and Status of Projects/Planning Concepts in the Terminal Area (December 31, 2011 through 2030)	
Description	**Status**
Massport Projects/Planning Concepts	
1. International Gateway Project (Terminal E) The project expands and upgrades Terminal E to provide better service to international passengers. This project is being constructed in phases:	
Phase 1 – A weather-protected airside bus portico linking the ground floor with the second floor to accommodate passengers arriving from remotely parked aircraft.	Completed in 2004.
Phase 2 – Expanded Federal Inspection Services (FIS) Facility, and improved meeter/greeter lobby and the ticketing area to maximize passenger convenience and reduce processing times. Includes accommodation for bicycles.	Completed in 2007. Bike racks added at Terminal E in the summer of 2012
Future Phase – Construction of a new West Concourse, adding three new wide body aircraft gates.	Initial work on the Future Phase (new West Concourse) was completed as part of an airport-wide in-line baggage screening project in 2004. The remainder of the future phase is included in Massport's long-term capital plan and is anticipated to be in place by 2030.
2. Massport Satellite FIS Facility Improvements Project To accommodate more efficiently the potential growth of the international market, Massport proposed to construct a new satellite FIS Facility at the southeast end of Terminal B, Pier A.	This project is no longer being considered in this form.
3. Renovations and Improvements at Terminals B The airline industry continues to react to financial and other operating will pressures. This has led to a number of consolidations and realignments within the airlines. To address these changes and the continuing need for airlines to relocate with new partners, Massport has initiated analysis of terminal changes to better accommodate these ongoing airline partnership changes and facilitate broader flexibility in terminal utilization. This includes renovation of existing spaces, connecting of the Terminal B Piers, construction of some new spaces and reconfiguration of 8 aircraft gates to better facilitate passenger processing.	Construction of the Terminal B renovations and improvements commenced in 2012 and are planned for completion in 2014. Approximately 79,000 square feet of existing space will be renovated and approximately 84,000 square feet of new space will be added. Eight existing aircraft loading gates will be relocated.
Tenant Projects/Planning Concepts	
4. Terminal B Garage Repairs Structural repairs and garage lighting upgrades. Installed solar panels on garage roof.	This project includes routine maintenance as well as significant structural rehabilitation of the Terminal B Garage. The multi-year construction project is complete. While there were temporary reductions in garage capacity for construction, the project will not provide any additional parking capacity. The installed solar panels trees (200 kilowatts (kW)) on the garage roof and new light-emitting diode (LED) lighting have already begun to reduce energy consumption and improve air quality. Two 1,000 gallon rainwater collection tanks to recycle stormwater were set to provide water for maintenance and street sweeper use throughout Airport properties. Further details on energy savings are described in *Chapter 1, Introduction/Executive Summary.*

Note: See Figure 3-1 for the location of terminal area projects/planning concepts.

Service Area Projects/Planning Concepts

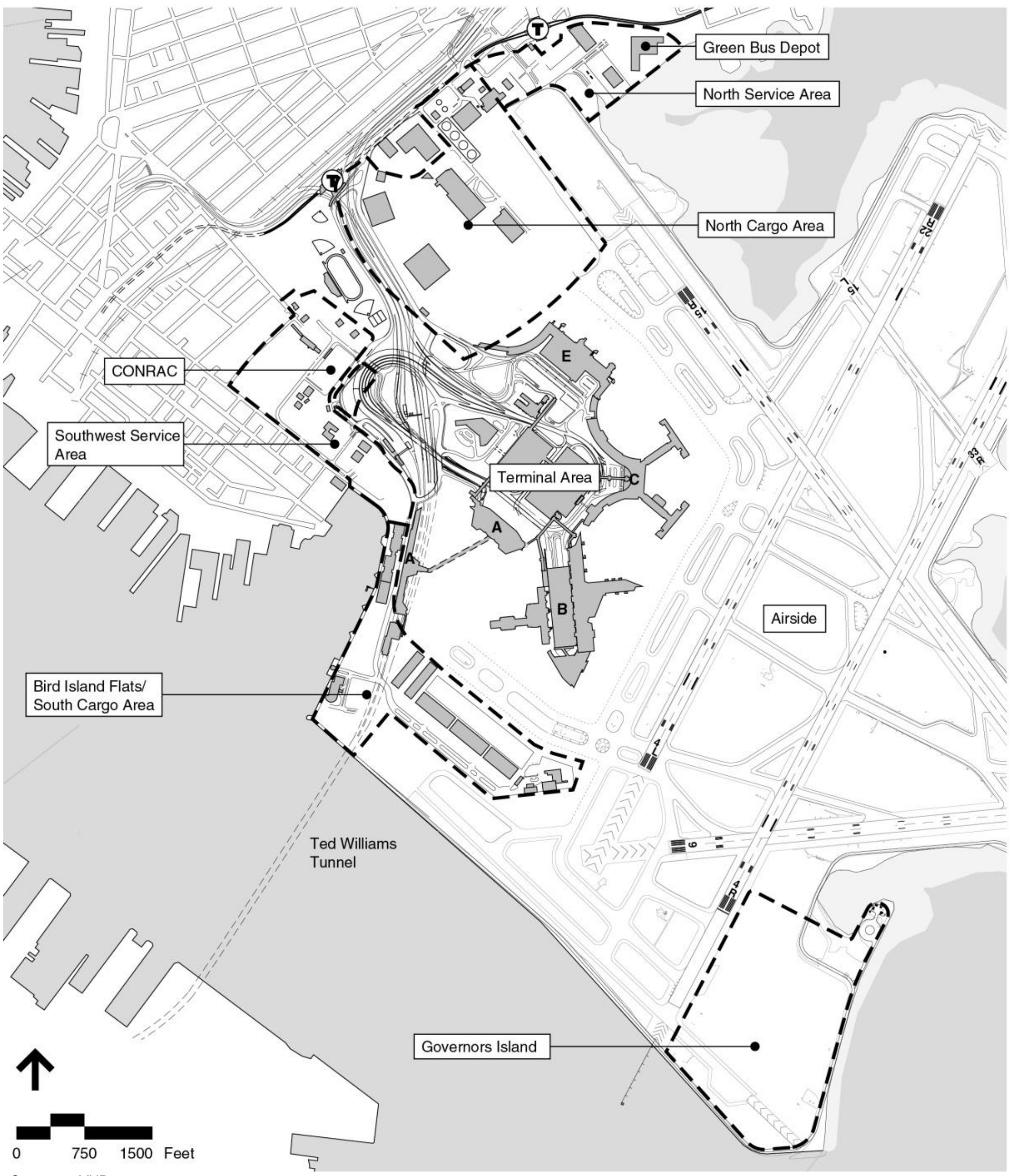
Logan Airport's service areas contain airline support businesses and operations. Land uses in the service areas continually evolve in response to changing airline business, customer, and tenant needs, as well public works projects. Massport continues to explore more efficient ways of using the limited land resources in the service areas. The five service areas at Logan Airport are shown in Figure 3-2 and are described below:

- **North Cargo Area (NCA)** is located in Logan Airport's northwest corner. It is bounded by the main Logan Airport outbound roadway to the south, Route 1A to the west, the Jet Fuel Storage Facility to the north, and the airside apron area to the east. The NCA, which is adjacent to Logan Airport's airside area, is the Airport's primary airline support area. It accommodates air cargo and essential airline support businesses including hangars, ground service equipment (GSE) maintenance, and aircraft parking. The NCA is the most appropriate location for businesses and operations that require contiguous airside access and for businesses such as cargo that require adjacent landside as well as airside access. The NCA is the likely location for future hangar expansion either between or in the vicinity of the American Airlines and Delta Air Lines hangars, for replacement cargo buildings and for aircraft parking to accommodate changes in aircraft fleet over time. In the interim, portions of the NCA will continue to be used for economy parking.
- **North Service Area (NSA)** is located north of the NCA near the Massachusetts Bay Transportation Authority's (MBTA) Wood Island Station and Runway 15R-33L. The NSA includes two flight kitchens, weather and navigation equipment, the temporary bus/limousine pool, an airport edge buffer and the new Green Bus Depot. Massport will also construct a section of the East Boston Greenway Connector running parallel to the MBTA Blue Line corridor in this section of the Airport.
- **Southwest Service Area (SWSA)** is located south of Logan Airport's main access roadway and is bounded on the east by Harborside Drive. Because of its proximity to the terminals and the regional highway system, the SWSA functions as Logan Airport's primary ground transportation hub and includes the taxi and bus/limousine pools. The entire SWSA is being redeveloped to accommodate the new ConRAC facility and associated activities. As an interim measure during ConRAC construction, the bus and limousine pools have been temporarily relocated to the NSA. The taxi pool has been temporarily relocated to Lot B, which is on Harborside Drive between the Logan Office Center Garage and the Hyatt Hotel. The former Gate Gourmet flight kitchen was relocated to a vacant flight kitchen facility in the NSA in 2012. The old Gate Gourmet building was demolished in 2012 to accommodate the new SWSA access roadway. The SWSA redevelopment project is scheduled for completion in 2014.
- **Bird Island Flats/South Cargo Area (BIF/SCA)** is located south and southeast of the Logan Airport's SWSA, and is generally bounded on the south by Boston Harbor and on the east and north by Logan Airport's airside area. The BIF/SCA is two service areas connected by Harborside Drive. The BIF portion has landside access via Harborside Drive and water access via the system of water taxis that shuttle passengers between downtown Boston, the South Shore, and Logan Airport. BIF development includes the Hyatt Hotel and Conference Center, the Logan Office Center and adjoining garage, an employee parking lot (Lot B), the Water Shuttle Dock, the Logan Airport Rescue and Fire Fighting Facility Marine Dock, and the Harborwalk that is a publicly accessible promenade along the harbor's edge. The SCA portion is Logan Airport's primary cargo area. It provides landside access and secured airside access. It also accommodates domestic and some international cargo operations and temporary relocation of the taxi pool during SWSA redevelopment. During construction of the ConRAC project, the Lot B surface employee lot is being used as the interim taxi pool. Once the taxi pool is relocated to its permanent new home along Porter Street in the SWSA, Lot B will be returned to an employee parking lot.
- **Governors Island (GI)** is located at Logan Airport's southern tip and is bounded by Runway 14-32 and Boston Harbor to the east and south, by Runway 4R to the west, and Runway 9 to the north. GI has

functioned as a storage site for the Central Artery/Tunnel (CA/T) Project and for construction stockpiles. The area also contains an Aircraft Rescue and Fire Fighting Facility training area, parking for snow removal equipment, a biocell remediation area, and FAA aircraft navigation equipment. The area has been considered as a future location of remain overnight (RON) aircraft parking.

Table 3-3 presents information on the status of each ongoing project and planning concept in the service areas. Both Massport and Logan Airport tenants are proposing projects or exploring planning concepts to modernize and carry out future improvements to the service areas. These planning concepts are also detailed in Table 3-3. The location of the ongoing service area projects and planning concepts that may potentially be constructed in the future are shown on Figure 3-3.

Figure 3-2 Logan Airport Service Areas



Source: VHB.

Figure 3-3 Location of Projects/Planning Concepts in the Service Areas

Source: Massport
Note: See Table 3-3 for a description of the numbered projects
1 Southwest Service Area Redevelopment Program, Consolidated Rental Car Facility, and Ground Transportation Operations Center
2 Relocated Compressed Natural Gas Station in the North Cargo Area (NCA)
3 Replacement Cargo Facilities in the NCA
4 North Service Area (NSA) Roadway Corridor Project
5 Replacement American Airlines Hangar in the NCA
6 Replacement Hangar Facilities in the NCA
7 Green Bus Depot in the NSA
8 Flight Kitchen Consolidation in the NSA
9 New/Replacement Ground Support (GSE) Consolidated Facility in the NCA

Table 3-3 Description and Status of Projects/Planning Concepts in the Service Areas (December 31, 2011 through 2030)	
Description	**Status**
Massport Projects/Planning Concepts	
1. Southwest Service Area (SWSA) Redevelopment Program The SWSA Redevelopment Program consolidates on-Airport and most off-Airport rental car operations and facilities into one integrated facility (ConRAC) to better serve tenants and the traveling public, to reduce ground transportation and air quality impacts on-airport and in the surrounding neighborhoods, and to reduce associated off-airport impacts and accommodates a portion of off-Airport rental car operations. Redevelopment of the SWSA is needed because the existing SWSA and rental car facilities were inefficient and not adequate to meet Logan Airport's or the rental car companies' future needs. The SWSA Redevelopment Program is replacing and upgrading existing ground transportation uses within the SWSA. The redevelopment includes a consolidated car rental facility with a four-level garage to accommodate rental car retail operations and storage; support facilities for the car rental operations; a new clean-fuel unified shuttle bus system; a relocated and reconfigured taxi pool; bus and limousine pool; and roadway improvements, pedestrian and bicycle facilities, and site landscaping. It also includes a customer service center and four quick turn-around maintenance and service facilities. Leadership in Energy and Environmental Design® (LEED) Silver certification is being pursued for the facility. ConRAC construction was preceded by numerous enabling activities that reorganized the SWSA through multiple sub-phases allowing for enough of the site to be cleared for staging and construction. Some of these enabling projects include reorganization of rental car operations within the SWSA. Others include temporary relocation of ground transportation operations for a limited time period, including the taxi pool to Lot B, the Cell Phone Lot to an existing open parking lot across from the Logan Airport gas station, and the bus and limousine pool to the North Service Area (NSA). The project also included the demolition of the existing flight kitchen to allow the extension of Hotel Drive. Phase 2 of the SWSA Buffer (EEA #14137) (see Table 3-5) is being integrated with the proposed SWSA Redevelopment Program.	A Final Environmental Impact Report/Environmental Assessment (EIR/EA) was prepared in accordance with the Secretary of Energy and Environmental Affairs' Certificate on the Notice of Project Change (NPC). The Final EIR/EA was filed on March 1, 2010. An extended comment period closed on May 24, 2010. The Secretary's Certificate finding that the Final EIR adequately and properly complies with Massachusetts Environmental Policy Act (MEPA) was issued on May 28, 2010. The project is now under construction and completion is anticipated in late 2013/2014. Several of the enabling projects have been completed or are underway, including temporary relocation of the taxi pool to Lot B, relocation of the cell phone lot from Lot B to the intersection of Hotel Drive and North Service Road, and relocation of the bus and limousine pool to the NSA. These enabling projects were necessary to allow for mobilization and construction within the SWSA. In addition, the first quick-turnaround rental car maintenance and service facility is now under construction.

Table 3-3 Description and Status of Projects/Planning Concepts in the Service Areas (December 31, 2011 through 2030) (Continued)	
Description	**Status**
Massport Projects/Planning Concepts	
1. Southwest Service Area (SWSA) Redevelopment Program (Continued) **Ground Transportation Operations Center (GTOC)** The new GTOC within the ConRAC facility will function as the hub for management of ground transportation at the Airport. GTOC staff will assume direct responsibility for: ▪ Shuttle bus management and reporting via computer-aided dispatch (CAD) and automatic vehicle location (AVL) technology ▪ Real-time bus and transit information collection and dissemination to airport users ▪ Coordination with internal and external agencies related to ground transportation GTOC staff will also provide indirect support for: ▪ Long-term ground transportation planning efforts ▪ Taxi and limousine pool management ▪ Parking management ▪ Traffic management on Airport roadways The GTOC will include a video wall to graphically display information from a variety of sources, including: vehicle location and status information from the CAD/AVL system, curbside camera feeds from the Consolidated Camera Surveillance System (CCSS), flight arrival and departure information from Flight Information Display System (FIDS), the status of curbside Dynamic Message Signs (DMS), emergency alerts, and other information.	Construction of the GTOC was underway in 2012 as part of the ConRAC project and is planned to open with the full ConRAC in 2014.
2. Relocated Compressed Natural Gas (CNG) Station in the North Cargo Area (NCA) This would involve the relocation of Massport's existing CNG Station to accommodate the airside operations in the NCA.	Massport continues to examine several potential on-Airport parcels for relocation of the existing CNG station. Relocation is not expected to occur before 2015.
3. Replacement Cargo Facilities in the NCA Construction of new cargo facilities in the NCA would compensate for the loss of cargo facilities that resulted from the Central Artery/Tunnel (CA/T) Project, as well as for the projected growth in cargo demand.	The project remains under evaluation. If a decision is made to proceed with this project, construction would likely commence after 2015. Hangar upgrades for Buildings 8 and 9 are in the feasibility assessment stage.
4. North Service Area (NSA) Roadway Corridor Project The NSA Roadway Corridor Project coordinates the roadway and urban design vision for North Service Road and Frankfort Street with on-going design and construction efforts in the NSA. The project will coordinate with the NCA Logan Airport Economy Parking Garage, East Boston- Chelsea Bypass Project, the SWSA redevelopment enabling projects and the NSA Buffer Project to produce a unified utility, roadway, and landscape vision for the NSA roadway corridor between Prescott Street and Neptune Road.	The project was under construction and completed in 2012. The Greenway Connector pedestrian/bicycle path, which would provide a section of the connection between Bremen Street and Constitution Beach adjacent to the NSA, is described in Table 3-5.

Table 3-3 Description and Status of Projects/Planning Concepts in the Service Areas (December 31, 2011 through 2030) (Continued)

Description	Status
Massport Projects/Planning Concepts	
5. Replacement American Airlines Hangar in the NCA This proposal would involve the renovation of portions of the American Airlines Hangar to keep it operational until demolition and reconstruction planning can be completed. Roof, mechanical systems, and restrooms are top priorities for renovation. Ultimately the existing 97,000-square foot American Airlines Hangar would be demolished and replaced with a new hangar that could accommodate Group V aircraft.	Planning and design for this proposal has been placed on hold indefinitely. If a decision is made to go ahead with this project, construction would not likely commence until after 2015.
6. Replacement Hangar Facilities in the NCA Construction of new hangar facilities in the NCA would be required to compensate for the loss of hangar facilities that resulted from the CA/T Project, as well as for the projected demand for hangar space.	Evaluation of this planning concept has been placed on hold. If planning resumes, construction would not likely commence until after 2015.
7. Green Bus Depot in the NSA The Green Bus Depot occupies a 7.7-acre site in the North Service Area. The new facility would service the new fleet of Massport clean-fuel shuttles buses including approximately 30 hybrid-electric buses and 20 CNG buses. The new maintenance facility will allow the bus fleet to remain on the airport instead of traveling to Chelsea where current maintenance facilities are located. Access to the facility would be from the existing Airport roadway system. LEED Silver certification is being pursued for the facility.	An expanded ENF was filed with MEPA in July 2010. No further MEPA review was required and construction commenced in 2011. Construction was completed in 2012.
Tenant Projects/Planning Concepts	
8. Flight Kitchen Consolidation in the NSA This project would consolidate existing on-Airport operations in the NSA.	Due to changes in the flight kitchen industry post-September 11, 2001, expansion of flight kitchen facilities is not anticipated. Initial consolidation of the flight kitchen functions occurred in 2005 with the consolidation of the LSG SkyChef facilities into one building in the NSA, leaving one adjacent flight kitchen facility vacant. The inactive flight kitchen was renovated and reactivated in early 2012 when Gate Gourmet relocated from the SWSA to the NSA. In 2007, Signature Flight constructed a multi-tenant GSE facility as a component of its fixed-based operator facility and the proposed expansion of the GSE facility is under-going a feasibility analysis.
9. New/Replacement Ground Support Equipment (GSE) Consolidated Facility in the NCA This planning concept would provide multi-tenant maintenance facilities for GSE.	If the conceptual planning for the proposal moves beyond feasibility screening, construction would not likely commence until after 2015.

Note: See Figure 3-3 for the location of service area projects/planning concepts.

Airside Area Projects/Planning Concepts

The airside area includes all Logan Airport land from the edge of the terminal buildings to the Logan Airport harbor boundary, incorporating the Logan Airport apron, runways, gates, and other airfield operating facilities. Airside improvements include upgrades and improvements to the airfield to enhance the operational efficiency and safety of Logan Airport. Table 3-4 describes the status of projects (shown on Figure 3-4) and planning concepts under consideration for Logan Airport's airside area as of March 1, 2013.

Figure 3-4 Location of Projects/Planning Concepts on the Airside

Source: Massport
Notes: See Table 3-4 for a description of numbered projects.

1	Runway 22R and 33L Runway Safety Area (RSA) Improvements
2	Logan Airside Improvements Planning Project
2a	Demolition and relocation of Cargo Buildings 60 and 61
2b	Construction of a new unidirectional 5,000 foot Runway 14-32
2c	Construction of a Taxiway D straightening and realignment
2d	Straightening and realignment of Taxiway N
2e	Centerfield taxiway
2f	Reduction in approach minimums on Runways 22L, 27, 15R, and 33L by FAA
3	Governors Island Aircraft Parking

Table 3-4 Description and Status of Projects/Planning Concepts on the Airside (December 31, 2011 through 2030)

Description	Status
1. Runway 22R and 33L Runway Safety Area (RSA) Improvements The FAA requires RSAs to accommodate aircraft overruns, undershoots, and veer-offs in emergency situations. Consistent with FAA requirements, Massport is continuously looking for opportunities to increase the margin of safety for all runways and where practicable providing FAA standard RSAs at all locations. At Logan Airport, the FAA standard RSA is typically 500 feet wide by 1,000 feet long at each runway end. Where this space is not available, the FAA has approved the use of Engineered Materials Arresting System (EMAS) for aircraft overrun protection. EMAS uses a system of collapsible concrete blocks that can stop an aircraft by exerting predictable forces on the landing gear while minimizing aircraft damage. In 2004, the FAA approved installation of a 190-foot section of EMAS at Runway 22R. The FAA also directed Massport to evaluate opportunities for additional safety enhancements at this location. Massport installed a 158-foot of EMAS at Runway 33L in 2006, in anticipation of full environmental review of additional improvements. A detailed alternatives analysis was conducted to evaluate options for safety enhancements at both runway-ends. As described in the 2009 Environmental Notification Form (ENF), 2010 Draft Environmental Assessment/Environmental Impact Report (EA/EIR), and 2011 Final EA/EIR, an Inclined Safety Area (ISA) similar to what was constructed at Runway-End 22L is proposed for Runway End 22R. A pile-supported deck with EMAS approximately 460 feet long by 300 feet wide is proposed for Runway End 33L.	Massport filed an ENF with MEPA on June 30, 2009 that described the proposed RSA enhancements at both runway ends. A Draft EA/EIR was filed on July 15, 2010. A Final EA/EIR was filed January 31, 2011 and the Secretary's Certificate was issued March 18, 2011. Remaining environmental permits were secured by May 2011 and construction of the 33L RSA was completed ahead of schedule in November 2012.Runway End 22R enhancements will be completed by the end of 2015.
Runway 33L Light Pier Replacement. The Runway 33L timber light pier was constructed in 1960 and extends to the south-east 2,400-feet from the runway end, predominantly over Boston Harbor. The Runway 33L RSA project is replacing the landward 500-feet of the light pier. During RSA construction, it was determined that replacement of the remaining 1,900-feet of the light pier should be replaced due to its advanced age and efficiencies of combining the construction with the RSA project in the summer of 2012 while the runway was already closed.	Massport filed a Notice of project Change (NPC) to the RSA project in January 2012. The Secretary's Certificate was issued March 9, 2012. All local, state and federal permits were secured for the additional work in June 2012 and the full replacement was completed in October 2012. As part of this project, the Runway 33L Instrument Landing System (ILS) approach was upgraded from CAT I to CAT III. FAA approved and published the aRea NAVigation (RNAV) procedure on March 7, 2013.

Table 3-4 Description and Status of Projects/Planning Concepts on the Airside (December 31, 2011 through 2030) (Continued)

Description	Status
2. Logan Airside Improvements Planning Project The project involves construction of a new unidirectional Runway 14-32, Centerfield Taxiway, extension of Taxiway D, realignment of Taxiway N, improvements to the southwest corner taxiway system, relocation of cargo buildings, and reduction in approach minimums on Runways 22L, 27, 15R, and 33L. These airfield improvements were to reduce current and projected levels of aircraft delay and enhance airfield safety at Logan Airport. The components of this project and status are presented below.	
a. Demolition and relocation of Cargo Buildings 60 and 61.	This component of the project was completed in 2006.
b. Construction of a new unidirectional 5,000-foot Runway 14-32.	Construction was completed in 2006 and Runway 14-32 became operational on November 23, 2006. The first full year of operation of Runway 14-32 was 2007.
c. Construction of a Taxiway D straightening and realignment, and southwest corner taxiway realignment and the installation of lighting, marking, signage, and drainage.	The southwest corner taxiway realignment component of the project was completed in 2007. The Taxiway D extension was fully constructed in 2009.
d. Straightening and realignment of Taxiway N.	This project component is anticipated to commence after 2015.
e. Construction of a 9,300-foot long Centerfield Taxiway located between and parallel to Runway 4L-22R and Runway 4R-22L.	As part of its Record of Decision (ROD) for the Airside Improvements Planning Project under NEPA, the FAA initially deferred its decision on Centerfield Taxiway (Taxiway M) pending an operational review to identify any other potential beneficial actions. The FAA directed the technical work on the operational review and conducted briefings with a citizen panel. The FAA divided the study into two phases. Phase 1 focused on current conditions and Taxiway N, and Phase 2 included operations with both Taxiway N and the Centerfield Taxiway. Both of these Phases were completed and the public comment period on the project ended in September of 2007. The FAA approved the Centerfield Taxiway in April, 2007. Construction of the Centerfield Taxiway began in the spring of 2008 and was completed in August of 2009. The Centerfield Taxiway is being used as intended by the EIS for taxiing for long-haul domestic and international flights using Runway 22L and to improve flow on the airfield and reduce taxiway congestion. Massport paved the taxiway with warm mix asphalt, which reduces energy consumption and has air quality benefits.
f. Reduction in approach minimums on Runways 22L, 27, 15R, and 33L by FAA.	Reduction in approach minimums on Runways 15R and 33L was approved in the Airside EIS/EIR. Implementation will be affected by realignment of the Instrument Landing System (ILS) localizer. Construction impacts of relocation of the ILS localizer were addressed as part of the proposed enhancements to the RSA at the end of Runway 33L (see above). The new Runway 33L RSA deck will be able to accommodate the future relocation of the localizer. Additional navigational upgrades were installed as part of the Runway 33L Light Pier Replacement Project in 2012. Runway 33L is expected to be operating as a Category III ILS in March 2013.

Table 3-4 Description and Status of Projects/Planning Concepts on the Airside (December 31, 2011 through 2030) (Continued)	
Description	**Status**
3. Governors Island Aircraft Parking Massport has considered providing additional aircraft parking at Governors Island for the following: Remain overnight (RON) aircraft; cargo aircraft; and international aircraft. RON aircraft are generally commercial passenger aircraft that fly into the airport at night and fly out in the morning. Airlines sometimes schedule and position more aircraft than there are gate positions, therefore remote aircraft parking positions are required. Remote aircraft parking is appropriate for cargo aircraft that generally arrive in the morning and remain on the ground until their late evening departure. Some international scheduled and charter aircraft that have long turnaround times should be parked remotely when there is a high demand for gates.	Preliminary concepts evaluated by Massport involve the development of 20 to 50 aircraft positions and ancillary uses. This project is on hold. If the concept is deemed feasible and planning continues, it is anticipated that construction would occur after 2015.

Note: See Figure 3-4 for the location of airside projects/planning concepts.

Airport Buffer Areas and Other Open Space

Massport has committed up to $15 million for the planning, construction, and maintenance of four airport edge buffer areas and two parks along Logan Airport's perimeter. Three buffers have been completed, including the Bayswater Buffer, Navy Fuel Pier Buffer, and SWSA Buffer Phase I. The SWSA Buffer Phase 2 is now under construction. These areas are located generally along the Logan Airport's perimeter boundary and are intended to provide attractive landscape buffers between airport operations and adjacent East Boston neighborhoods. The buffer design occurs in consultation with Logan Airport's neighbors and other interested parties in an open community planning process. To collaborate in East Boston open space planning, Massport also participates in meetings with other agencies including Massachusetts Department of Transportation (MassDOT), the City of Boston and the MBTA. Table 3-5 describes the status of ongoing buffer projects and other Massport greenspace projects under consideration as of March 1, 2013. Figure 3-5 shows the location of these buffer projects.

Figure 3-5 Location of Airport Buffer Projects/Open Space

Source: Massport.
Note: See Table 3-5 for a description of the numbered projects.
1 Southwest Service Area (SWSA) Buffer
2 North Service Area (NSA) Airport Edge Buffer (Neptune Road Buffer)
3 Navy Fuel Pier Buffer
4 Bayswater Embankment
5 Bremen Street Park
6 The Greenway Connector

Table 3-5 Description and Status of Airport Edge Buffer Projects/Open Space (December 31, 2011 through 2030)

Description	Status
1. Southwest Service Area (SWSA) Buffer Phase 1 of this project involves the construction of an approximately half-acre linear area with landscaping and lighting improvements along Maverick Street that will include evergreen and deciduous trees, ornamental shrubs, and groundcovers.	Phase I construction was completed in 2006.
Phase 2 of this project involves additional landscaping and solid barriers.	Phase 2 of the SWSA Buffer design has been integrated with the SWSA Redevelopment Program. Phase 2 consists of installing landscaping (i.e., densely planted or planted atop earth berms for enhanced separation) and solid barriers such as fences and walls. The project will enhance bicycle and pedestrian connectivity between Maverick Street and East Boston Memorial Park and Stadium with extensive landscaping including trees, shrubs, flowering perennials, and decorative fences. The Secretary's Certificate on the SWSA Redevelopment Project Final Environmental Impact Report (FEIR) was issued in May, 2010. Construction of the SWSA Phase 2 Buffer is anticipated to be completed in late 2013/2014.
2. North Service Area (NSA) Airport Edge Buffer (Neptune Road Buffer) The NSA Buffer involves landscape improvements along the airport edge. The NSA Buffer will involve significant landscape beautification and improved pedestrian/bicycle connections, primarily on the Massport parcel located at the intersection of Neptune Road and Vienna Street.	Massport selected a design consultant in May 2009 and began the community planning process in December 2010. Construction is anticipated to commence in 2013. In the interim, a series of landscape improvements along Logan Airport's north entrance are underway.
3. Navy Fuel Pier Buffer The Navy Fuel Pier Buffer project began with the Army Corps of Engineers' (ACOE) remediation of the former Navy Fuel Pier, which was completed in 2001. The project involved beautification of the property (0.7 acres) through landscape improvements and stabilization of the waterfront perimeter.	Final construction of the buffer was completed in 2007.
4. Bayswater Embankment This project involved creation of a landscaped buffer between Bayswater Street and Boston Harbor.	Construction of this airport edge buffer was completed in 2003.
5. Bremen Street Park The 18-acre Bremen Street Park was constructed by the Central Artery/Tunnel (CA/T) Project as East Boston's second largest neighborhood park. The park contains a variety of facilities, a direct pedestrian connection to Massachusetts Bay Transportation Authority's (MBTA) Blue Line Airport Station, and a half-mile segment of the three-mile East Boston Greenway. The park was built on land previously used as off-airport parking.	Final construction of the park was completed in 2008.
6. The Greenway Connector The one-half mile pedestrian/bicycle path connects the Bremen Street Park pedestrian/bicycle path to the City of Boston/DCR Greenway Connector to Constitution Beach. When completed there will be a continuous pedestrian/bicycle path from Piers Park to Constitution Beach that will connect Piers Park, Bremen Street Park, Stadium Park, and Constitution Beach.	Massport continued work with the City of Boston and community representatives and others in 2012 regarding the design and construction of the Greenway Connector between Bremen Street Park and an Overlook at Wood Island Marsh. The City of Boston will construct a pedestrian/bicycle path from the Overlook to Constitution Beach. The Greenway Connector construction documents were completed in 2012 and construction is scheduled to begin in the spring of 2013 and is anticipated to be completed in late 2013.

Note: See Figure 3-5 for the location of airport edge buffer projects/planning concepts.

Airport Parking Projects/Planning Concepts

The total number of employee and commercial parking spaces permitted at Logan Airport is limited by the Logan Airport Parking Freeze under the State Implementation Plan (SIP). Parking supply at Logan Airport has varied with respect to the specific locations and sizes of individual lots, the mix of parking spaces for air travelers and employee spaces, and the number of spaces in and out of service at any one time due to construction projects being undertaken at Logan Airport, while at all times remaining in compliance with the Logan Airport Parking Freeze. *Chapter 5, Ground Access to and from Logan Airport* contains additional information on the historic and existing supply of parking at Logan Airport. Table 3-6 describes current commercial parking projects at Logan Airport. The locations of parking projects are shown on Figure 3-6.

Figure 3-6 Location of Airport Parking Projects/Planning Concepts

Source: Massport.
Note: See Table 3-6 for a description and status of numbered projects.
1 Logan Airport Economy Parking Garage Project in the NCA (North Cargo Area)

Table 3-6 Description and Status of Airport Parking Projects/Planning Concepts (March 2011)

Description	Status
1. Logan Airport Economy Parking Project in the NCA (North Cargo Area) This involved construction of an interim two-level deck above the existing surface economy parking lot on the Robie Parcel in the NCA. The two decks, above ground level parking, will facilitate consolidation of existing temporary parking at various on-airport locations to one location. The parking consolidation will result in significant customer service improvements, operational and environmental benefits including reduced vehicle miles traveled with associated air quality benefits.	On June 23, 2010, the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) issued an Advisory Opinion confirming that no MEPA review was required for this parking consolidation. Construction of all the relocated parking spaces was completed in early 2011. *Chapter 5, Ground Access to and from Logan Airport* describes how the parking consolidation will be managed in accordance with the Logan Parking Freeze. Bicycle racks were added in 2012.

Note: See Figure 3-6 for the location of airport parking projects/planning concepts.

Economy Parking Garage. Source: Massport.

Airport-wide Projects

Massport regularly plans and implements airport-wide projects/planning concepts such as those described in Table 3-7.

Table 3-7 Description and Status of Future Airport-wide Projects/Planning Concepts (December 31, 2011 through 2030)

Description	Status
1. Logan Airport Wayfinding System This project provides a comprehensive wayfinding system for Logan Airport facilities including terminals, terminal curbside, parking garages, and approach roadways including airport wide signage analysis and planning, development or design guidelines and graphic standards, and a master implementation plan for future projects.	The main project was completed with improvements to the wayfinding system ongoing. This project currently has no funding and is being implemented in phases as part of other projects as feasible.
2. The East Boston-Chelsea Bypass (Dedicated Airport Access Road) (EEA# 14661) This bypass was planned as a new roadway connection between Logan Airport and the Chelsea Street Bridge following an abandoned rail corridor. The dedicated Bypass roadway is for airport access only and is for commercial vehicles only. The Bypass roadway will provide a means to remove airport traffic (trucks, cargo vehicles, parking shuttles, taxis, transit buses, etc.) from the local road system. The Bypass road is expected to reduce congestion on local East Boston streets in the vicinity of Day Square, Eagle Square, and the Neptune Road corridor. The Bypass may also be used by MBTA transit vehicles.	An Environmental Notification Form (ENF) was filed in October 2010, and project construction began in 2011.The roadway was completed in November 2012 and the Bypass is now open**.** The road was named the "Martin A. Coughlin" Bypass Road for the late Martin A. Coughlin, a neighborhood activist who lobbied for a commercial road to reduce traffic congestion in Day Square.

Logan Airport in 2030

In 2030, Logan Airport is envisioned to be an efficient airport handling more aircraft and passengers within a modernized terminal system and ground access network. While the footprint of Logan Airport is constrained by its location with Boston Harbor on three sides and the East Boston community on the other, Massport will continue to use the available land in an effective and environmentally sound manner. Key features include consolidated parking, a streamlined bus and shuttle system, attractive landscaped buffers, leading edge stormwater management infrastructure, and internal improvements to the terminals, which make better use of existing space, enhance intra-terminal connectivity, and improve the security processing facilities. Massport does not anticipate any major changes to the airfield between 2011 and 2030 other than minor upgrades for safety and operational efficiency and routine maintenance (the Runway 33L RSA improvements were completed in November 2012 and the Runway 22R improvements will be completed by 2015).

Although no major roadway changes are currently planned, Massport will be advancing a series of curb infrastructure improvements that will improve operations, high-occupancy vehicle (HOV) access, curb utilization, customer service, safety, and the environment as well as reduce curb dwell times for Logan Airport beginning in 2013. With more passengers expected to be traveling to and from the Airport in 2030, the appropriate mix of HOV/shared-ride/transit services and parking strategies will be necessary to maintain acceptable levels of service on the airport roadways and terminal curbsides. Recent Massport ground access investments, such as the ConRAC, Unified Shuttle Bus Fleet, Green Bus Depot, Economy Parking consolidation, and the East Boston-Chelsea Bypass Road, were key steps in establishing conditions under which Logan Airport can accommodate some of the future passenger levels while minimizing traffic impacts on- and off-Airport.

Additional short- and long-term initiatives will continue to be explored as operating conditions evolve. For example, in 2013, Massport will evaluate further the long-term feasibility of the Silver Line pilot program, which offers free-fare boardings at Logan Airport. In addition, Massport plans to test new pricing and schedule initiatives for Logan Express in order to generate incentives for use of the popular scheduled bus service. Furthermore, Massport is exploring a proposal for formalizing a regional shared-ride van service agreement for Logan Airport. Longer-term initiatives will be evaluated in the context of an agency-wide planning effort, which is expected to be underway in 2013.

As further detailed in *Chapter 5, Ground Access to and from Logan Airport*, by the year 2030 Logan Airport could expect a peak parking demand that would exceed the current limit of commercial parking spaces placed by the Logan Airport Parking Freeze and the available on-airport spaces. Under constrained parking conditions, much of this travel demand to the Airport will be met through modes other than on-airport parking. The key challenge for Massport is to discourage growth in curbside drop-off/pick-up activity by private vehicles or taxicabs, since those often result in the most vehicle trips, greatest curb demand, and highest emissions. This will be done by encouraging growth in sustainable transportation modes, including public transit, HOVs, and shared-ride services. Massport's longer-range ground access strategy will carefully consider both the parking constraint and new HOV initiatives.

In 2030, Massport will remain committed to sustainability. Massport will continue to use and refine its Energy Master Plan, incorporate sustainable and renewable energy features on key infrastructure projects whenever possible, and use the Sustainable Design Guidelines and Standards to guide the construction and renovation of new and existing buildings. Through these measures, Massport will continue to reap environmental benefits in the areas of improved energy efficiency and renewable energy generation, materials reuse and recycling, enhanced stormwater management, and water conservation.

This Page Intentionally Left Blank

4

Regional Transportation

Introduction

This chapter places Logan Airport in the context of the New England region's transportation system and reports on the status of the region's airports in 2011. Massachusetts Port Authority's (Massport's) ongoing efforts to support an efficient regional air and surface transportation networks are discussed. Massport has developed updated passenger activity and aircraft operations forecasts for the airports which it manages, namely Logan Airport, Hanscom Field, and Worcester Regional Airport. Massport is considering a long-range planning horizon out to 2030. The planning forecasts for Hanscom Field are addressed under a separate report, the *Hanscom Field ESPR*. This chapter focuses on the current year and provides the status of long-range regional transportation planning efforts in the region which are relevant to Massport's three airports as well as the regional transportation network. This chapter specifically describes:

- Passenger and aircraft operations activity levels at the regional airports in 2011 including: Bradley International Airport (CT); T.F. Green Airport (RI); Manchester-Boston Regional Airport (NH); Portland International Jetport (ME); Burlington International Airport (VT); Bangor International Airport (ME); Tweed-New Haven Airport (CT); Portsmouth International Airport at Pease (NH); Worcester Regional Airport, Massachusetts (MA); and Hanscom Field (MA).
- Changes in airline service levels and other factors that have contributed to trends in regional airport activity.
- The status of current improvement plans and projects at the regional airports.
- Massport's initiatives and joint efforts with other transportation agencies to improve the efficiency of the New England regional transportation system.
- Regional long-range transportation planning efforts.

Key Findings and Status Update

Key findings and status updates for New England regional airports and the regional transportation system in 2011 and for future long-range planning efforts include the following:

- The total number of air passengers utilizing New England's commercial service airports, including Logan Airport, increased from 43.1 million in 2010 to 44.7 million annual air passengers. This represents an annual increase of 3.8 percent, which exceeds the overall average increase of 1.7 percent in the U.S. passenger market in 2011.[1] In comparison, the total number of air passengers utilizing New England's commercial service airports was 46.7 million in 2000 and 45.6 million in 2004. The decline in passenger traffic at the regional airports reflects the challenging operating environment facing U.S. airlines since the global economic downturn that began in 2008 and is consistent with the national trend at secondary and tertiary airports.

- The challenging airline operating environment has continued to affect smaller communities disproportionately. Within the region, Logan Airport passenger traffic grew considerably faster than air passenger levels at the other regional airports. Of the 44.7 million air passengers using New England's commercial service airports in 2011, 64.7 percent of air passengers (28.9 million) used Logan Airport compared to a low of 55.5 percent (22.7 million) in 2002. Despite the recent increases in Logan Airport's regional share, it remains well below a high of 73 percent in 1985.[2] Passenger levels at the regional airports increased by 1.1 percent (0.2 million) in 2011, compared to an increase of 5.4 percent (1.5 million) at Logan Airport. This trend reflects a slow recovery at the regional airports following the recent service cuts by legacy air carriers and low-cost carriers (LCCs) in these smaller secondary markets. Growth at Logan Airport has been driven by the continued expansion of LCC service, in particular, JetBlue Airways.
- Aircraft operations in the New England region increased by 2.1 percent, from 1.07 million operations in 2010 to 1.09 million operations in 2011. Commercial airline operations remained largely flat, increasing by 0.8 percent (4,932 operations), while general aviation (GA) increased by 4.3 percent (17,827 operations) due primarily to a recovery in GA activity since the 2008/2009 economic recession. Military operations decreased by 1.4 percent (483 operations). While aircraft operations in the region increased slightly in 2011 compared to 2010, aircraft operations have declined significantly since 2000. Total regional aircraft operations fell by nearly one third, from 1.6 million in 2000 to 1.1 million in 2011.
- On July 1, 2011, the State of Connecticut established the Connecticut Airport Authority (CAA) with the goal of transforming Bradley International Airport and the state's five general aviation airports (Danielson, Groton/New London, Hartford Brainard, Waterbury-Oxford, and Windham airports) into economic drivers for the state.
- Massport continued to engage in metropolitan cooperative planning efforts including GreenDOT, the Healthy Transportation Compact,[3,4] and the Boston Metropolitan Planning Organization (Boston MPO).
- Massport is participating in the development of the Massachusetts Department of Transportation's (MassDOT) first statewide strategic multi-modal, long-range transportation plan known as *weMove Massachusetts*.[5] The goal of *weMove Massachusetts* is to build action-oriented policies based on stakeholder feedback to implement priorities for the present and future needs of the Massachusetts transportation system.
- Massport is cooperating with MassDOT's efforts to expand Boston's South Station to meet the current and future demand for rail mobility within Massachusetts and along the Northeast Corridor.
- MassDOT and the other New England state transportation agencies are collaborating with the Federal Aviation Administration (FAA) on the *New England Regional Airport System Plan – General Aviation* study to provide an understanding of general aviation airports, infrastructure and capital needs for the New England region.

1 Airports Council International, 2011 Worldwide Air Traffic Report.
2 Based on airport passenger statistics from 1985 to 2011.
3 Massachusetts Department of Transportation, www.eot.state.ma.us/default.asp?pgid=content/releases/pr060210_GreenDOT&sid=release, June 2, 2010.
4 Massachusetts Department of Transportation, www.massdot.state.ma.us/main/healthytransportationcompact.aspx.
5 Massachusetts Department of Transportation, Office of Transportation Planning. http://www.massdot.state.ma.us/wemove/ (Accessed November 2012).

New England Regional Airport System

As shown in Figure 4-1, the New England region is anchored by Logan Airport, serving a major international gateway and domestic origin-and-destination market, and a system of 10 commercial service, reliever and GA airports[6] (regional airports); together, these 11 airports accommodate nearly all of New England's air travel demand. The regional airports range in activity levels from the Bradley International Airport, which served 5.6 million commercial passengers in 2011, to Hanscom Field, which handled 6,500 charter passengers in 2011.

Figure 4-1 New England Regional Transportation System

6 The *New England Regional Airports Air Passenger Service Study* (FAA, 1995) defined the Bradley International, T.F. Green, Manchester, Portland International Jetport, Bangor, Burlington, Worcester Regional and Tweed-New Haven Airports as the region's principal commercial airports, other than Logan Airport, since all of these airports either supported or had previously supported commercial jet passenger services. Subsequently, in 1999, limited commercial passenger service was introduced at Hanscom Field and at Portsmouth International Airport, though neither airport has been able to sustain commercial airline services over the long-term. These 11 airports are included in the New England Regional Airport System Plan (NERASP) Study, which was published in 2006.

Massport owns and operates two of the regional airports, Hanscom Field and Worcester Regional Airport, which both play important roles in the regional transportation system, as described below.

- Hanscom Field (BED) is located in Bedford, MA, approximately 15 miles northwest of Logan Airport, and is New England's premier facility for business/corporate GA. Hanscom Field serves as a GA reliever airport for Logan Airport, accommodating a variety of GA operations. In 2011, there were approximately 163,000 aircraft operations at Hanscom Field, over five times the number of GA operations that occurred at Logan Airport. In addition to its role as a GA facility, Hanscom Field has also accommodated niche commercial airline services in the past. However, Hanscom Field lost scheduled commercial service at the beginning of 2008 when Boston-Maine Airways discontinued services to Trenton, NJ. Streamline Air, a public charter carrier, launched regularly scheduled flights at Hanscom Field in April 2011. Streamline provided scheduled charter flights on 30-seat turboprop aircraft between Hanscom Field and Trenton, but services were discontinued September 14, 2012.
- Worcester Regional Airport (ORH) is located in central Massachusetts, approximately 40 miles west of Logan Airport. Worcester Regional Airport is recognized as an important aviation resource that can accommodate both corporate/GA activity and commercial airline services. In 1995, Massport began collaborating with the City of Worcester, the Airport's then owner, to identify opportunities for increasing Worcester Airport's utilization in order to accommodate some of the regional demand that would otherwise use Logan Airport. Massport assumed operation of Worcester Regional Airport in 2000 and later acquired the Airport in June 2010. In 2011, aircraft operations at Worcester Airport totaled 46,700 operations, with GA accounting for 94 percent of aircraft activity. After losing commercial airline services in 2006 when Allegiant discontinued service, Worcester Regional Airport regained regularly scheduled charter service in 2008 with the entry of Direct Air. Direct Air served Worcester Regional Airport through 2011, flying to Myrtle Beach and other Florida destinations, but subsequently ceased all operations in March 2012. Massport is currently considering enhancing ORH's all-weather capability including upgrading the Runway 11 Instrument Landing Systems (ILS) from a Category I to a Category III system, and its associated taxiway infrastructure and navigation aids.

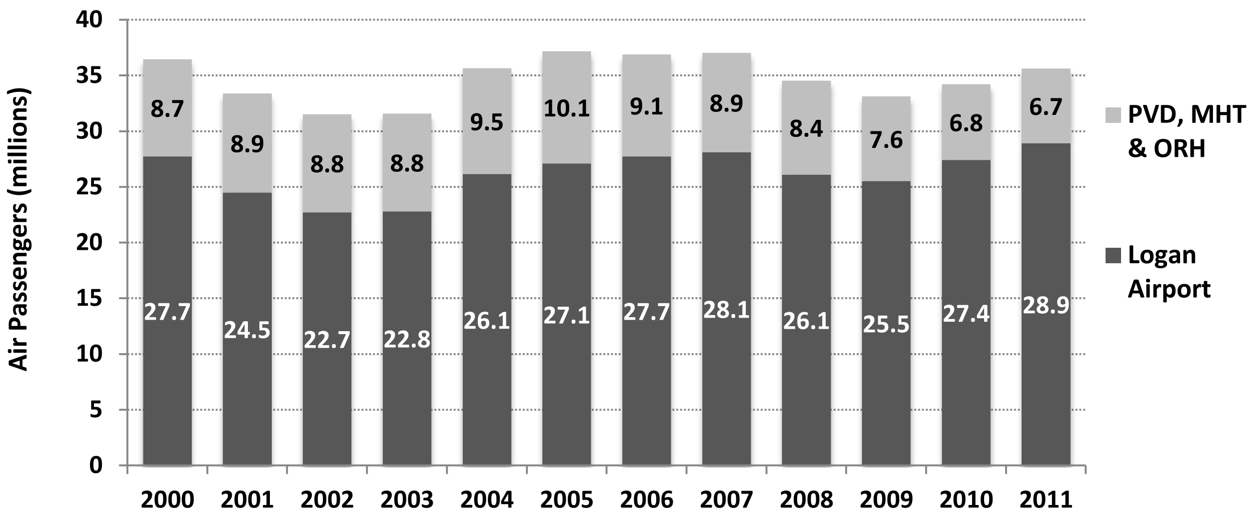
The regional airports that are closest to and have the greatest influence on passenger traffic and aircraft activity at Logan Airport are T.F. Green Airport in Warwick, RI and Manchester-Boston Regional Airport in Manchester, NH. These airports are in close proximity to Logan Airport and have overlapping market areas, providing convenient choices for some passengers in the Greater Boston Area and beyond. The New England Regional Airport System Plan (NERASP) Study, which was published in 2006, identified a high degree of cross-airport utilization within the Greater Boston airport system: Logan Airport, T.F. Green Airport, and Manchester-Boston Regional Airport. In effect, the three airports act as a system of airports, with significant numbers of passengers choosing the most convenient airport in terms of access, airfares, and available air services depending on their individual air travel needs.[7]

In the first half of the decade, the Central Artery/Tunnel construction project and high fares made Logan Airport less attractive for many air travelers in the Greater Boston area. T.F. Green Airport and Manchester-Boston Regional Airport were viewed as convenient alternatives to Logan Airport. Offering low-cost services on Southwest Airlines, these two airports captured an increasing share of the Greater Boston market. However, with the completion of major portions of the Central Artery/Tunnel project in 2004, as well as JetBlue Airway's entry and expansion at Logan Airport, the Airport has recaptured passengers from its core service area that were previously using the regional airports.

7 *New England Regional Airport System Plan,* Federal Aviation Administration, 2006.

Logan Airport is now well-positioned in terms of access, airfares, and available air services to meet the demands of the core Boston passenger market. Despite declines in airline services and passenger traffic, T.F. Green Airport and Manchester-Boston Regional Airport are also positioned to serve their own catchment areas. Even after the recent traffic declines, both airports accommodate considerably more passengers from their respective market areas than before the entry of Southwest Airline in the late 1990s. In 2011, T.F. Green, Manchester-Boston Regional, and Worcester Regional Airports served 18.8 percent (6.7 million) of the combined passengers (35.6 million) at the four Greater Boston market area airports, down from a high share of 28.0 percent (8.8 million) in 2002. The highest level of passengers accommodated by the three regional airports over the past 11 years was 10.1 million passengers in 2005. Figure 4-2 depicts the historical distribution of air passengers for these three regional airports and Logan Airport.

Figure 4-2 Passenger Activity Levels at Logan Airport and T.F. Green, Manchester-Boston Regional and Worcester Regional Airports, 2000-2011



Source: Massport and individual airport data reports.

In addition to Logan Airport and the regional airports discussed above, a third tier of airports serves isolated communities or provides niche commercial airline services in New England. These airports include: Hyannis Airport, Martha's Vineyard Airport, Nantucket Memorial Airport, New Bedford Regional Airport, and Provincetown Municipal Airport in MA; Augusta State Airport, Bar Harbor Airport, Rockland Airport, and Northern Maine Regional Airport in ME; Lebanon Municipal Airport in NH; Block Island State Airport and Westerly State Airport in RI; and Rutland Southern Vermont Regional Airport in VT. The third-tier airports support frequent commercial service to Logan Airport and, in some instances, T.F. Green Airport during the summer months. Most of these third-tier airports are not in close proximity to Logan Airport and are isolated due to geographic factors. Because of their remoteness and/or limited market areas, many of these airports are unlikely to attract passengers that now fly from Logan Airport. Instead, these airports are dependent on Logan Airport for connecting services.

Air Passenger Trends

The following section provides an overview of air passenger trends for the regional airports over the last decade.

Regional Airport Passengers

In 2011, New England's 11 commercial airports accommodated 44.7 million passengers. As shown in Table 4-1, total air passenger traffic at the New England airports increased by 3.8 percent, up from 43.1 million in the prior year. The growth in air passenger traffic in the region surpassed overall growth in the U.S. passenger market, which increased by 1.7 percent in 2011.[8]

The increase in the region's air passengers was driven by growth at Logan Airport, where passenger traffic grew by 1.5 million or 5.4 percent. Passenger traffic at the other regional airports grew slightly by 0.2 million or 1.1 percent in 2011. Consequently, the 11 regional airports' share of New England passengers decreased to 35.3 percent in 2011, compared to 36.3 percent in 2010 and 44.5 percent in 2002 (Figure 4-3). Despite the recent declines in regional airport passengers, the regional airports continue to accommodate a significant share of the region's passengers, up substantially from 31.3 percent in 1995 and 27.0 percent a decade earlier in 1985. The decline in passenger traffic at the regional airports reflects the challenging operating environment facing U.S. airlines and is consistent with the national trend at secondary and tertiary airports. The global economic downturn that began in 2008 resulted in a drop in passenger demand and widespread airline capacity reductions, particularly at the smaller regional airports. Airlines eliminated less profitable routes, cut frequencies in smaller markets, and reduced flying with small regional jets (RJs), which had become uneconomical to operate with sustained high fuel prices. While the majority of the service cuts were completed by 2010, airlines remained conservative with growth plans and did not increase overall capacity significantly at the regional airports in 2011.

8 Airports Council International, 2011 Worldwide Air Traffic Report.

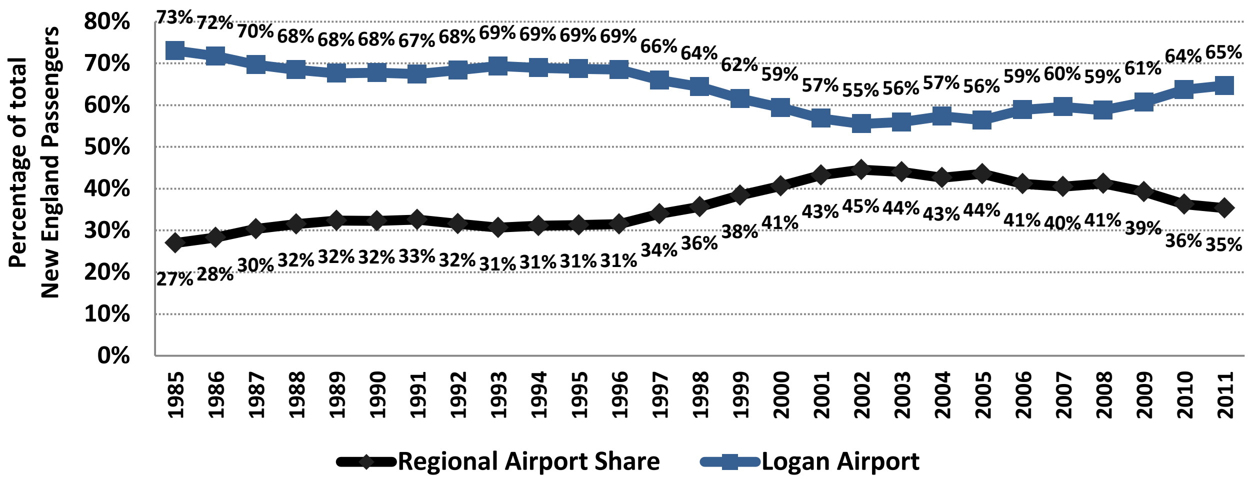
Table 4-1 Passenger Activity at New England Regional Airports and Logan Airport, 2000-2011

Airport	Passenger Levels (millions)[1] 2000	2001	2002	2003	2004	2005	2006
Bradley International	7.34	6.89	6.53	6.26	6.74	7.38	6.91
T.F. Green	5.43	5.53	5.39	5.18	5.51	5.73	5.20
Manchester-Boston Regional	3.17	3.23	3.36	3.60	3.97	4.33	3.90
Portland International Jetport	1.34	1.26	1.25	1.25	1.37	1.45	1.41
Burlington	0.90	1.04	1.10	1.10	1.25	1.37	1.37
Bangor	0.38	0.37	0.41	0.41	0.45	0.48	0.42
Worcester Regional [2]	0.11	0.13	0.07	0.00	0.00	0.00	0.03
Tweed-New Haven	0.08	0.06	0.04	0.03	0.08	0.13	0.08
Hanscom Field [3]	0.16	0.13	0.07	0.04	0.02	0.02	0.02
Portsmouth International [4]	0.07	0.06	0.07	0.06	0.05	0.01	0.04
Subtotal	**18.98**	**18.63**	**18.22**	**17.93**	**19.45**	**20.90**	**19.38**
Logan Airport	27.73	24.47	22.70	22.79	26.14	27.09	27.73
Total	**46.71**	**43.10**	**40.92**	**40.72**	**45.59**	**47.99**	**47.11**

Airport	Passenger Levels (millions)[1] 2007	2008	2009	2010	2011	Percent Change (2010-2011)	Avg. Annual Growth (2000-2011)
Bradley International	6.52	6.11	5.33	5.34	5.61	5.1%	-2.4%
T.F. Green	5.02	4.69	4.33	3.94	3.88	-1.5%	-3.0%
Manchester-Boston Regional	3.89	3.72	3.18	2.81	2.71	-3.6%	-1.4%
Portland International Jetport	1.65	1.76	1.73	1.71	1.68	-1.8%	2.1%
Burlington	1.41	1.52	1.43	1.30	1.30	-0.5%	3.4%
Bangor	0.40	0.35	0.37	0.39	0.43	10.3%	1.1%
Worcester Regional [2]	0.00	0.00	0.04	0.07	0.11	57.1%	0.0%
Tweed-New Haven	0.08	0.07	0.07	0.07	0.08	14.3%	0.0%
Hanscom Field [3]	0.02	0.00	0.00	0.00	0.01	-	-22.3%
Portsmouth International [4]	0.11	0.08	0.00	0.00	0.00	-	-
Subtotal	**19.10**	**18.30**	**16.49**	**15.63**	**15.81**	**1.1%**	**-1.6%**
Logan Airport	28.10	26.10	25.51	27.43	28.91	5.4%	0.4%
Total	**47.20**	**44.40**	**42.00**	**43.06**	**44.72**	**3.8%**	**-0.4%**

Source: Massport and individual airport data reports.
Note: Data for Logan Airport includes international and connecting passengers.
1 All passengers in millions. Passenger levels are enplaned plus deplaned passengers (where available) or enplaned passengers times 2.
2 Worcester Regional Airport served fewer than 5,000, but more than 0, passengers in 2005 and 2008.
3 Hanscom Field served fewer than 5,000, but more than 0, passengers in 2008.
4 Portsmouth International passenger numbers for 2005-2008 revised to exclude through passengers.

Figure 4-3 Regional Airports' Share of New England Passengers, 1985-2011



Source: Massport and individual airport data reports.

Continued passenger declines at airports such as Manchester-Boston Regional, T.F. Green, Portland International Jetport, and Burlington International Airport offset traffic improvements at other regional airports. Manchester-Boston Regional experienced the largest passenger decline among regional airports, with passengers decreasing by 0.1 million or 3.6 percent. T.F. Green passengers decreased by 0.06 million or 1.5 percent. Among regional airports with increases in air passengers, Bradley International Airport saw the largest growth in 2011. Passenger traffic at Bradley International Airport increased by 0.3 million or 5.1 percent due to service additions by JetBlue Airways, Southwest Airlines, and Delta Air Lines.

Aircraft Operation Trends

This section reports on recent aircraft operations trends for the regional airports, including passenger aircraft operations, GA operations, all-cargo aircraft operations, and aircraft load factors.

Regional Airports Aircraft Operations

As shown in Table 4-2, total aircraft operations in the New England region (including Logan Airport) increased by 2.1 percent, from 1.07 million operations in 2010 to 1.09 million operations in 2011. Logan Airport's total operations grew by 4.6 percent (16,344 operations) compared to 2010, due primarily to a recovery in GA activity. Aircraft operations at the regional airports increased by 0.8 percent, which was only a slight change from 2010 levels (5,932 operations).

Commercial operations in the New England region remained largely flat, increasing 0.8 percent from approximately 619,600 operations in 2010 to 624,500 operations in 2011. Commercial operations were up 0.8 percent at both the regional airports and Logan Airport. This reflects an end to the trend of commercial airline operation declines in recent years, brought about by the fuel spike in 2008 and the economic recession of 2008 to 2009. However, airlines continued to monitor and control capacity carefully in 2011 even as passenger demand showed signs of recovery. The same trend was seen across the nation. Total U.S. aircraft operations declined by 1.4 percent, while U.S. passengers increased by 1.7 percent in 2011.[9]

9 Airports Council International, 2011 Worldwide Airport Traffic Report.

GA operations increased at both the regional airports and Logan Airport in 2011. Total GA operations in the New England region increased by 4.3 percent. The recovery in GA operations at Logan Airport significantly outpaced the recovery at the regional airports in 2011. GA activity began to rebound at Logan Airport in 2010 following a steep decline during 2008-2009 due to high fuel prices and economic recession. Businesses increased their travel and use of GA transportation as the economy improved. GA operations at Logan Airport increased by approximately 13,550 operations or 92.3 percent; however, the 28,230 GA operations in 2011 remain below pre-2007 levels and the 35,230 GA operations peak in 2000. The regional airports saw an increase of 4,280 operations or 1.1 percent in GA activity. Military operations at the regional airports decreased by 1.4 percent in 2011.

GA operations continue to be the dominant type of aircraft activity at the regional airports. In 2011, GA accounted for 55.7 percent of total aircraft operations at the regional airports. In comparison, GA represented only 7.7 percent of aircraft activity at Logan Airport, which primarily accommodates the region's domestic and international commercial airline operations. Commercial airline operations accounted for 39.5 percent of total operations at the regional airports, compared to 92.3 percent of total operations at Logan Airport.

Overall, the regional airports accommodated a much greater share of the region's aircraft operations than their share of air passengers due to high levels of GA traffic. While only 35.3 percent of New England's air passengers enplaned or deplaned at one of the regional airports, these airports accounted for 66.1 percent of the region's aircraft activity. On average, there were approximately 22.0 passengers per aircraft operation at the regional airports compared to 78.3 passengers per operation at Logan Airport.

While aircraft operations in the region increased slightly in 2011 compared to 2010, aircraft operations have declined significantly since 2000. Total aircraft operations fell by nearly one third, from 1.6 million in 2000 to 1.1 million in 2011. There were similarly large reductions in all three categories of activity – commercial, GA and military. A number of factors have contributed to lower levels of commercial and GA aircraft operations including the immediate effects of the September 11, 2001 terrorist attacks, reductions in short-haul commercial airline flights following post-September 11, 2001 security changes, escalating and sustained high fuel prices, economic contractions and slower growth, a declining private pilot base, a shift to larger capacity commercial aircraft, and airline service reductions. Annual aircraft operations from 2000 to 2011 are provided in *Appendix F, Regional Transportation.*

Table 4-2 Aircraft Operations by Classification for New England's Airports, 2000, 2010 and 2011

	2000				2010				2011				
Airport	Commercial[1]	General Aviation[2]	Military[2]	Total	Commer-cial[1]	General Aviation[2]	Military[2]	Total	Commer-cial[1]	General Aviation[2]	Military[2]	Total	Share of NE Total
Bradley International	132,062	31,863	5,811	169,736	80,418	18,759	3,028	102,205	86,838	16,483	3,630	**106,95**	9.8%
T.F. Green	103,750	52,184	2,764	158,698	60,128	21,096	347	81,571	57,194	21,774	369	**79,337**	7.3%
Manchester-Boston Regional	61,506	45,740	586	107,832	53,971	13,636	933	68,540	51,379	12,497	874	**64,750**	6.0%
Portland International Jetport	47,609	56,571	2,072	106,252	35,035	24,776	446	60,257	35,157	21,453	533	**57,143**	5.3%
Burlington	45,745	59,377	10,24	115,363	29,538	36,106	4,776	70,420	29,166	42,562	5,890	**77,618**	7.1%
Bangor[3]	21,446	34,831	26,50	82,784	16,190	20,142	15,525	51,857	16,177	19,503	13,22	**48,900**	4.5%
Tweed-New Haven	5,260	56,200	328	61,788	3,201	31,884	381	35,466	3,367	33,919	310	**37,596**	3.5%
Worcester Regional	4,029	46,518	495	51,042	1,629	41,843	572	44,044	2,017	44,050	634	**46,701**	4.3%
Portsmouth International	6,104	31,601	9,973	47,678	1,516	25,674	7,707	34,897	1,717	27,056	8,158	**36,931**	3.4%
Hanscom Field	6,572	204,512	1,287	212,371	0	161,942	1,795	163,737	750	160,840	1,409	**162,99**	15.0%
Subtotal	**434,083**	**619,397**	**60,064**	**1,113,544**	**281,626**	**395,858**	**35,510**	**712,994**	**283,762**	**400,137**	**35,02**	**718,92**	**66.1%**
Logan Airport	452,763	35,233	0	487,996	337,961	14,682	NA	352,643	340,757	28,230	NA	368,987	33.9%
Total	**886,846**	**654,630**	**60,064**	**1,601,540**	**619,587**	**410,540**	**35,510**	**1,065,637**	**624,519**	**428,367**	**35,02**	**1,087,913**	**100.0%**

	Percent Change (2000-2011)				Percent Change (2010-2011)			
Airport	Commercial[1]	General Aviation[2]	Military[2]	Total	Commer-cial[1]	General Aviation[2]	Military[2]	Total
Bradley International	-34.2%	-48.3%	-37.5%	-37.0%	8.0%	-12.1%	19.9%	4.6%
T.F. Green	-44.9%	-58.3%	-86.6%	-50.0%	-4.9%	3.2%	6.3%	-2.7%
Manchester-Boston Regional	-16.5%	-72.7%	49.1%	-40.0%	-4.8%	-8.4%	-6.3%	-5.5%
Portland International Jetport	-26.2%	-62.1%	-74.3%	-46.2%	0.3%	-13.4%	19.5%	-5.2%
Burlington	-36.2%	-28.3%	-42.5%	-32.7%	-1.3%	17.9%	23.3%	10.2%
Bangor[3]	-24.6%	-44.0%	-50.1%	-40.9%	-0.1%	-3.2%	-14.8%	-5.7%
Tweed-New Haven	-36.0%	-39.6%	-5.5%	-39.2%	5.2%	6.4%	-18.6%	6.0%
Worcester Regional	-49.9%	-5.3%	28.1%	-8.5%	23.8%	5.3%	10.8%	6.0%
Portsmouth International	-71.9%	-14.4%	-18.2%	-22.5%	13.3%	5.4%	5.9%	5.8%
Hanscom Field	-88.6%	-21.4%	9.5%	-23.2%	-	-0.7%	-21.5%	-0.5%
Subtotal	**-34.6%**	**-35.4%**	**-41.7%**	**-35.4%**	**0.8%**	**1.1%**	**-1.4%**	**0.8%**
Logan Airport	-24.7%	-19.9%	NA	-24.4%	0.8%	92.3%	NA	4.6%
Total	**-29.6%**	**-34.6%**	**-41.7%**	**-32.1%**	**0.8%**	**4.3%**	**-1.4%**	**2.1%**

Source: Massport; FAA Tower Counts; FAA Terminal Area Forecast; individual airport data reports.
1 May include some Air Taxi operations by fractional jet operators. FAA Tower counts combine some fractional jet operations with small regional/commuter airline operations.
2 Includes itinerant and local operations at the regional airports. Military operations at Logan Airport are negligible and not included in Massport counts.
3 Updated 2010 operations for Portland International Jetport and Burlington provided by airports.
4 Commercial operations at Bangor include international aircraft making a technical stop.
5 Commercial operations at Hanscom Field include Streamline operations only; other air taxi operations included with GA.
NE New England

Airline Passenger Service in 2011

Airlines can adjust service at an airport or on a specific route in two ways: one is to change the number of flights operated, and the other is to change the size of the aircraft. Changes in flight frequency and changes in aircraft size both affect the number of seats available to passengers, also known as seat capacity. Airline services are therefore typically discussed in terms of seat capacity as well as the number of flight departures.[10] This section examines changes in airline departures and seat capacity at the regional airports in 2011 and provides an overview of new and discontinued routes.

Service Developments at the Regional Airports

In 2011, a total of 16 airlines provided scheduled passenger service from the 10 regional airports to 42 non-stop destinations.[11] Scheduled commercial services increased slightly overall at the regional airports. This marks an end to the steep airline service cuts seen in recent years, with high fuel prices and economic recession forcing carriers to eliminate or reduce frequencies on less profitable routes. The regional airports were all impacted by airline service declines in previous years and saw only a gradual beginning in recovery in service levels in 2011.

Table 4-3 shows the share of scheduled domestic departures for Logan Airport and the ten regional airports in recent years for the peak travel month of August. The regional airports accounted for 42.5 percent of the scheduled departures in the New England region in August 2011, seeing little change from 42.2 percent in August 2010. Overall airline capacity at the medium-size airports – Bradley International Airport, T.F. Green Airport, and Manchester-Boston Regional Airport – remained largely the same, while the smaller airports saw a slight increase in airline services in 2011. Details of scheduled passenger operations by market and carrier for the regional airports for the years 2000 to 2011 are presented in *Appendix F, Regional Transportation*.

Table 4-3 Share of Scheduled Domestic Departures – Logan Airport and the Ten Regional Airports, 2000-2011[1]

	2000	2001	2002	2003	2004	2005
Logan Airport, MA	54.8%	54.6%	50.9%	50.0%	52.4%	49.6%
Bradley International, CT; Manchester-Boston Regional Airport, NH; T.F. Green Airport, RI	29.8%	29.2%	32.5%	32.7%	33.9%	35.1%
Bangor, ME; Burlington, VT; Hanscom Field, MA; Portland International Jetport, ME; Portsmouth International Airport, NH; Tweed-New Haven, CT; Worcester Regional, MA	15.4%	16.2%	16.6%	17.2%	13.8%	15.3%
	2006	**2007**	**2008**	**2009**	**2010**	**2011**
Logan Airport, MA	52.8%	52.2%	53.5%	55.5%	57.8%	57.5%
Bradley International, CT; Manchester-Boston Regional Airport, NH; T.F. Green Airport, RI	33.6%	33.5%	32.3%	30.3%	29.5%	29.2%
Bangor, ME; Burlington, VT; Hanscom Field, MA; Portland International Jetport, ME; Portsmouth International Airport, NH; Tweed-New Haven, CT; Worcester Regional, MA	13.6%	14.3%	14.2%	14.2%	12.7%	13.3%

Source: Official Airline Guide Market Files.
1 For the peak travel month of August.

10 A departure is an aircraft take off at an airport. While aircraft operations include both departures and arrivals, airline services are typically described in terms of departures, as the number of scheduled departures generally equals the number of scheduled arrivals. Changes in departures translate to changes in overall operations.

11 Includes Allegiant Air, Direct Air, and Streamline. Allegiant Air serves Bangor with scheduled services to Sanford and St. Petersburg. Direct Air provided regularly scheduled charter service to Myrtle Beach, Punta Gorda, Sanford, and West Palm Beach from Worcester Regional Airport in 2011. Streamline provides regularly scheduled charter services between Hanscom Field and Trenton.

Bradley International Airport

Bradley International Airport in Windsor Locks, CT was the only medium-sized airport to experience some service increase in 2011. Expanded services to Florida accounted for a large part of the scheduled departure and seat capacity increases. JetBlue Airways, which began service at the Airport in November 2010, continued twice daily narrow-body service to Fort Lauderdale and Orlando in 2011. Southwest Airlines also maintained a new twice daily service to Orlando, introduced at the end of 2010. Other service increases included US Airways adding frequencies to its New York La Guardia turboprop service and Delta Air Lines' RJ service to Washington National, which was introduced in 2010. Scheduled seat capacity at the Airport increased by 6.6 percent compared to 2010.

T.F Green Airport

T.F. Green in Warwick, RI saw continued reductions in scheduled departures and available seat capacity by the majority of airlines at the Airport. The most significant cutbacks were implemented by Southwest Airlines, which discontinued Nashville service and reduced frequencies on its Baltimore, Orlando, and Philadelphia routes. Delta Air Lines, on the other hand, introduced some service increases in 2011 following its consolidation of operations at the Airport due to the Northwest Airlines merger. Delta Air Lines launched new RJ service to Washington National in 2011 and increased the aircraft size on its Atlanta route. Delta Air Lines also began RJ service to Raleigh/Durham in 2011, but discontinued the service later in the year. Overall scheduled seat capacity at T.F. Green Airport decreased by 4.3 percent. JetBlue Airways launched nonstop service from T.F. Green to Orlando and Ft. Lauderdale on November 29, 2012.

Manchester-Boston Regional Airport

Manchester-Boston Regional Airport also experienced significant cutbacks by Southwest Airlines, United Air Lines, and US Airways in 2011. Southwest Airlines discontinued non-stop service to Phoenix and also reduced scheduled frequencies on its Baltimore, Orlando, and Tampa routes. United Air Lines cut frequencies to Washington Dulles. US Airways also reduced frequencies and aircraft size in the Charlotte market. Scheduled seat capacity at Manchester decreased overall by 7.1 percent.

Portland International Jetport

Portland International Jetport (ME) experienced a modest recovery in airline capacity. Delta Air Lines increased the size of aircrafts serving the Atlanta market, replacing RJs with narrow-body MD-88s. US Airways also increased frequencies in the Philadelphia market. Overall scheduled seat capacity increased 3.9 percent at Portland International Jetport.

Burlington International Airport

Burlington International Airport (VT) also experienced a modest increase in airline capacity. Delta Air Lines increased the aircraft size in the New York JFK market, and Continental Airlines[12] increased the aircraft size on its New York Newark route. Overall scheduled seat capacity increased by 3.5 percent at Burlington International Airport.

Worcester Regional Airport

Worcester Regional Airport lost all commercial service in 2006 when Allegiant Airlines pulled out, but then regained regularly scheduled charter service by Direct Air at the end of 2008. Direct Air started at Worcester Regional Airport with service to Punta Gorda and Sanford in 2008. Seasonal service to Myrtle Beach and West Palm Beach was added in 2009 and 2010 respectively. Direct Air expanded services considerably in 2011, increasing departures by approximately 23 percent and growing seat capacity by 31 percent compared to 2010 levels. However, Direct Air discontinued all services in March 2012.

12 In 2012 Continental Airlines merged with United Airlines.

Bangor, New Haven, Portsmouth and Hanscom Airports

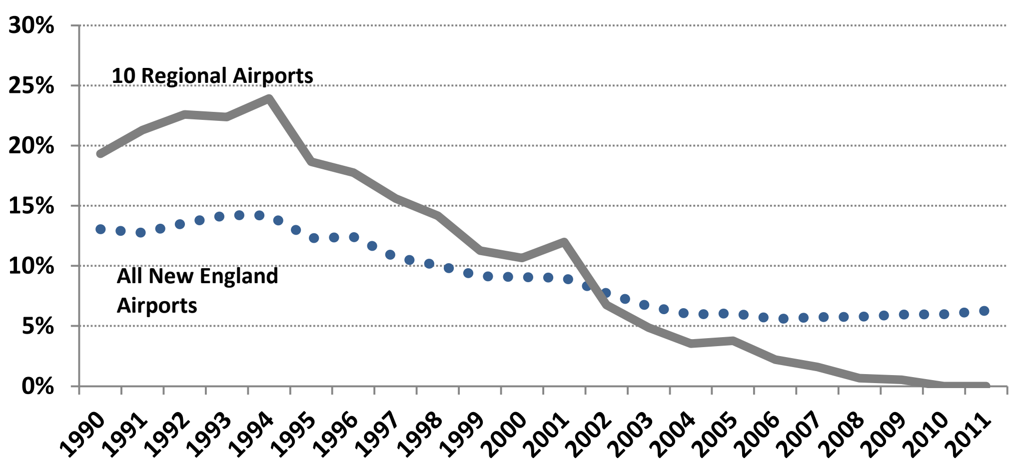
Among the other smaller regional airports, Bangor Airport (ME) was the only one to see a significant recovery of commercial service. Scheduled seats grew by 17.3 percent at Bangor Airport, with US Airways increasing frequencies in the Philadelphia market and Delta Air Lines also adding larger RJs on its New York La Guardia route. Tweed-New Haven Airport (CT) saw capacity on US Airways, the one carrier offering scheduled service, decline by 4.5 percent. Portsmouth International Airport (NH) and Hanscom Field (MA) both lost all scheduled service earlier in 2008 when Boston-Maine Airways discontinued service. In 2011, the public charter carrier, Streamline, introduced regularly scheduled charter service on turboprop aircraft from Hanscom Field to Trenton, NJ but this service was discontinued in September 2012. Portsmouth had not regained commercial passenger service as of 2011.

Regional Reliance on Logan Airport

Despite the service reductions at the regional airports in 2011, the trend of decreased reliance on connecting service through Logan Airport continued. Figure 4-4 shows that the share of flights between the regional airports and Logan Airport has been declining steadily since the mid-1990s. In the early 1990s, scheduled service to Logan Airport represented over 20 percent of regional airport flights. This share dropped as regional airports gained more non-stop service to both origin and destination (O&D) destinations and airline connecting hubs. In 2010, the last scheduled flights from the regional airports to Logan Airport were eliminated entirely. The significance of this trend is that it reduces pressure on Logan Airport to provide connecting service for small planes from small communities to other destinations, resulting in more convenient air service routings for passengers, and opening up capacity at Logan Airport for higher value intracontinental and international flights.

However, while service between the 10 regional airports and Logan Airport has been eliminated, other remote communities in New England continue to rely on Logan Airport for connecting services. Logan Airport acts as a connecting hub for a number of other New England airports, such as the Cape Cod and Island Airports. Logan Airport remains the sole commercial air service destination for some communities, such as Augusta, Presque Isle, and Rockland, ME, as well as Rutland, VT.

Figure 4-4 Share of Flights Originating at New England Airports with Logan Airport as Destination, 1990-2011



Source: Official Airline Guide Market Files (August for each year).
Note: Includes all New England airports with scheduled airline service.

Regional Airport Facility Improvement Plans

The following section describes significant airport improvements that are planned or under construction at the regional airports in the near future.

T.F. Green Airport

Planning for an airport-wide improvement program at T.F. Green Airport in Warwick, RI, including the proposed extension of Runway 5-23 to allow for non-stop service to the West Coast, is currently underway. The Draft Environmental Impact Statement (DEIS) was filed in July 2010 and the Final EIS for the T.F. Green Airport Improvement Program, was filed in July 2011. The FAA approved its Record of Decision (ROD) on September 23, 2011. In January 2013, the FAA published a final Written Re-Evaluation of the ROD, as project design and construction phasing changed since the ROD was issued. Extending the runway will enable the Airport to accommodate demand for long-range non-stop flights to the West Coast. Safety projects include improving the Runway Safety Areas at Runway 16-34 runway ends and resurfacing the runway, and demolishing Hangar No. 1 due to an air space penetration. Other enhancements include terminal and concourse expansion and parking and roadway improvements. Because of the potential environmental impacts associated with wetlands and community disruption, the FAA prepared an EIS to assess the proposed improvements.

The new InterLink facility near T.F. Green Airport, an intermodal transportation hub, opened on October 27, 2010. The InterLink serves multiple transportation functions, including: Rhode Island Public Transit Authority (RIPTA) bus service; Massachusetts Bay Transportation Authority (MBTA) commuter train service traveling between Warwick, Providence, and Boston; a consolidated car rental facility, and parking (for commuter rail service only); and a direct pedestrian link to the airport terminal. The rail platform is integrated with a consolidated rental car facility that houses airport rental car operations.

Manchester-Boston Regional Airport

Since the early 1990s, over $500 million was invested in Manchester-Boston Regional Airport to improve and develop landside and airside facilities and infrastructure. Projects included a 158,000 square foot passenger terminal, two 75,000 square foot terminal additions, a 4,800 space parking garage with an elevated pedestrian walkway connection to the terminal, roadway improvements, a new air traffic control tower, and extensive runway reconstruction and lengthening. Ongoing customer service enhancement initiatives have included the construction of a new cell phone lot in 2007 for motorists waiting to pick up passengers and various concessions improvements through 2008 and 2009.

Manchester-Boston Regional Airport completed an Airport Master Plan Update in 2011, an update to its previous 1997 Master Plan. The master plan update provides a blueprint for development and improvement of airport facilities and infrastructure through 2030. Upcoming projects focus on airfield pavement rehabilitation, terminal optimization, best use of landside property, and parking and roadway rehabilitation. Short-term project highlights planned for the next five years include:

- Highlander redevelopment site work associated with the demolition of the Highlander Inn and Conference Center located in the Runway Protection Zone of Runway 6
- Roadway and parking improvements
- Curbside enhancements
- Refurbishing and expansion of baggage claim equipment

- Terminal ramp replacement and taxiway rehabilitation
- Construction of a glycol collection/treatment facility
- Construction of a snow removal equipment storage building

The Manchester Airport Access Road project was completed in November 2011, providing a new exit and roadway off of the F.E. Everett Turnpike into Manchester-Boston Regional Airport. The two-mile access road provides better highway access to the airport, as well as access to 1,000 acres of prime industrial and commercial land near the airport for economic development.

Bradley International Airport

An eight-year, $200 million airport modernization project at Bradley International Airport was completed in 2010. Originally launched in 2000, the modernization project introduced a refurbished and expanded Terminal A with an additional 260,000 square feet new concourse, new ticket counters and waiting areas, major gate renovations, and a state-of-the-art security and communications system. A 28,000 square feet International Arrivals Building was also completed. Bradley International Airport is scheduled to start construction on a new Terminal B in 2012, which will include the addition of 22 domestic gates and two international gates.

In 2011, the Connecticut Airport Authority (CAA) was established to oversee the operation and development of Bradley International Airport. The CAA, a quasi-public agency consisting of an 11-member board, will manage day-to-day operations at Bradley International Airport, as well as at five GA airports in Connecticut. The goal of the CAA is to transform Bradley International Airport and the state's five GA airports (Danielson, Groton/New London, Hartford Brainard, Waterbury-Oxford, and Windham airports) into economic drivers for the state. Bradley International Airport was previously run by a board under the Connecticut Department of Transportation.

A three year-long renovation project for the airport hotel, the Sheraton Bradley Airport Hotel, was completed in 2011, featuring newly outfitted guest rooms, a redesigned lobby, and an expanded fitness center and pool. Current near-term capital improvement projects identified in Bradley's 2010-2013 Airport Strategic Plan include:

- Demolition of old Murphy Terminal and design of new terminal area;
- Associated roadway realignment and utility relocation for terminal redevelopment;
- Rehabilitation of Taxiways C North and C South; and
- Sound insulation program.

Hanscom Field

Massport has planned several airside and landside improvements at Hanscom Field, which are described in detail in the *Hanscom 2005 ESPR*[13] and the annual report on *The State of Hanscom*.[14] In Fiscal Year 2011, Massport invested approximately $3.7 million in airfield, terminal, and other facility improvements at Hanscom Field. The next Hanscom ESPR will evaluate 2012 conditions.

13 Massport. *2005 L.G. Hanscom Field Environmental Status & Planning Report* (2007).
14 Massport. *The State of Hanscom*, 2010.

In 2011, Massport received FAA AIP funds to reconstruct Taxiway S and a portion of the west ramp. The ongoing pavement reconstruction project is the one active AIP eligible project at Hanscom Field. Renovations to the Civil Air Terminal building, which began in 2010, continued in 2011. The installation of a new roofing system for the Civil Air Terminal, which included the installation of solar panels, was completed, and work on the installation of a new Access Control System for the Terminal and various airfield gates was started.

Solar Panels on Civil Air Terminal building. Source: Massport.

Other near-term airside improvements planned include relocation of perimeter roadways and ongoing approach and departure surface vegetation management. On the landside, Rectrix Aviation commenced work on the Hangar 24 facility demolition and construction of a new fixed-base operator (FBO) facility in the fall of 2012. As part of this project, a new fuel farm will also be constructed adjacent to the existing Jet Aviation fuel farm.

Worcester Regional Airport (ORH)

- Completed in 2008, the Worcester Regional Airport Master Plan was funded by the FAA and the former Massachusetts Aeronautics Commission (MAC). The Worcester Master Plan provided a strategic roadmap to guide airport development through 2020. Near-term projects focused on maintaining essential operations, safety and security functions and included runway pavement reconstruction, runway safety area upgrades, and a vegetation removal and maintenance plan. Long-term initiatives include upgraded corporate/GA facilities including a FBO facility and hangars, a new Airport Rescue and Fire-fighting Facility (ARFF) and ongoing runway and taxiway pavement rehabilitation. Various demand-driven projects including terminal enhancements and additional parking facilities were also identified; however, these projects depend on the level and type of future aviation activity realized at Worcester Regional Airport. Massport is currently pursuing enhancements to ORH's all-weather capability including upgrading the Runway 11 Instrument Landing Systems (ILS) from a Category I to a Category III system, and its associated required airfield infrastructure and navigation aids including taxiway improvements. This project is a safety and operational priority for the Airport.

The following near-term projects identified in the Worcester Master Plan were completed as of the end of 2011:

- Installed engineered materials arresting system (EMAS) on the Runway 29 End;
- Resurfaced 3,000 feet of Runway 11;
- Installed EMAS on the Runway 11 End; and
- Resurfaced 4,000 feet of Runway 29 and reconstructed Taxiway Delta.

Massport and third party developers have committed to invest in the following airside and landside improvement projects over the next few years:

- Installation of a new terminal roof and HVAC system;
- Airside and landside pavement rehabilitation;
- Rehabilitation of the existing ARFF station; and
- Rectrix Aviation is developing new FBO facilities including regional aircraft maintenance capabilities.

Long-term Worcester Roadway Improvements
In 2008, the Central Massachusetts Regional Planning Commission (CMRPC) initiated the Worcester Regional Mobility Study that was envisioned as a transportation plan with the goal of improvement of improving the movement of people and goods through the Greater Worcester Region. The final Study was released in May 2011. One of the Study's objectives was to improve ground transportation access between the regional roadways and Worcester Regional Airport within the context of an "economic development corridor" that could benefit other local businesses. Several alternative routes were identified and recommended for further study including a new interchange off the Interstate 90 in the vicinity of Route 56. The Study also assessed a range of alternatives to address regional mobility concerns and recommended thirteen roadway infrastructure improvement intended to reduce congestion, enhance regional mobility, and address existing interchange/intersection constraints. The study presented the recommended phasing and packaging of recommended alternatives into short-term (zero to five years), mid-term (five to ten years), and long-term actions (over ten years).

Near-term Worcester Directional Signage Improvement Program
CMRPC also supported Massport's goal to identify immediate actions for improving roadway access to Worcester through a signage improvement program. In collaboration with the MassDOT, the City of Worcester, Massport identified six primary routes now used by travelers to access Worcester. The team also developed a sign design and placement plan. The goal was to improve directional signage on these roads between Worcester and the Massachusetts Turnpike Pike and Interstate 290 by achieving the following objectives:

- To ensure that key decision points would be adequately signed;
- To reduce sign "clutter" by removing old and unnecessary signs; and
- To design and install new airport trailblazer signs consistent with Massport's and MassDOT's wayfinding standards.

MassDOT has installed the desired signs that were produced by the Massport Sign Shop. To date more than 80 signs have been installed including several signs on Auburn roads approved by the Town of Auburn in March 2011.

Regional Long-Range Transportation Planning

A balanced regional intermodal transportation network would reduce reliance on Logan Airport as the region's primary transportation hub and provide New England travelers with a greater range of viable transportation options. This section highlights efforts to achieve this balance through cooperative transportation planning at a broad array of transportation agencies and concerned parties to promote an integrated, multi-modal regional transportation network.

The unified MassDOT brought together many Commonwealth entities that plan, build, own, operate, and maintain all modes of transportation, under a five-member board of directors. (Massport remains an independent authority focused on airport and seaport needs with its own board of directors, including the Secretary of MassDOT.) The creation of MassDOT was intended to help integrate, coordinate, and prioritize multimodal transportation policy and investment in Massachusetts, resulting in a more effective, efficient, equitable, rational, and innovative transportation system. As a fundamental part of the transportation framework in the Boston metropolitan area, and for all of New England, Massport supports an integrated multimodal transportation policy to improve the efficient use of transportation infrastructure on both a metropolitan and a regional scale. In 2011, MassDOT continued to make strides in improving the existing transportation infrastructure by addressing structurally deficient infrastructure with innovative construction techniques, developing a comprehensive environmental responsibility and sustainability initiative, and continuing to invest in the Boston metropolitan area's rapid transit.

Logan Airport's functional role is New England's premier commercial airport, providing an essential and efficient connection between the New England states and the global economy. Recent studies have indicated that there is a serious lack of usable aviation capacity in the coastal mega-regions[15] (although not in Boston itself) and identify a need for access to alternative forms of short-distance travel across these regions.[16] Since the construction of a second major Boston airport has been judged impractical in the past, the potential of high-speed rail is increasingly being viewed as an important complementary component in the regional transportation system and aviation planning.[17] Given the comparable travel times, proximity of service to downtown Boston, and the potential for highly efficient electrified propulsion, high-speed rail could provide efficient intercity connectivity for city-pairs in a corridor up to 600 miles long, which would be competitive with air travel.[18] Boston's South Station is undergoing planning and design for expansion that would support the current and future rail mobility in Massachusetts and along the Northeast Corridor (NEC) including supporting future high-speed rail. In 2011, Amtrak services in the NEC had a 54 percent share of the Boston-New York City markets (excluding traffic by other surface modes such as private car and bus) (Figure 4-5).

Regional Aviation Economic Impact Study

The Aeronautics Division of MassDOT completed a wide-ranging economic impact study of the statewide airports system's (the 39 public use airports including Logan Airport) contribution to the economy of Massachusetts. The analysis found that Massachusetts public use airports generated $11.9 billion in total economic activity, including $4.9 billion in total annual payroll resulting from 124,369 jobs that can be traced to the aviation industry.[19] In particular, Massport's three airports are noted to make significant contributions to the regional economy generating approximately $10.3 billion or 87 percent of the overall economic benefits generated by the Massachusetts airport system.[20] Specifically, Logan Airport supported over 94,000 jobs in Massachusetts and the total economic impact is now estimated at approximately $8.87 billion per year.[21] Hanscom Field supported 11,765 jobs and a total impact of $1.4 billion while Worcester Regional Airport supported 418 jobs and a total economic impact of $51.5 million. Hanscom Field is particularly important for its function as an active military facility, which is aided by its proximity to Boston-area technology and research industry. For every $100 spent by aviation-related businesses, an additional multiplier impact of

15 The coastal mega-regions are the continuously urbanized areas along the east and west coasts of the U.S. (Washington, DC, Philadelphia, New York City, Hartford, Boston)
16 FAA: *Capacity Needs in the National Airspace system 2007-2025* (commonly referred to as FACT-2) and TRB: *ACRP Report 31: Innovative Approaches to Addressing Aviation Capacity Issues in Coastal Mega-regions.*
17 Transportation Research Board *ACRP 03-23: Integrating Aviation and Passenger Rail Planning*.
18 "Where High-Speed Rail Works Best" America 2050 - http://www.america2050.org/pdf/Where-HSR-Works-Best.pdf Page 1-2
19 Massachusetts Department of Transportation Aeronautics Division. *Massachusetts Statewide Airport Economic Impact Study Executive Summary*. (2011). Accessed January 4, 2011 <http://www.massdot.state.ma.us/portals/7/downloads/aero_economicStudy_111021.pdf>
20 Ibid.
21 Ibid.

$56 is created within Massachusetts according to the study. While the economic impact of the region's airports was the focus of the study, it also noted qualitative benefits of the state's airports including:

- Facilitating emergency medical transport
- Providing police support
- Supporting aerial surveying, photography, and inspection operations
- Conducting search-and-rescue operations
- Supporting the U.S. military and other government operations
- Providing youth outreach activities

Massachusetts Statewide Airport System Plan (MSASP)

The MassDOT Aeronautics Division completed the Massachusetts Statewide Airport System Plan (MSASP) in 2010. The MASP provides guidance to state policy makers for the long term development of the Commonwealth's airport system. It documents the status of the current airport system; provides a long term vision for the system; identifies system goals and related improvements; establishes priorities for system and airport funding; and provides supporting data and materials.

Boston and Statewide Long-term Transportation Vision

The Boston MPO developed a long-range vision for the region and its transportation network in 2035.[22] The vision described by the Boston MPO identifies the Boston metropolitan region as continuing to be an economic, educational, and cultural hub which will continue to contribute to the high quality of life. The high quality of life will be supported by a well-maintained transportation system consisting of safe, healthy, efficient, and varied options. The variety of transportation options will allow people to find jobs and services within easy reach of affordable housing, and will reduce environmental impacts thereby improving air and environmental quality. This vision is possible through attentive maintenance, cost-effective management, and strategic investment in the region's transportation system. This vision is broad-based; more specifically for the Airport, the long-range vision finds that support for air cargo is critical as the State Freight Plan[23] finds air freight shipping to grow more quickly than any other shipping mode.

Although the other New England states have statewide long-term transportation plans, Massachusetts currently does not. MassDOT is currently undertaking the Commonwealth's first statewide strategic multi-modal transportation plan known as *weMove Massachusetts*.[24] The philosophy behind *weMove Massachusetts* is that MassDOT needs to make logical, defensible, and smart choices on how to invest the agency's limited resources based on the articulated values. The goals of *weMove Massachusetts* are to engage stakeholders through a bottom-up approach as well as internal agency stakeholders in a discussion about the present and future needs of the transportation system, to build action-oriented policies based on stakeholder feedback that can serve as a bridge between MassDOT's values and investments, and to develop a forward thinking, data-driven, decision-making methodology to assist MassDOT in implementing its priorities transparently and measurably.

Massport is an active participant in the development of the Boston MPO long-range transportation plan and has a representative on the *weMove Massachusetts* Stakeholder Advisory Group.

22 Boston Region Metropolitan Planning Organization. *Paths to a Sustainable Region.* September 22, 2011.
23 Massachusetts Department of Transportation. *State Freight Plan*. September 2010.
24 https://www.massdot.state.ma.us/wemove/Home.aspx

Regional Cooperative Planning Efforts

Several regional transportation cooperation planning efforts are underway, as described below.

New England Regional Airport System Plan (NERASP)
In fall of 2006, the FAA New England Region, in concert with the New England Airport Directors and New England State Aviation Directors, completed the NERASP. The results of this study describe the foundation of a regional strategy for the air carrier airport system to support the needs of air passengers through 2020. To date, the development of that strategy has been instrumental in facilitating the investment and development of the primary commercial airport system in New England.

During preparation of the 2006 NERASP study, which analyzed the primary commercial airports in New England, the group recognized that a similar evaluation of GA would also prove useful. It would provide state aviation officials with a greater understanding of airport roles and infrastructure investment. Faced with the current struggling economy, rising airport and aircraft operational costs, declining operational activity, an aging infrastructure and with limited state and federal funds to address improvements, the importance of developing both a short-range and long-range perspective on the future performance of the New England GA airport system is clear.

New England Regional Airport System Plan – General Aviaton (NERASP-GA)
The New England state aviation officials, in partnership with the FAA, are currently conducting a study of the GA airport system in New England, including primary commercial service airports that service a GA component. This assessment of the New England GA airport system will provide state aviation officials with a common understanding of their state airport system in relation to the New England region as a whole. Assisted by this information, the FAA will be better positioned to make decisions regarding priority capital investments. Moreover, the NERASP study proved that the geographic boundary of the New England region, as well as its cultural identity, makes an overall study of New England an effective planning approach. Information on the NERASP-GA study can be found at http://www.nerasp-ga.com.

Conference of New England Governors and Eastern Canadian Premiers
The Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) is a formally established body that coordinates regional policy programs in the areas of economic development, transportation, environment, energy, and health, among others. The NEG/ECP focuses on aviation and intercity passenger rail, particularly in the northeastern coastal mega-region, as part of a larger transportation system that needs modal balance. Efficient use of this multi-state network affects the overall viability of the highway, aviation, freight, and commuter rail transportation networks that serve the region and the nation. Improved planning coordination between airports and intercity passenger rail services and related ground transportation offers the potential to achieve complementary investments in airport and rail capacity and services. MassDOT has a representative on the NEG/ECP Transportation and Air Quality Committee which covers regional transportation issues and infrastructure development, use, and efficiency. The NEG/ECP and other policy decision makers throughout the region have been able to utilize strategies and information developed in the NERASP, which provides a framework for integrated regional aviation policy and planning. This organization serves an important function to help achieve a greater balance between air, rail, and auto trips, and ultimately help to increase overall transportation capacity without overburdening Logan Airport and the New England aviation system.

In 2011, the NEG/ECP passed a resolution on transportation which provided direction on enhancing alternative-fuel vehicle infrastructure in the region, increasing multi-modal transportation options, and improving freight and passenger rail networks.[25]

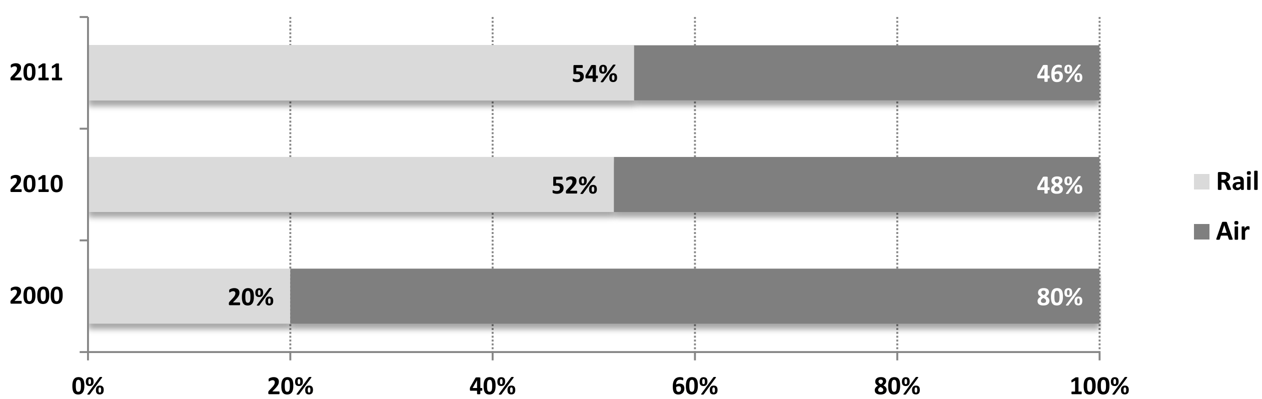
Regional Rail Transportation Initiatives

This section reports on recent developments and current rail service originating in Boston, the status of air-rail linkages in the Northeast Corridor, and the expanding Pilgrim Partnership, which provides commuter rail between Massachusetts and Rhode Island.

Amtrak Northeast Corridor
Amtrak's NEC is an intercity rail line that operates between Boston-South Station and Washington, DC via New York City. Other major destinations served by the route include Providence, RI; New Haven, CT; Philadelphia, PA; and Baltimore, MD. Logan Airport passengers can connect directly to Boston-South Station via Silver Line bus rapid transit (BRT) service or via taxi. Amtrak operates two services between Boston and Washington, DC: the Acela Express (high-speed, limited-stop service) and the Northeast Regional (lower-speed service that makes local stops along the route). Travel times on the Acela Express range from 3.5 hours from Boston to New York to just over 6.5 hours from Boston to Washington, DC. Travel times on the Northeast Regional range from about 4.25 hours from Boston to New York to approximately 7.75 hours from Boston to Washington, DC. A total of 19 daily departures are offered from Boston-South Station to Penn Station in New York, of which about half are Acela Express. Most trips continue south to Washington, DC, and a smaller number of Northeast Regional trains continue further south to Newport News, Virginia.

System-wide Amtrak ridership was 30.2 million one-way trips in Fiscal Year 2011. The NEC represented 36 percent (10.9 million) of total system-wide Amtrak ridership. In Fiscal Year 2011, the NEC carried 10.9 million passengers, an increase of 5.1 percent (0.5 million passengers) over the number of passengers in 2010 (10.4 million). Acela Express accounted for 3.4 million passengers, while the Northeast Regional accounted for 7.5 million passengers. Overall NEC ridership reached a new record in 2011, matching and surpassing the previous 2008 peak of 10.9 million passengers and up significantly from 8.4 million in 2000. Amtrak's share of the Northeast total passenger market has increased substantially since the introduction of Acela service in 2000. In 2011, Amtrak captured approximately 54 percent of the total air/rail market between Boston and New York, compared to 20 percent in 2000, as shown in Figure 4-5.

Figure 4-5 Rail-Air Market Share within the Northeast Corridor - Boston-New York City, 2000-2011



Source: Amtrak.

25 Conference of New England Governors and Eastern Canadian Premiers. Resolution 35-4, "Resolution Concerning Transportation". July 11, 2011.

Recent forecasts of Amtrak ridership along the NEC indicate that ridership could reach 17.4 million passengers in 2020, 26.2 million passengers in 2030, and expand to 43.5 million passengers in 2040. This forecast indicates that the substantially reduced travel times of high-speed rail transportation would become more attractive along the NEC.[26]

Northeast Corridor Infrastructure Master Plan and Next-Generation High Speed Rail Plan
The *Northeast Corridor Infrastructure Master Plan*, a new regional rail planning study, was released in May 2010. The Master Plan documents NEC growth needs through 2030, including expanded capacity and improvements in Boston-New York and New York-Washington intercity travel times. A 76 percent increase in rail ridership from 13 million to 23 million[27], a 36 percent increase in train movements from 154 average weekday to 210 average weekday, and the need for $52 billion in additional capital investment is expected over the next 20 years.

Following up on the release of the Northeast Corridor Infrastructure Master Plan, Amtrak also unveiled a Next-Generation High-Speed Rail proposal in September 2010 titled *A Vision for High-Speed Rail in the Northeast Corridor*. The proposal outlines a brand-new 426-mile two-track corridor running from Boston to Washington, offering high-speed rail service with sustained maximum speeds of 220 mph. The route would allow for an 84-minute trip time between Boston and New York and a three-hour trip time between Boston and Washington. Under this Next-Generation high speed rail plan, the New York City – Boston market would see a further shift from auto and air to rail due to the dramatic improvements in rail travel times, and projects the air market between the two city-pairs to be nearly eliminated by 2050.[28] This plan states that traveler's shift to high speed rail would reduce delays on competing modes (air and auto) and the shift away from shorter and smaller intraregional flights would free up air transport capacity for higher-value transnational and international flights.[29]

An update to the *Northeast Corridor Infrastructure Master Plan* and *A Vision for High-Speed Rail in the Northeast Corridor* was released in July 2012. Since these two documents were released, the two programs have been integrated into a single coherent service and investment program, called the Northeast Corridor Capital Investment Program. The Northeast Corridor Capital Investment Program would advance the near-term projects outlined in the Master Plan to benefit the NEC while incrementally phasing improvements to the Acela high-speed service to support the next-generation high-speed rail proposed.[30] The near-term NEC improvements are identified to occur between 2012 and 2025 and the long-term Next-Generation High-Speed Rail improvements are identified to occur between 2025 and 2040. The publication of the 2012 update is the first step in "improving the NEC for all users in order to sustainably support the population and economic growth facing the Northeast over the next 30 years" but considerable more planning work is required by all stakeholders.[31]

In 2011, the U.S. DOT awarded Amtrak and the New York State DOT $745 million for two high-speed rail projects on the Northeast Corridor. A major upgrade to tracks and overhead wires will be conducted along a 24-mile stretch in New Jersey, allowing for an improvement in Acela express train speeds from 135 mph today to 160 mph. Improvements to the Harold railroad interlocking in Queens, NY will also be completed, eliminating delays and reducing commuting time for Amtrak riders.

26 "The Amtrak Vision for the Northeast Corridor: 2012 Update Report." Amtrak. July 2012.
27 Includes ridership on Amtrak and state rail lines, but excludes ridership on commuter rail lines.
28 "A Vision for High-Speed Rail in the Northeast Corridor" Amtrak September 2010, Page 21.
29 Ibid.
30 "The Amtrak Vision for the Northeast Corridor: 2012 Update Report." Amtrak. July 2012.
31 Ibid. pg. v.

Boston-South Station Expansion
In support of the Northeast Corridor Capital Investment Program, MassDOT is currently designing and planning the expansion of the Boston-South Station to meet the infrastructure and capacity needs of the NEC. At present, South Station operates above its design capacity for efficient train operations and orderly passenger queuing. Operating with only 13 tracks, the current South Station constrains the current and future rail mobility within Massachusetts and through New England and the NEC.[32] The proposed expansion of South Station will result in the following benefits to rail mobility:[33]

- Improve the performance of existing and future high-speed and intercity passenger rail service to and from Boston. Today's NEC on-time performance is approximately 85 percent for Acela Express and 75 percent for Northeast Regional trains. The 2030 target for on-time performance is 95 percent for Acela Express and 90 percent for Northeast Regional. Without expanding South Station and its support facilities, not only will these targets be missed, but on-time performance will deteriorate even further in the future.
- Enable growth in high-speed and other intercity passenger rail service in the northeastern U.S., at a time when both the roadway and aviation networks are at or over capacity.
- Support sustainable economic growth and improved quality of life in NEC metropolitan areas, including Boston.
- Support a more attractive and increased MBTA Commuter Rail service, with associated benefits such as increased statewide transportation access, environmental sustainability, and improved personal mobility.

In order for the South Station track expansion to be implemented as currently conceived by MassDOT, the existing U.S. Postal Service (USPS) General Mail Distribution Facility located adjacent to South Station must be relocated. The USPS has undergone a national study of its facilities for streamlining and consolidation. While that process is still continuing, it is currently assumed that the USPS facility will remain in its current location and thus needs to be relocated for track expansion to occur. Massport has worked cooperatively with MassDOT, the MBTA and the USPS to identify a site on Massport property in South Boston that could be the recipient site of a relocated USPS facility should that become necessary.

Commuter Rail Services
The Pilgrim Partnership is an arrangement between the MBTA and the Rhode Island Department of Transportation (RIDOT), under which RIDOT allocates some of its federal funding to the MBTA in return for commuter rail service to Boston from Rhode Island. Sixteen daily round-trips are provided between Boston and Providence. Expanded commuter rail service to T.F. Green Airport in Warwick, RI was introduced in December 2010. Travel time between Boston and Warwick is approximately 1.25 hours, and 10 of the 16 daily Boston-Providence departures currently continue on to Warwick. Expanded service to Wickford, RI is commenced in 2012, with an eventual extension down to Kingston, RI also planned.

The extended commuter rail enhances ground access options from the Boston metropolitan area to T.F. Green Airport. The passenger catchment areas of T.F. Green Airport and Logan Airport overlap, and this new commuter rail service has the potential to attract passengers in the overlapping catchment area living along the Providence/Stoughton MBTA commuter rail line to T.F. Green Airport.

32 "Boston South Station High Speed Intercity Passenger Rail Expansion Project." Massachusetts Department of Transportation. August 6, 2010.
33 Massachusetts Department of Transportation. "South Station Expansion Project Website." http://www.massdot.state.ma.us/southstationexpansion/Home.aspx. Accessed August 2, 2012.

Other Regional Cooperative Planning Efforts

Recognizing that Logan Airport is a substantial trip generator and key transportation resource in the metropolitan area, Massport participates in several interagency transportation planning forums pertaining to enhancing a variety of travel modes.

GreenDOT

GreenDOT is a comprehensive sustainability initiative with three primary goals: reduce greenhouse gas (GHG) emissions; promote the healthy transportation options of walking, bicycling, and public transit; and support smart growth development. GreenDOT is MassDOT's policy mechanism to achieve the GHG reduction targets set out in the Executive Office of Energy and Environmental Affairs (EOEEA) GHG reduction plan enabled by the Global Warming Solutions Act of 2008. Massport is fulfilling the intention of GreenDOT by working to reduce GHG emissions associated with surface transportation to the Airport, and by providing more accommodations for walking, bike and public transit. MassDOT's mode shift goal is to triple the current mode share of bicycling, public transit, and walking, each by 2030. Massport supports GreenDOT's smart growth development goal by actively working to improve public transportation in the metropolitan area, a key component of smart growth principles (information on GreenDOT provided at www.massdot.state.ma.us/GreenDOT.aspx).

Massport has participated in an interagency Transportation Sustainability Committee organized by MassDOT, leading up to the development of MassDOT's GreenDOT Implementation Plan. The final GreenDOT Implementation Plan was completed in December 2012 and developed to serve as the framework for embedding the sustainability goals of GreenDOT into the core business and culture of MassDOT. The Implementation Plan captures current MassDOT innovations, leading sustainability policies of the Commonwealth, and national best practices and presents a guide to achieve the sustainability and livability vision of MassDOT.[34] The Implementation Plan identifies fifteen sustainability goals organized under seven sustainability themes: Air; Energy; Land; Materials; Planning, Policy & Design; Waste; and Water. These goals work towards decreasing resource use, minimizing ecological impacts, and improving public health outcomes from MassDOT's operations and planning processes.

Healthy Transportation Compact

The Healthy Transportation Compact interagency initiative brings together the state departments of Health and Human Services, Energy and Environmental Affairs, the Commissioner of Public Health, the MassDOT Highway Division and the MassDOT Rail and Transit Division with the intention of facilitating transportation decisions that balance the needs of all transportation users, expand mobility, improve public health, support a cleaner environment and create stronger communities. Actions include facilitating better accommodations for those with mobility limitations, increasing opportunities for physical activities, increasing bicycle and pedestrian travel through additional, safer and better connected bicycle and pedestrian infrastructure, a statewide complete streets policy, implementing health impact analyses for transportation decisions, and the federal Safe Routes to School program.

Massport activities at Logan Airport will support the Healthy Transportation Compact through its ongoing development of the Southwest Service Area and North Cargo Area. The projects include an improved pedestrian environment for employees, neighborhood residents and visitors. Streetscape improvements and new pedestrian and bicycle routes strengthen connections between the neighborhood, terminals, airport buffers, mass transit and the Harborwalk (a multimodal off-road path), Bremen Street Park and the Greenway Connector; as well as the Logan Office Center and the on-airport shuttle bus. Pedestrian actuated crossings are planned at signalized intersections along Harborside Drive and sidewalks provided along Harborside Drive,

34 "Draft GreenDOT Implementation Plan." Massachusetts Department of Transportation. June 2012.

Jeffries Street, and Porter Street. Midblock crossings or crosswalks at unsignalized intersections will consider street and pedestrian level lighting, as well as advanced warning signs and/or systems, as necessary. As described previously, bicycle access and parking is planned in secured locations for public and employee use.

Boston Metropolitan Planning Organization (Boston MPO)
Massport supports multimodal transportation planning and improving integration with its facilities through its permanent voting membership on the Boston MPO, providing input on policy and programming decisions.

MPOs are established in large metropolitan areas and are responsible for conducting a federally required cooperative, comprehensive, and continuous metropolitan transportation planning process. Based on this planning, MPOs determine which surface transportation system improvements will receive federal capital (and occasionally, operating) transportation funds. The Boston MPO´s mission is to establish a vision and goals for transportation in the region and then develop, evaluate, and implement strategies for achieving them.

Massport plays an active role on the MPO's decision-making board, participating in policy decisions related to the Long-range Regional Transportation Plan and project programming for the Transportation Improvement Program. The MPO also guides the work conducted by Central Transportation Planning Staff (CTPS) via its Unified Planning Work Program. CTPS is occasionally used by Massport to support its ground transportation planning initiatives.

Metropolitan Area Planning Council (MAPC)
Massport is also an ex-officio member of MAPC, which is a regional planning agency serving the people who live and work in Metropolitan Boston. The MAPC mission is to promote smart growth and regional collaboration, which includes protecting the environment, supporting economic development, encouraging sustainable land use, improving transportation, ensuring public safety, advancing equity and opportunity among people of all backgrounds, and fostering collaboration among municipalities. MAPC membership includes 101 municipal government representatives, 21 gubernatorial appointees, 10 state officials (including Massport), and three City of Boston officials. A staff of approximately 40 individuals supports the Council and its Executive Committee of 25 selected members. Massport is not currently an executive committee member.

Summary of Regional Long-Range Transportation Planning Efforts

The aim of regional transportation planning efforts is to reduce reliance on Logan Airport, and to provide New England travelers with a variety of viable transportation options. The NERASP study conducted in 2006 has helped to develop the primary commercial airport system in New England in order to support these benefits. Meanwhile, the NEG/ECP works to coordinate the highway, aviation, freight, and commuter rail transportation networks. Rail service such as the Amtrak Northeast Corridor and proposed improvements such as the Boston-South Station Expansion, also help to balance the passenger load among various forms of transportation. Other supporting planning forums include GreenDOT, the Healthy Transportation Compact, and Boston MPO.

This Page Intentionally Left Blank

5

Ground Access to and from Logan Airport

Introduction

This chapter describes Massachusetts Port Authority's (Massport) achievements in improving Logan Airport's connectivity by diversifying ground transportation options (for passengers and employees) and reducing reliance on automobile travel to and from Logan Airport. Multimodal connectivity is an important element of airport planning, design and operations, affecting the daily travel choices that passengers and employees make. Improving the multimodal connectivity of the Airport can provide environmental benefits by reducing greenhouse gas (GHG) emissions associated with travel to and from Logan Airport. Offering a range of multimodal transportation options also reduces transportation costs and improves customer service for air passengers, employees, and other Airport users.

This chapter reports on ground access to and from Logan Airport from the Boston metropolitan area. Ground access conditions in 2011 are compared to 2010 conditions, as well as forecast future conditions in 2030, the long-range planning horizon. The predicted vehicle miles traveled (VMT) at Logan Airport is based on the projected passenger activity levels in 2030. For further information on the development of the 2030 long-range forecast, refer to *Chapter 2, Activity Levels.*

Regional transportation efforts as they relate to the Airport and planning efforts to diversify transportation options in the New England region (primarily through commuter, passenger, and high-speed rail) are discussed in *Chapter 4, Regional Transportation.*

Key Findings

Highlights of ground access and surface transportation to Logan Airport in 2011 include:

On-Airport Transportation and Activity

- The total number of annual air passengers at Logan Airport increased 5.4 percent to 28.9 million, compared to 27.4 million in 2010. During the same period, average daily traffic on Airport roadways increased by 5.6 percent from 94,179 vehicles per day in 2010 to 99,449 vehicles per day in 2011. Even with almost a million additional passengers, traffic volumes remained lower than those experienced in the mid-decade years. In 2007, which was the most comparable year to 2011 in terms of overall Airport passenger activity levels in the last decade, the average daily traffic was 110,690 vehicles per day, or 10 percent higher than 2011 levels.[1]

- Massport began using an updated, more detailed, micro-simulation tool to model, calculate and analyze VMT on the Airport roadway system. The new model (VISSIM) calculated a VMT increase of 2.9 percent from 2010 to 2011. Using the previous model would have shown a 5.7 percent increase in VMT. This difference can be attributed to the new model having better calibration of on-Airport mode share among different users and reflecting more accurate roadway geometry.
- Similar to the trend in traffic volumes, VMT has shown an overall decline in comparison to the number of air passengers at Logan Airport. The average weekday VMT was 7 percent higher in 2007 than 2011 levels, although there were fewer air passengers using the Airport in 2007 (800,000 fewer in 2007 than 2011).[2]
- The number of vehicles that parked on-Airport (measured by the revenue parking exits) increased by nearly 4 percent from 2,582,453 in 2011 compared to 2,494,019 in 2010, but remained well below historic high levels. (In the past 12 years, the highest level was recorded in 2000 at 3,423,118 parked vehicles.) Massport was in compliance with the Logan Airport Parking Freeze throughout 2011.
- In March 2011, Massport completed construction of the Logan Airport Parking Deck Project, now known as the Economy Parking Garage. Located in the North Cargo Area (NCA) on the former Economy Lot 2, the garage allowed the consolidation of commercial overflow parking spaces at various locations into a single parking facility.

Ground Access Activity

- Massachusetts Bay Transportation Authority (MBTA) Silver Line bus boardings at the Airport continued to grow, increasing by over 8 percent in 2011, while Blue Line transit boardings at Airport Station remained relatively level compared to 2010. MBTA ridership on the Blue and Silver Lines has been increasing steadily over the past several years, increasing over 50 percent since 2007.
- 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 showed reduced dwell times and faster travel times through the terminal area, which resulted in extension of the free-fare program through June 1, 2013.
- In 2011, ridership on all types of water transportation to the Airport increased by about 3 percent in comparison to the previous year. However, ridership on the MBTA ferry has been decreasing steadily over the last several years. Overall ridership on water transportation has decreased 16 percent since 2007 with most of the ridership loss occurring on the MBTA ferry service, while there has been a slight increase in water taxi use since 2007.
- In 2011, air passenger ridership using Logan Express bus service increased about 1 percent compared to 2010 levels, whereas employee use of Logan Express increased by almost 15 percent, from 467,020 in 2010 to 536,513 employee passengers in 2011. Since 2007, there has been a decrease in air passenger ridership on Logan Express (147,921 fewer passengers or a 19 percent decrease). However, this has been counter-balanced by increased employee use (132,291 more employees or a 33 percent increase) keeping overall Logan Express ridership steady since 2007. Employee ridership now accounts for about 45 percent of the service's total ridership.

1 In 2007, there were 28,102,455 air passengers at Logan Airport, approximately 800,000 fewer than in 2011, in which there were 28,907,938 air passengers.
2 Comparison of 2007 and 2011 used the previous VMT model for year over year comparison accuracy.

- Limousine/shared-ride van ridership increased by an estimated 10 percent, and taxi dispatches increased 6 percent in 2011 compared to 2010. After showing some declines in limousine ridership during the Economic Recession of 2008/2009, it has since rebounded, showing an overall increase of 8 percent since 2007 levels.

Ground Transportation Mode Shares

- The *2010 Logan Airport Air Passenger Ground-Access Survey* indicates that share of high-occupancy vehicles (HOV) modes to the Airport has returned to 2004 levels (at 30 percent HOV mode share). This represents a 2 percent increase in HOV mode share from the levels reported in the *2007 Air Passenger Ground Access Survey*.
- Logan Airport continues to rank among the top U.S. airports with respect to HOV/transit/shared-ride mode share. It is useful to note, however, that there is no standard aviation industry definition with respect to categorizing ground access modes as HOV versus single-occupancy vehicle (SOV). While some modes (e.g., Logan Express and the Silver Line) clearly fall into the HOV mode category, the proper category of a limousine or taxi is less clear. For example, if Logan Airport ground access mode shares were recalculated using the same category definitions as are used by San Francisco International Airport (SFO), the Logan Airport HOV mode share would exceed 40 percent, ranking Logan Airport higher than SFO for HOV mode share.
- Moreover, many private passenger vehicles arrive at Logan Airport with several occupants. In fact, the 2010 survey indicates that 69 percent of private vehicles carried two or more air passengers, for an average of 2.3 air passengers per private passenger vehicle. Thus, to be consistent with current transportation planning practice, vehicle occupancy would serve as a more representative measure of ground access activity and mode choices. If access mode shares were defined based on occupancy rather than type of vehicle category, Logan Airport's HOV share of ground-access trips would be 71 percent.

2030 Vehicle Miles Traveled (VMT) Projections and Future Parking Demand

- Annual air passenger levels are predicted to increase 37.8 percent or to 39.8 million by 2030. A 20 percent increase in VMT is projected by 2030. This is compared to a nearly 9 percent decrease in VMT realized over the past 10 years (even as annual air passenger levels in 2000 and 2010 were about the same).
- Peak parking demand (the number of spaces needed to accommodate parked vehicles on the peak day of the year) at Logan Airport is already at practical parking capacity level. Thus, as air passenger levels increase, as suggested by the 2030 forecasts, Massport will not be able to accommodate the potential additional parking demand on-Airport with the existing Logan Airport Parking Freeze in place. Much of this travel demand to the Airport will have to occur via other modes. The challenge is how to influence a shift so that the passengers generating the excess parking demand are encouraged to use sustainable HOV transportation modes rather than increasing taxi or private vehicle drop-off and pick-up activity that would generate unacceptable levels of curbside congestion (and associated emissions). Recent analyses suggest that by constraining parking at Logan Airport, vehicle trips to the Airport would increase in the form of curbside drop-offs by taxis and private vehicles. This is a key planning issue that Massport will address in future airport-wide strategic planning efforts.

Methodology

The methodologies for collecting gateway traffic volumes and calculating VMT are described below.

Gateway Traffic Volumes

Gateway roadways are defined as access points to/from Logan Airport, which include the Route 1A roadway ramps, Ted Williams Tunnel (TWT) (Interstate 90) ramps, Frankfort Street/Neptune Road, and Maverick Street.

All of the Airport's gateway roadways are now equipped with permanent traffic count stations, as part of the airport-wide Automated Traffic Monitoring System (ATMS). These stations provide data to calculate:

- AADT, annual average daily traffic
- AWDT, annual average weekday daily traffic
- AWEDT, annual average weekend daily traffic

Since the data are collected continuously throughout the year, seasonal adjustment factors are only necessary when significant gaps in the data occur (typically due to equipment issues or construction activity). When seasonal adjustment factors are used, these are based on a combination of the seasonality (monthly variation) of counts from other ATMS stations, air passenger levels, and parking exits. On occasion, traditional automated traffic recorder (ATR) counts are collected to supplement the ATMS data.

Vehicle Miles Traveled (VMT)

VMT is calculated as the total number of miles traveled by all vehicles within the Logan Airport roadway system. VMT is an important metric because it is used to calculate motor vehicle air quality emissions, and it is one indication of the traffic levels on roadways within specific areas and at specific times.

VMT on Logan Airport has historically been calculated using a model that was developed for the Logan Airport roadway system that was in place in 1994. The VMT model functions by distributing current-year gateway volumes throughout Logan Airport based on historical volume and mode share data to estimate roadway volumes and, ultimately network VMT. A factor is applied to the AWDT VMT to determine AM peak hour, PM peak hour, and highest 8-hour VMT each year. The roadway infrastructure at the Airport and how vehicles travel through the Airport have changed substantially since 1994. With the introduction of new roadways, ramps, and destinations at Logan Airport and new VMT reducing strategies, adapting the original model to these changes has become more challenging. To take into account these changes, a new VMT (VISSIM)[3] model was used to estimate 2011 VMT; this model can be easily adapted to reflect changes in the evolving Logan Airport roadway transportation network.

Three years ago, Massport developed a microscopic traffic simulation model of the 2007 Logan Airport transportation network using VISSIM. The VISSIM model is reflective of evening peak hour traffic conditions. One of the benefits of using the VISSIM model over the previous VMT model is that the VISSIM model can be easily updated with new infrastructure configurations, traffic volumes, vehicle routing, and VMT reducing strategies. Given the changes anticipated for Logan Airport in the near-term and in the long-term, this model will greatly improve the accuracy of results and of future projections. Another benefit of using VISSIM to determine VMT is that the program can make judgments based on travel times,

3 PTV America. (2011). Verkehr In Städen Simulationsmodell- VISSIM version 5.40 [computer software]. Portland, OR.

congestion, and driver behavior to route vehicles through the network when historical data are not available for calibration. For example, this could show how a new traffic signal might change the flow of traffic in the network, or how a new taxi route could change travel times along a particular route.

The VISSIM model was developed for a larger study area than the original VMT model, which only focused on the major Airport gateways, the circulation roadways, and the terminal areas. The VISSIM model now accounts for a larger on-Airport study area from Lovell Street and the NCA to Harborside Drive and the South Cargo Area (SCA), and includes the Southwest Service Area (SWSA). The overall VMT growth due to the slightly larger study area is negligible. The study area of the VISSIM model roadway network can be found in *Appendix G, Ground Access*. The VISSIM model not only estimates VMT associated with curbside activity and parking, but also with Logan Airport operations, rental car activity, and hotel activity.

To deploy the VISSIM model to estimate 2011 VMT, updates were made to the mapped Logan Airport road network against which the model was calibrated. Since the development of the model, some destinations (such as the taxi pool) have been relocated, vehicle routes have changed, and volumes have grown. All of these changes were accounted for in the VISSIM model. The model was calibrated to existing PM peak hour volume data to improve the accuracy of the results. Similar to the VMT model, calibration factors were determined to calculate morning, highest 8-hour, and average weekday VMT from the updated VISSIM model. Tables provided in *Appendix G*, *Ground Access* compare existing and simulated traffic volumes at Logan Airport for the 2011 condition.

On-Airport Transportation in 2011

This section reports on Massport's monitoring and management of:

- Traffic conditions, including traffic volumes and VMT calculations for 2011
- Parking conditions, including parking supply and demand, parking rates and parking facilities
- Parking programs (including preferred parking for hybrid vehicles)
- Pedestrian and bicycle parking facilities updates.

Central to these components is Massport's leadership and commitment to developing, promoting, and providing alternative means of ground transportation for access to and from Logan Airport. The diverse range of environmentally-responsible transportation modes to access the Airport by air travelers, employees and other Airport users has reduced reliance on automobile travel, thus reducing traffic congestion and contributing to improvements in air quality.

Traffic Conditions (2011)

Figure 5-1 shows the roadway infrastructure at Logan Airport in 2011. Geometric improvements and modifications at four intersections began in the late fall of 2010 as part of the enabling projects of the SWSA Redevelopment/Consolidated Rental Car (ConRAC) facility project. These roadway changes were fully implemented in the spring of 2011 and are analyzed in *2011 ESPR*. The new, but temporary/relocated bus/limousine pool opened February 1, 2011, and is included in the 2011 VMT analysis.

Gateway Traffic Volumes

Table 5-1 summarizes the daily gateway traffic volumes at Logan Airport for the years 2000 through 2011. It includes annual average daily traffic (AADT), annual average weekday daily traffic (AWDT), annual average weekend daily traffic (AWEDT), and annual air passengers, for reference.

The AADT entering and departing Logan Airport via its gateway roadways increased by 5.6 percent between 2010 and 2011. This increase in average daily traffic can be attributed to:

- A 5.4 percent increase in air passenger activity in 2011;
- A 6 percent increase in taxi dispatches; and
- A 4 percent increase in parking activity (exits).

Although the highest passenger levels recorded since 2000 at Logan Airport were in 2011, the traffic volumes remain lower than those experienced in the mid-decade years with almost a million fewer passengers. In 2007, which was the most comparable year to 2011 in terms of overall Airport passengers in the last decade, the AADT was 110,690, or 10 percent higher than 2011 levels.

In May 2008, a card-access controlled gate was installed at the Maverick Street gateway to limit Airport-related vehicle traffic in the Jeffries Point residential neighborhood. Access through this gate is exclusively for registered East Boston residents. The analysis of gateway volumes and VMT characteristics continue to reflect this shift in traffic from local streets to Route 1A.

Vehicle Miles Traveled

Consistent with previous years, the following specific time periods were analyzed for 2011:

- Morning peak hour (AM Peak Hour);
- Evening peak hour (PM Peak Hour);
- Highest consecutive 8-hour (High 8-Hour); and
- Average AWDT.

Table 5-2 summarizes the VMT estimates for Logan Airport-related traffic from 2000 through 2011 using the old VMT model (for comparison purposes to previous years), and includes the new VISSIM model results for 2011. The VMT for Airport-related traffic increased by 5.7 percent in 2011 compared to 2010 as calculated by the old VMT model and 2.9 percent in 2011 compared to 2010 based on the new VISSIM model. This increase in VMT can be attributed to an increase in annual passengers at the Airport and a change in distribution of traffic volumes among the different gateways.

Similar to the trend in traffic volumes, VMT has shown an overall decline in comparison to the number of air passengers at Logan Airport. The most comparable year to 2011 in terms of overall Logan Airport passengers was 2007, however, average weekday VMT was 7 percent higher in 2007 than 2011 levels.

Details of the 2011 VMT modeling results are presented in *Appendix G, Ground Access*.

Figure 5-1 Logan Airport Roadway Network, 2011

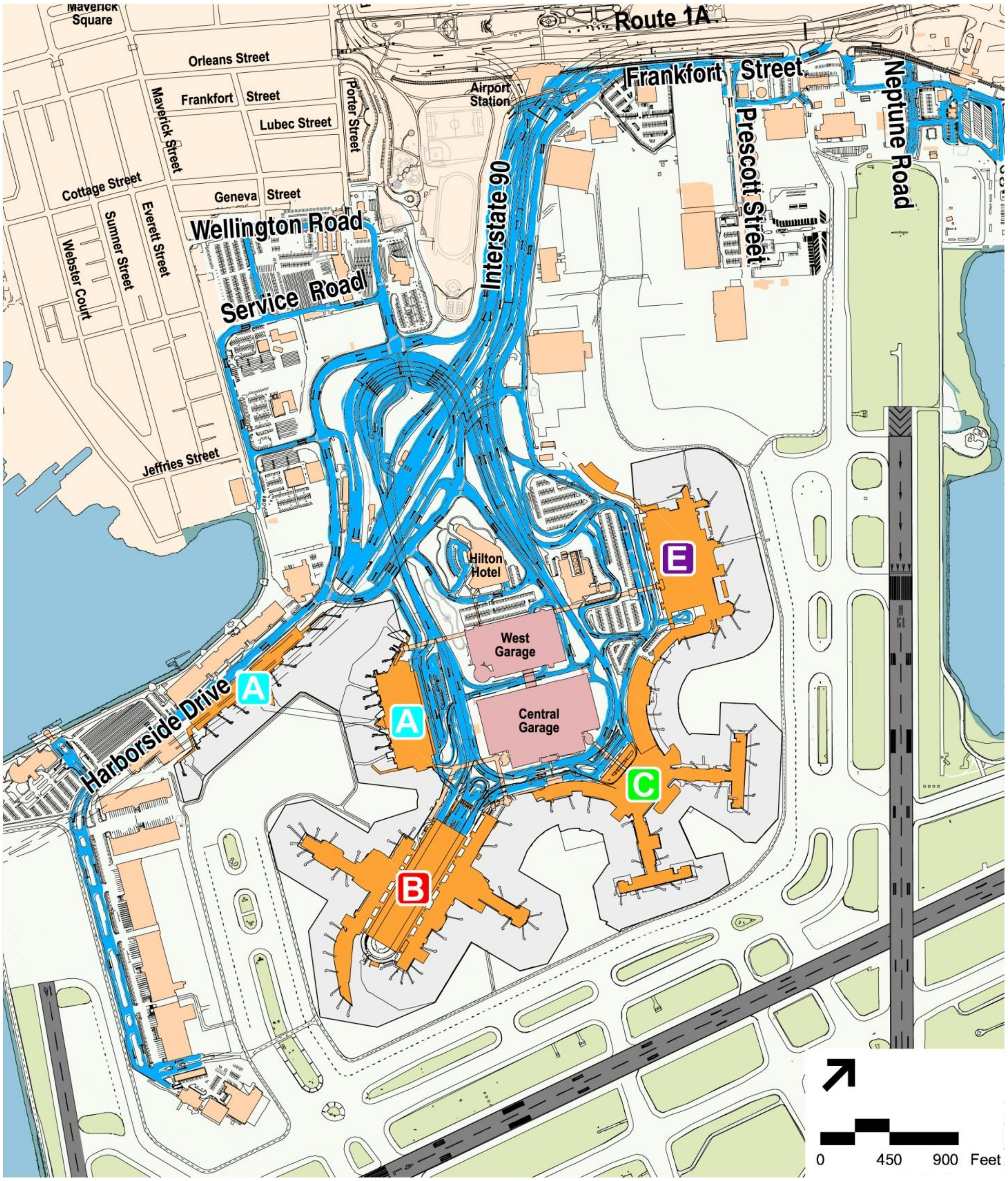


Table 5-1 Logan Airport Gateways: Annual Average Daily Traffic, 2000 - 2011

	AADT		AWDT		AWEDT		Annual Air Passengers	
Year	Volume	Percent Change	Volume	Percent Change	Volume	Percent Change	Level of Activity	Percent Change
2000	95,058	3.8%	101,446	3.9%	78,358	2.1%	27,412,926	1.3%
2001	86,811	(8.7%)	91,588	(9.7%)	74,911	(4.4%)	24,474,930	(11.7)%
2002	84,927	(2.2%)	89,731	(2.0%)	73,398	(2.0%)	22,696,141	(7.3%)
2003 [1,2]	88,978	4.8%	*93,680*	4.4%	*77,239*	5.2%	22,787,169	0.4%
2004	100,206	12.6%	106,278	13.4%	84,950	10.0%	26,142,516	14.7%
2005	106,000	5.8%	112,600	6.0%	89,400	5.2%	27,087,905	3.6%
2006 [3]	NA	NA	NA	NA	NA	NA	27,725,443	2.4%
2007	110,690	4.4%	119,200	5.9%	91,320	2.1%	28,102,455	1.4%
2008	96,187	(13.1%)	100,107	(16.0%)	80,797	(11.5%)	26,102,651	(7.1%)
2009	89,575	(6.9%)	93,670	(6.4%)	78,905	(2.3%)	25,504,845	(2.3%)
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%**

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.
NA Information Not Available.

Table 5-2 Airport Study Area Vehicle Miles Traveled (VMT) for Airport-Related Traffic, 2000 - 2011

Analysis Year	AM Peak Hour	PM Peak Hour	High 8-Hour	Average Weekday	Average Weekday Percent Change
2000 **(VMT model)**	11,213	13,252	85,823	178,798	3.0%
2001 **(VMT model)**	10,097	11,929	78,965	164,511	(8.0%)
2002**(VMT model)**	9,902	11,677	77,072	160,569	(2.4%)
2003 **(VMT model)**	9,426	11,035	74,405	155,011	(3.5%)
2004 **(VMT model)**	8,292	10,563	77,029	160,477	3.5%
2005 **(VMT model)**	8,477	10,998	80,240	167,166	4.2%
2006 **(VMT model)**	NA	NA	NA	NA	NA
2007 **(VMT model)**	9,594	12,304	88,614	184,613	10.4%
2008 **(VMT model)**	8,533	10,941	78,663	163,882	(11.2%)
2009 **(VMT model)**	8,098	10,379	74,612	155,442	(5.2%)
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 (New VISSIM model)	**8,391**	**10,978**	**76,920**	**167,647**	**2.9%**

Source: VHB and Massport.
NA Information Not Available

The overall reduction in VMT since 2000 reflects the success of the Logan Airport Modernization project in reducing on-Airport roadway trip lengths by improving circulation roadways and service improvements that have increased HOV/shared-ride mode share.

Parking Conditions

Massport manages the on-Airport parking supply at Logan Airport to: (1) promote long-term rather than short-term parking (thus reducing the number of trips to Logan Airport); (2) support efficient utilization of parking facilities; (3) provide good customer service; and (4) comply with the provisions of the Logan Airport Parking Freeze. Details are presented in the following sections.

In 2011, the Logan Airport parking supply underwent significant changes. Massport completed construction of the ConRAC enabling projects of the SWSA Redevelopment Program, which eliminated various surface parking lots that were used to accommodate overflow parking. In addition, Massport completed construction of the Economy Parking Garage by adding two structured levels to the former at-grade Economy Lot in the NCA, centralizing all Economy and overflow parking in one location. Meanwhile, continued rehabilitation of the Terminal B garage and roadways caused the temporary loss of terminal-area commercial parking spaces. All of the parking supply reorganization complied with the provisions of the Logan Airport Parking Freeze.

Logan Airport Parking Freeze

The number of commercial parking spaces allowed at Logan Airport is regulated by the Logan Airport Parking Freeze (310 Code of Massachusetts Regulations 7.30), which is an element of the Massachusetts State Implementation Plan (SIP) under the Federal Clean Air Act. As required, Massport submits semi-annual filings to the Massachusetts Department of Environmental Protection (MassDEP) demonstrating Massport's compliance with the Logan Airport Parking Freeze. The reports for March and September 2011 are provided in *Appendix G, Ground Access*.

The Logan Airport Parking Freeze sets an upper limit of commercial and employee parking spaces at Logan Airport. As permitted (and encouraged) by the Parking Freeze provisions, Massport has periodically converted employee spaces to commercial spaces, within the overall limit imposed by the Parking Freeze. Table 5-3 presents the total number of parking spaces permitted on-Airport and Massport's allocation of these spaces between commercial and employee spaces.

Table 5-3 Logan Airport Parking Freeze: Allocation of Parking Spaces

	Type of Spaces		
Year	On-Airport Commercial Spaces	On-Airport Employee Spaces	Total Logan Airport Spaces Permitted
1992 - 1994	12,215	7,100	19,315
1995 - 1997	12,890	6,425	19,315
1998 - 2000	14,090	5,225	19,315
2001 - 2006	15,467	5,225	20,692[1]
2007 - 2010	17,319	3,373	20,692
2011 - 2012	18,019	2,673	20,692
2012	18,265	2,673	20,938[2]

Source: Massport.

1 In 2000, the MassDEP and EPA approved an amendment to the Logan Airport Parking Freeze to permit the transfer of 1,377 spaces originally located in the East Boston Parking Freeze Area to the Logan Airport Parking Freeze Area.

2 In July 2012, Massport acquired property at 135B Bremen in East Boston, which supported 246 park-and-fly spaces that were in the East Boston Parking Freeze inventory. Massport's elimination of those park-and-fly spaces from the East Boston Parking Freeze Area led to a revised parking freeze inventory for Logan Airport and East Boston.

Parking Supply Changes
The parking supply at Logan Airport underwent significant changes in 2011, primarily because of two major activities: the Economy Parking Garage and the ConRAC program's enabling projects. This section describes the changes and Table 5-4 provides a summary of the parking allocation.

Parking Consolidation in the North Cargo Area (NCA)
In March 2011, Massport completed construction of the Economy Parking Garage, a two-level parking deck above the former surface parking lot in the NCA. The Economy Parking Garage allowed the consolidation of roughly 2,000 commercial parking spaces from various on-Airport overflow and temporary commercial parking lots into a single structured-parking facility, for a total of about 2,800 commercial parking spaces. The garage maintains on-Airport parking capacity in compliance with the limits imposed by the Logan Airport Parking Freeze[4] (refer to Table 5-4). The parking consolidation has resulted in significant customer service improvements, eliminated many labor- and cost-intensive overflow parking management operations, and provided environmental benefits of reducing automobile and shuttle bus VMT and associated air emissions. In addition, the egress from the facility was designed and constructed to prevent exiting vehicles on Prescott Street from heading north into East Boston via Frankfort Street and Neptune Road; instead traffic is directed to Airport service roads and the primary Airport exit roadways.

Management of the parking supply continues so as to ensure strict compliance with the Parking Freeze. In addition to the benefits listed above, the Economy Parking Garage has simplified the monitoring and reporting of the Parking Freeze compliance by accommodating more vehicles in the automated parking revenue control system.

Impact of ConRAC-related Construction on Parking Supply
In 2010, Massport began construction of enabling projects for a ConRAC in the SWSA. The continued ConRAC construction has removed parking at several overflow surface lots, including Lot B in the SCA (which closed for construction of the temporary taxi pool on August 2, 2010[5]), the Old Post Office lot (Lot 4) in the SWSA (permanently closed in early May 2011), and the "Sky Chefs" overflow lot in the North Service Area. Other overflow lots that were closed include the parking lot across from Wood Island Station (which is the temporary bus/limousine pool) and a parking lot/area off Lovell Street (currently being used for construction purposes). The former Gulf Station overflow parking lot, which was temporarily closed during the reconstruction of the Hotel Drive/North Service Road intersection, has been now re-opened with automated revenue control; it is now called Terminal E, Lot 3.

Managing Parking Supply and Ensuring Compliance with the Parking Freeze
The existing supply of parking spaces at the Airport is carefully managed throughout the day, with particular attention during the week's peak-days (typically Tuesday through Thursday), to ensure compliance with the Logan Airport Parking Freeze and to efficiently manage the available supply of parking spaces on the Airport. Massport staff use several methods to monitor and manage the parking supply including the on-going tally of parking garage entrances/exits and a physical count three times each weekday (which includes an overnight count and license plate inventory). The real-time monitoring of parking use allows Massport staff to open and close facilities as necessary.

4 In 2011, a total of 700 employee spaces (first 300, then 400) were converted to commercial spaces under the Logan Airport Parking Freeze, increasing the permissible inventory of commercial spaces to 18,019 commercial and reducing the inventory of employee spaces to 2,673.
5 Since April 4, 2011, the taxi pool has been located on Lot B. Changes in traffic flow associated with the relocation of the taxi pool are reported in this chapter.

As a result, at the start of each day, the Massport staff has a clear picture of the available parking supply and what measures to take later in the day. For example, during some periods of peak demand (or when normal capacity is reduced by construction or maintenance), other surface lots may be temporarily available for use by Massport for overflow parking. The use of overflow lots is not a desired practice because it is labor-intensive and revenue control occurs separately from the pay-on-foot system. As noted earlier, the full opening of the Economy Parking Garage has eliminated much of this practice, and the availability and use of overflow lots is now substantially diminished.

Table 5-4 Logan Airport Parking Freeze: Allocation of Commercial Parking Spaces, 2011-2012

Location and Facility	Number of Spaces		Status
	March 2011	March 2012	
Terminal Area			
Central Garage and West Garage	10,375	10,344	Minor changes
Terminal B Garage	2,380	2,632	Renovations completed; back to full capacity
Terminal E Lot 1	269	269	No change
Terminal E Lot 2	257	257	No change
Terminal E Lot 3 (Former Gulf Station Lot)	229	222	Restored the temporary loss of spaces that occurred in 2010. With the subsequent conversion from an overflow lot to a Terminal E lot, a few spaces were lost with the reconfiguration and installation of revenue control equipment.
North Cargo Area (NCA)			
Economy Lot 2	n/a	n/a	Closed for construction, June 2010
Logan Airport Economy Parking Garage	2,880	2,789	Design capacity.
North Service Area			
Sky Chef Valet Lot	0	0	Eliminated for construction purposes, November 2010
Southwest Service Area			
Former U.S. Postal Service Site	416	0	Eliminated for consolidated rental car facility (ConRAC) construction, May 2011
Vacant bus/limousine pool (temporary)	250	0	Briefly vacant and available in early 2011; eliminated for construction, May 2011
Total in-service revenue commercial spaces	**17,056**	**16,513**	Excludes hotel and general aviation (GA) spaces (noted below)
Signature Flight Support (General Aviation)	35	35	No change
Hotel (Hilton, Hyatt)	505	505	No change
Total in- service commercial spaces	**17,596**	**17,053**	Includes hotel and GA spaces
Total commercial spaces (freeze limit) [1]	**17,619**	**18,019**	Includes in-service and designated spaces

Source: Massport, Parking Freeze Inventory, March 2011 and March 2012.

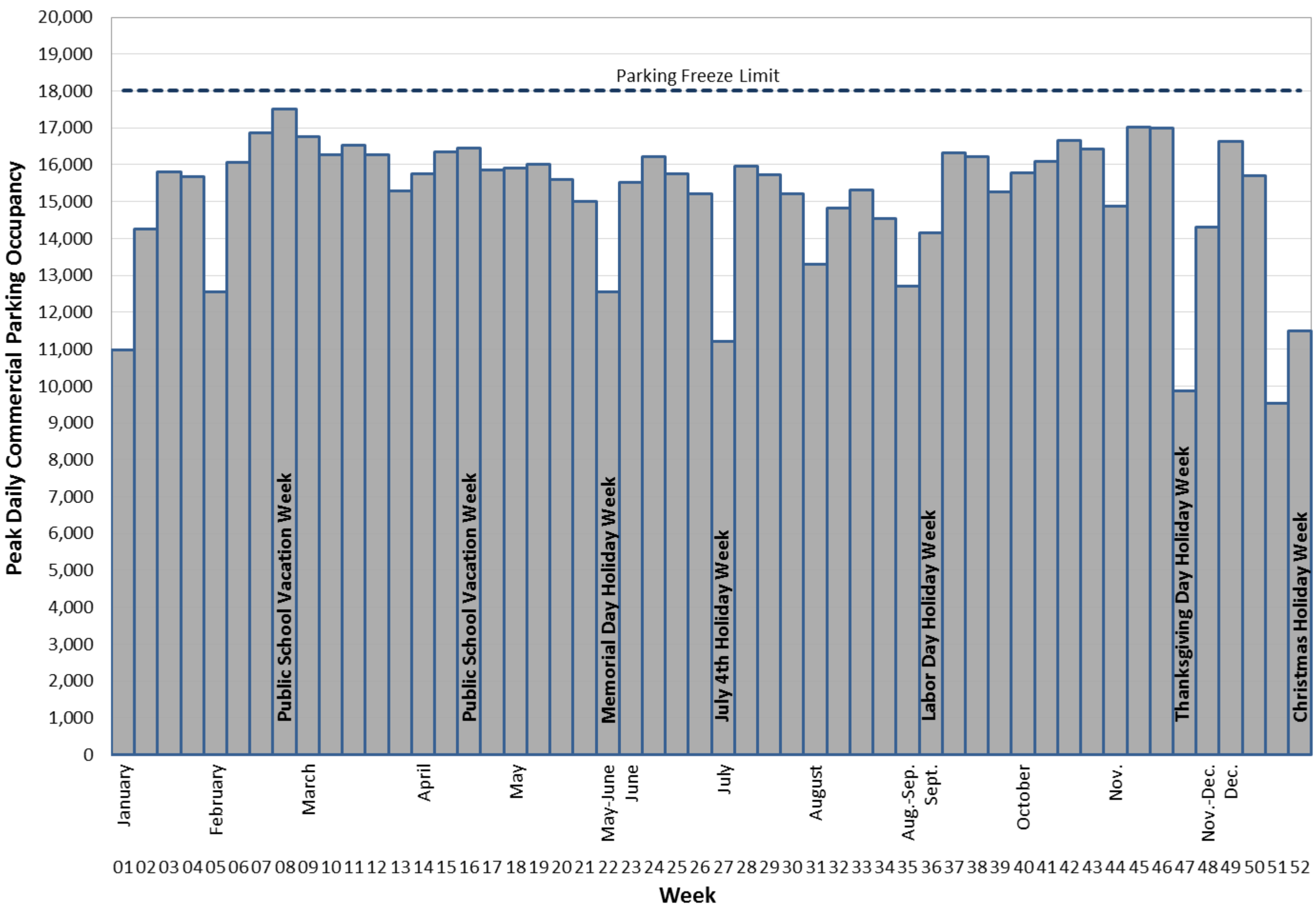
1 In 2011, a total of 700 employee spaces (first 300, then 400) were converted to commercial spaces under the Logan Airport Parking Freeze, increasing the inventory of commercial spaces to 18,019 commercial and reducing the inventory of employee spaces to 2,673.

In addition to the near-term, day-to-day management of the Logan Airport parking supply, Massport is engaged in efforts related to managing the parking supply in the long-term. Massport recognizes that these efforts must include additional or enhanced ground access services and facilities in order to handle the anticipated increase in travel (and parking) demand. Ground-access transportation strategies and initiatives are actively being explored, and are described later in the chapter.

Daily Parking Occupancy

On-Airport commercial parking occupancy typically peaks mid-week (Tuesday through Thursday) with lower occupancies occurring on other days. The number of vehicles parked at Logan Airport in commercial spaces over the course of any 24-hour period was obtained from count data for Tuesdays, Wednesdays and Thursdays throughout the year. The parking occupancy data are presented in Figure 5-2.

Figure 5-2 Commercial Parking: Peak Daily Occupancy, by Week, 2011



Source: Massport.
Note: The chart shows the highest daily count for each week in 2011.
The maximum number of commercial parking spaces permitted by the Logan Airport Parking Freeze is 18,019.
Most Massachusetts public schools had the following week-long school breaks in 2011: week 8, week 16, week 52. University breaks may differ. Columbus Day 2011 was during week 41. Thanksgiving 2011 was during week 47.

Parking Exits by Duration

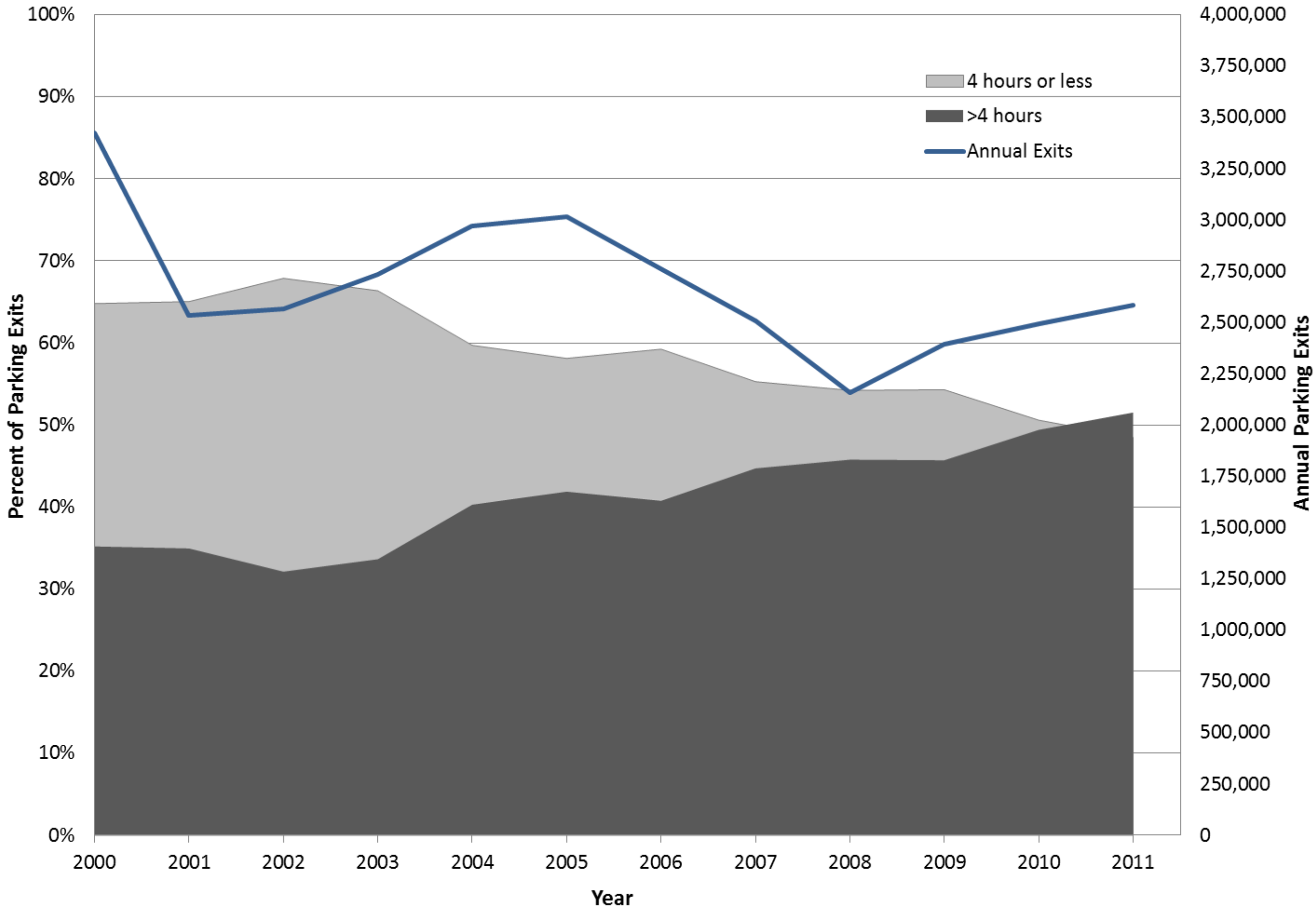
Total parking activity (as defined by revenue parking exits) increased nearly 4 percent between 2010 and 2011, as presented in Table 5-5. Notably, the distribution of parking exits by length of stay decreased for stays of up to four hours (Figure 5-3). This decrease occurred in both the number of exits in that category and as a share of all parking exits. In other words, in general vehicles were parked for longer durations during 2011. This increase in parking duration likely contributed to a lower turnover of parking spaces, and therefore resulted in the higher peak days as shown in Figure 5-2.

Table 5-5 Parking Exits by Length of Stay (Parking Duration)

		0-4 hrs.	>4-24 hrs.	>1-4 days	>4 days	Total
2000	Tickets	2,218,180	345,735	633,277	225,926	3,423,118
	Percent	65%	10%	19%	7%	
2001	Tickets	1,649,285	237,272	456,998	192,000	2,535,555
	Percent	65%	9%	18%	8%	
2002	Tickets	1,743,135	189,440	479,336	156,130	2,568,041
	Percent	68%	7%	19%	6%	
2003	Tickets	1,813,584	149,760	595,983	173,651	2,732,978
	Percent	66%	5%	22%	6%	
2004	Tickets	1,773,175	252,480	722,812	221,108	2,969,575
	Percent	59%	9%	24%	8%	
2005	Tickets	1,751,761	290,623	723,547	247,874	3,013,805
	Percent	58%	10%	24%	8%	
2006	Tickets	1,634,898	262,152	660,184	202,366	2,759,600
	Percent	59%	10%	24%	7%	
2007	Tickets	1,384,947	237,171	659,763	223,132	2,505,013
	Percent	55%	9%	26%	9%	
2008	Tickets	1,169,277	194,993	591,860	200,292	2,156,422
	Percent	54%	9%	27%	9%	
2009	Tickets	1,299,898	206,545	660,292	227,334	2,394,069
	Percent	54%	9%	28%	9%	
2010	Tickets	1,261,813	230,260	741,706	260,240	2,494,019
	Percent	51%	9%	30%	10%	
2011	**Tickets**	**1,251,956**	**235,039**	**800,188**	**295,270**	**2,582,453**
	Percent	**48%**	**9%**	**31%**	**11%**	
Percent Change (2010 to 2011)		**(0.8%)**	**2.1%**	**7.9%**	**13.5%**	**3.5%**

Source: Massport.

Figure 5-3 Percent of Parking Exits by Duration: Short vs. Long-Term Parking



Source: Massport.

2011 and 2012 Parking Rates

Massport establishes separate parking rates for the Airport's terminal area parking facilities and Economy Parking Garage, as detailed in Table 5-6. No changes to the rates were made in 2011, but new changes were made effective March 1, 2012.

Security restrictions on curbside parking and dwell times have made it necessary for Massport to establish parking rates for short-term parking to discourage curb pick-up and drop-off activity. Massport sets aside parking spaces specifically designed for this purpose and provides a free short-term parking lot known as the Cell Phone Waiting Lot (described in the next section).

With a pay-on-foot system, Massport encourages parking fees to be pre-paid at kiosks inside the terminals and garage access points at the pedestrian walkways, thus improving parking exit flow, and reducing vehicle idling and associated emissions at exit plazas. Pay stations are located in the terminals and at the pedestrian entrances to the Central Garage, Terminal B garage, and Terminal E parking lot. About 80 percent of parking patrons use the pay-on-foot system to pre-pay their parking fees.

Several off-Airport parking facilities, such as PreFlight Airport Parking in Chelsea, are privately owned and operated, and they are outside of the Logan Airport Parking Freeze area. Massport has no control over rates at off-Airport parking lots. The parking rates for the three major off-Airport parking providers (PreFlight, Park Shuttle & Fly, and Thrifty) vary from $13.50 to $18.50 for daily parking and from $81 to $105 for weekly parking.

Table 5-6 On-Airport Parking Rates, 2011 and 2012

Location	2011 Rate	2012 Rate	Location	2011 Rate	2012 Rate
Central Parking, Terminal B Garage, Terminal E Lots		*Effective as of March 1, 2012*	**Economy Parking**		*No change*
0 to 30 minutes	$3	$3	Daily Rate	$18	$18
31 minutes to 1 hour	$6	$6	Additional days 0 to 6 hours	$9	$9
1 to 1.5 hours	$9	$9	Additional days 6 to 24 hours	$18	$18
1.5 to 2 hours	$12	$12	Weekly Rate (6-7 days)	$108	$108
2 to 3 hours	$15	$17	More than 7 Days	$108 for 7 days + $18/each additional day	
3 to 4 hours	$18	$21			
4 to 7 hours	$22	$25			
7 to 24 hours (Daily)	$24	$27			
Additional days 0 to 6 hours	$12	$14			
Additional day(s) 6 to 24 hours	$24	$27			

Source: Massport
Note: 2012 rates are effective as of March 1, 2012.

On many weeks in 2011 and 2012, vehicles were diverted from a full Central Parking Garage to available spaces at the Economy Parking Garage or the Terminal E Lot 3. This primarily occurred on Tuesdays and Wednesdays, when the peak parking demand during the day exceed the availability of spaces in the terminal area. Early indications of mid-2012 activity suggest that peak-day demand has not dampened since the March 2012 parking rate increases for on-Airport parking; however, parking demand may have decreased for non-peak days, such as Fridays and Saturdays.

Cell Phone Waiting Lot

In late 2010, the Cell Phone Waiting Lot was relocated to the intersection of Hotel Drive and North Service Road (SR-2), in an area across the roadway from the American Airlines hangar.[6] The new lot was expanded from 50 to 61 spaces.

This parking lot provides a hassle-free waiting spot for drivers waiting for passengers on arriving flights. Before the creation of the Cell Phone Waiting Lot, drivers who were waiting for arriving passengers either used the short-term parking, circulated around the Airport, or dwelled at the curb until asked to move by State Police officers. Therefore, this facility reduces vehicle emissions by minimizing idling and VMT by such motorists. The maximum wait time permitted at this parking lot is 30 minutes and parking is free of charge.

Spot observations of the original cell phone lot revealed that the peak time of day for its use is typically late afternoon/early evening when the lot could be at 70 to 100 percent capacity. During peak holiday vacation periods, the lot was observed to be at capacity more frequently.

6 The original Cell Phone Waiting Lot opened in September 2007, with 50 parking spaces in an area of Lot B located off Harborside Drive.

PASSport Gold and Parking PASSport

Parking PASSport Gold and Parking PASSport allow users to enter and exit Logan Airport's parking garages and lots with an access card that is linked to an established account for faster payment transactions. Parking fees are automatically charged to a registered credit card and the receipt is emailed to the account holder. Customers in the Parking PASSport programs account for approximately 3 to 4 percent of parking exits at Logan Airport.

Massport offers guaranteed parking through its Parking PASSport Gold program. Thereby, Parking PASSport Gold eliminates the need for a motorist to circle the garage looking for available spaces. First implemented in 2006, the Parking PASSport Gold program had 5,782 customers as of December 31, 2011, compared to 4,565 at the end of 2010. About 8 percent of spaces in the Central/West Parking garage and 12 percent of spaces in the Terminal B garage are set aside for these customers.

Hybrid/Alternative Fuel Vehicle Preferred Parking

In the State's first preferred parking program for hybrid and alternative fuel vehicles (AFVs), Massport began offering preferred parking for customers driving hybrid and AFVs in the spring of 2007. Massport provides designated parking spaces at Logan Airport's Central Garage, Terminal B Garage, Terminal E surface lot, and Economy Parking.

Pedestrian Facilities and Bicycle Parking

Massport has made substantial progress in providing Airport-wide pedestrian access. Sidewalks along Harborside Drive and Hotel Drive connect to the terminals, where a series of overhead, enclosed walkways connect to the Central and West Parking garages as well as the Hilton Hotel. The sidewalks along Harborside Drive, Transportation Way, North Service Road, Maverick Street, and the Harborwalk facilitate pedestrian access to the Airport water shuttle boat dock, MBTA station and the pedestrian and bicycle pathways at Memorial Stadium Park, Bremen Street Park, and the East Boston Greenway.

Signs at Logan Airport encourage passengers to use alternative fuel vehicles whenever possible. Source: VHB.

Bicycle parking racks are provided at many landside facilities. Generally, these racks are expected to primarily serve employees, but are open for use by air passengers as well. Terminal A, the Logan Office Center, Signature General Aviation Terminal, and Airport Station all have bicycle racks. In 2012, bicycle parking racks were also added at Terminal E, the Economy Parking Garage, and at the newly constructed Green Bus Depot. The ConRAC facility, which is under construction, will also have bicycle parking racks for both employees and passengers.

Pedestrian and bicycle safety is further enhanced through the design of streetscape, intersections, lighting, and defined vehicle zones with new curbing, crosswalks, sidewalks, plantings and fencing. Bicycle connections are available around Airport Station, Memorial Park, Bremen Street Park, and the East Boston Greenway. Connections in the SWSA are planned that will allow employees and customers of the Airport to arrive via bicycle and park in a secure covered area within the new ConRAC garage. Commuters could then utilize the unified bus system or pedestrian connections to the terminals. In the North Service Area, connections to/from Bremen Street Park and the Logan Greenway Connector are under construction. These improvements will connect the existing shared-use path to a new, northern connector of the East Boston Greenway, which will be partially built by Massport (anticipated in 2013). Massport is also developing a Bicycle Plan for Logan Airport in order to identify the feasibility of multi-use paths and safe on-street routes for bicycle access to Airport buildings. When the study has been completed, these findings will be reported in the next *Environmental Data Report (EDR).*

Ground Access Modes: Ridership and Activity Levels in 2011

This section (1) provides an overview of transportation services available to Logan Airport users from the Boston metropolitan area, (2) reports on their 2011 ridership levels and historical trends, (3) notes the progress in meeting ground access goals, and (4) reports on Massport's cooperative planning ventures with other transportation agencies in Massachusetts.[7]

Figure 5-4 shows the distribution of ground access mode share for air passengers, as reported in the *2010 Logan Airport Air Passenger Ground Access Survey*. Logan Airport's HOV mode share is among the highest of any airport in the United States. Air passenger ground transportation modes to Logan Airport are divided into HOV/shared-ride and non-HOV/automobile categories, as follows:

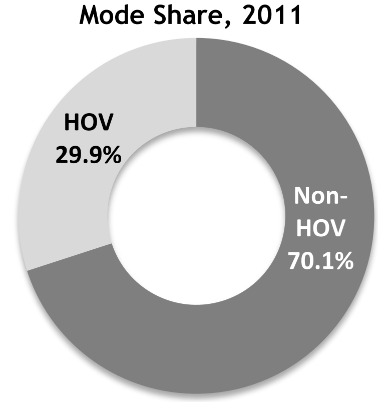
HOV (Shared-Ride) Modes:

- Public transit (Blue Line rapid transit, Silver Line bus rapid transit, bus, and water transportation)
- Logan Express scheduled bus service
- Scheduled buses and vans
- Courtesy shuttle buses
- Charter buses
- Unscheduled private limousines and vans

Non-HOV (Automobile) Modes:

- Private Autos
- Taxi
- Rental Car

Figure 5-4
Air Passenger Ground Access Mode Share, 2011



Source: 2010 Logan Airport Air Passenger Survey

HOV Mode Share Goal: 35.2% at 37.5 million annual passengers

While private automobiles, taxis, and rental cars often carry multiple occupants, they are not currently categorized as HOV modes.[8] Please refer to the *Ground Access Planning* section later in this chapter for further discussion of the Logan Airport HOV mode share goal.

7 For additional ridership figures, please refer to *Appendix G, Ground Access*.
8 The *2010 Logan Airport Air Passenger Ground Access Survey* indicates that the average occupancy of these automobile modes (private automobiles, taxis, and rental cars) is 2.1 persons per vehicle, indicating that Massport is somewhat conservative in the calculation of HOV/SOV split. The HOV mode share goal is based on modal categories and not on actual vehicle occupancy.

HOV/Shared-Ride Modes

Annual ridership levels for HOV/shared-ride transportation modes serving Logan Airport are summarized in Table 5-7. Figure 5-5 illustrates the public transportation options to access Logan Airport. The determination of Logan Airport's mode share (the percent of air passengers using a particular mode to access Logan Airport) is based on the results of a triennial air passenger survey.[9] The *2010 Logan Airport Air Passenger Ground Access Survey*[10] revealed a 29.9 percent HOV ground access mode share, up from 27.8 percent identified in the *2007 Logan Airport Air Passenger Ground Access Survey*. The *2010 Air Passenger Ground Access Survey* is discussed in further detail later in this chapter.

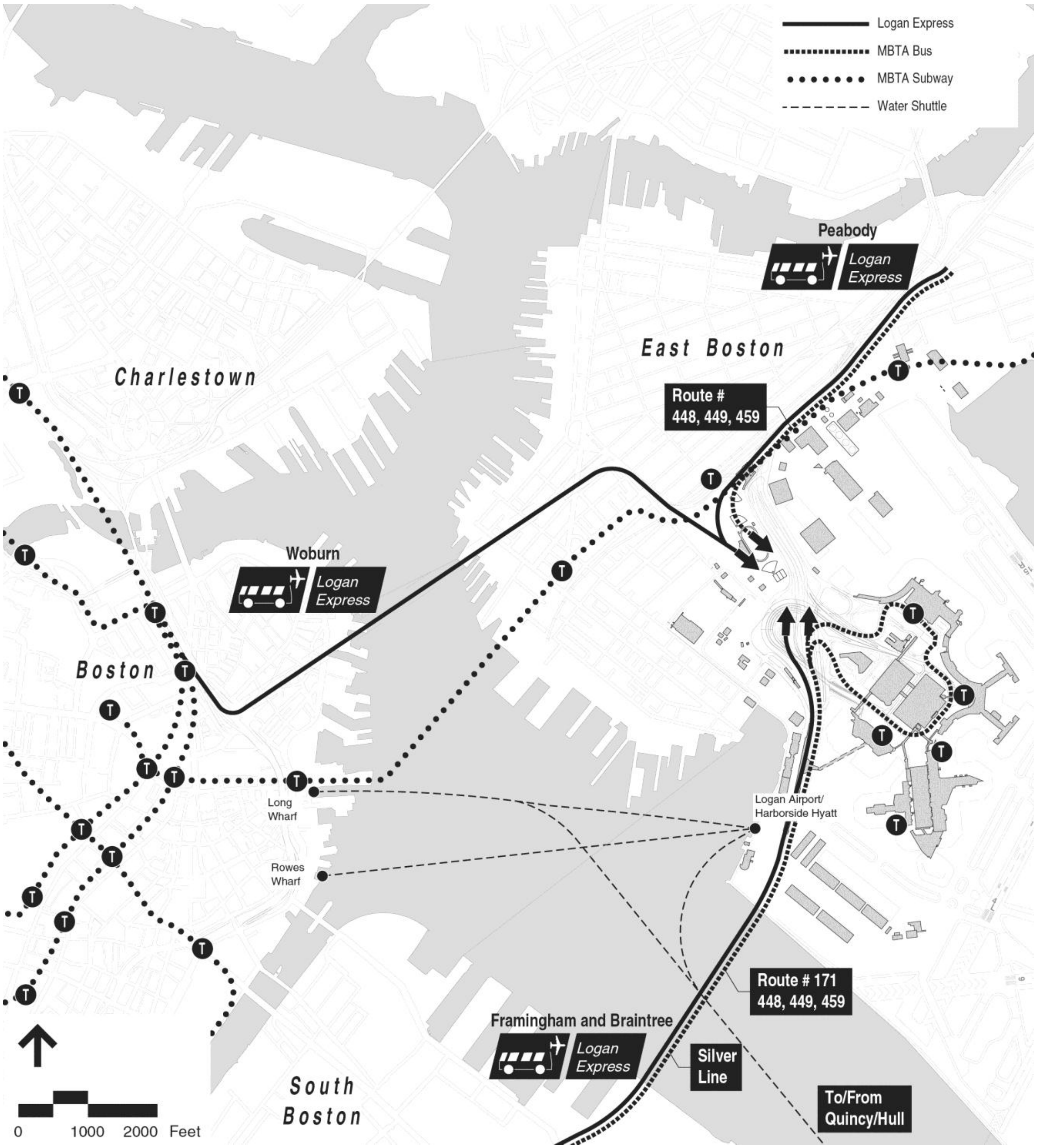
Table 5-7 Annual Ridership and Activity Levels on HOV/Shared-Ride Modes, 2000 - 2011

	MBTA Transit		Logan Express Bus			Water Transportation[3]			Scheduled and Unscheduled HOV	
Year	Blue Line[1]	Silver Line[2]	Air Passen -gers	Employ -ees	Total	MBTA Ferry [3]	Private Water Taxis	Rowes Wharf / Fan Pier Water Shuttle	Shared-Ride Vans/ Buses[4]	Limousine[5]
2000	1,518,789	NS	923,236	211,717	1,134,953	83,243	26,335	128,097	1,123,215	1,791,772
2001	1,457,190	NS	885,296	236,395	1,121,691	82,704	29,642	107,400	899,113	1,061,292
2002	1,343,475	NS	855,632	326,707	1,182,339	66,471	36,736	75,304	675,200	1,127,666
2003	1,300,272	NS	808,335	400,132	1,208,467	61,849	35,724	26,480	705,237	1,373,517
2004	1,375,632	NS	857,530	408,297	1,265,827	58,788	54,540	NS	761,320	1,448,581
2005	NA	254,608	837,530	397,660	1,235,190	51,960	44,975	NS	701,500	1,250,180
2006	NA	642,177	891,918	418,051	1,309,969	70,998	63,639	NS	775,640	1,591,361
2007	1,406,834	677,212	797,530	404,222	1,201,752	59,460	50,737	NS	NA	1,448,060
2008	2,212,111	709,905	688,673	432,761	1,121,434	48,003	48,630	NS	NA	1,385,317
2009	2,329,370	789,324	636,847	448,601	1,085,448	37,861	50,734	NS	NA	1,227,096
2010	2,270,241	831,323	644,412	467,020	1,111,432	34,794	54,382	NS	NA	1,426,316
2011	**2,277,311**	**900,359**	**649,609**	**536,513**	**1,186,122**	**33,403**	**58,879**	**NS**	**NA**	**1,568,618**
Percent Change (2010-11)	**0%**	**8%**	**1%**	**15%**	**7%**	**-4%**	**8%**	**NA**	**NA**	**10%**

Source: Massport
Notes:
NA Ridership numbers are not available.
NS Operation was not in service.
1 Airport Station fare gate entrances only. Automatic Fare Collection introduced in January 2007. The Bremen Street Park entrance to MBTA Airport Station opened June 2007; station activity is not limited to only Airport-related passengers.
2 Boardings at Logan Airport. SL1 service began June 1, 2005; ridership for 2005 is for the seven-month period only.
3 MBTA Ferry is the Harbor Express F2/F2H service, Quincy/Hull-Logan and Long Wharf. Private water taxis includes: City Water Taxi, Rowes Wharf Water Transport, and Boston Harbor Water Taxi; excludes Boston-Logan Water Shuttle (cancelled mid-2004). Rowes Wharf / Fan Pier Water Shuttle operated until June of 2003.
In 2005, available water transportation services decreased from four companies to two. Also in 2005, the final CA/T connections to the TWT were completed and opened to traffic.
4 Includes outbound passengers only on services offered by bus or van lines and hotels on a pre-determined schedule and route. Recent figures are not available.
5 Limousines include outbound passengers only; estimates are based on limousine dispatches and an established average vehicle occupancy based on *2010 Logan Airport Air Passenger Ground Access Survey* responses.

9 While the ridership information presented in this *2011 ESPR* provides a status report on 2010 conditions, it cannot be used to determine mode shares for individual modes or for passengers or employees separately because the data do not discern between air passengers or employees. Moreover, non-Airport patrons, such as East Boston residents and car rental patrons, can be included in the ridership data.
10 To better understand the ground access travel characteristics of air passengers to and from Logan Airport and to track historical trends of these characteristics, Massport administers a periodic (typically every three years) extensive survey of air passengers. The air passenger ground access survey is the principal means of measuring air passenger HOV mode share.

Figure 5-5 Logan Airport - Public Transportation Options



Rapid Transit

The MBTA provides direct connections to Logan Airport via the Blue Line at Airport Station and via the Silver Line to each of the terminals. According to the *2010 Logan Airport Air Passenger Ground Access Survey*, these services are used by over 7 percent of Logan Airport's air passengers. (Almost 17 percent of passengers with trip origins in Boston, Cambridge, Brookline and Somerville used MBTA public transit to travel to the Airport.) Both services are important for reducing automobile travel to the Airport: according to the survey, the majority of users of the Blue Line and Silver Line indicated that their alternative mode of travel to Logan Airport would have been a taxi or they would have been dropped off at the Airport by private vehicle.

Blue Line Ridership

Fare gate data indicate that 2.27 million riders entered Airport Station in 2011. Since fare gate data do not distinguish between Airport related riders and East Boston users, Airport passenger ridership levels on the Blue Line can no longer be directly identified as part of the ESPR/EDR reporting.[11] The increase in ridership at Airport Station can be attributed to the opening of the Bremen Street Park entrance to the station in 2007.

The Blue Line Airport Station (picture left) entrance and the Silver Line bus rapid transit at Logan Airport (picture right). Source: Massport.

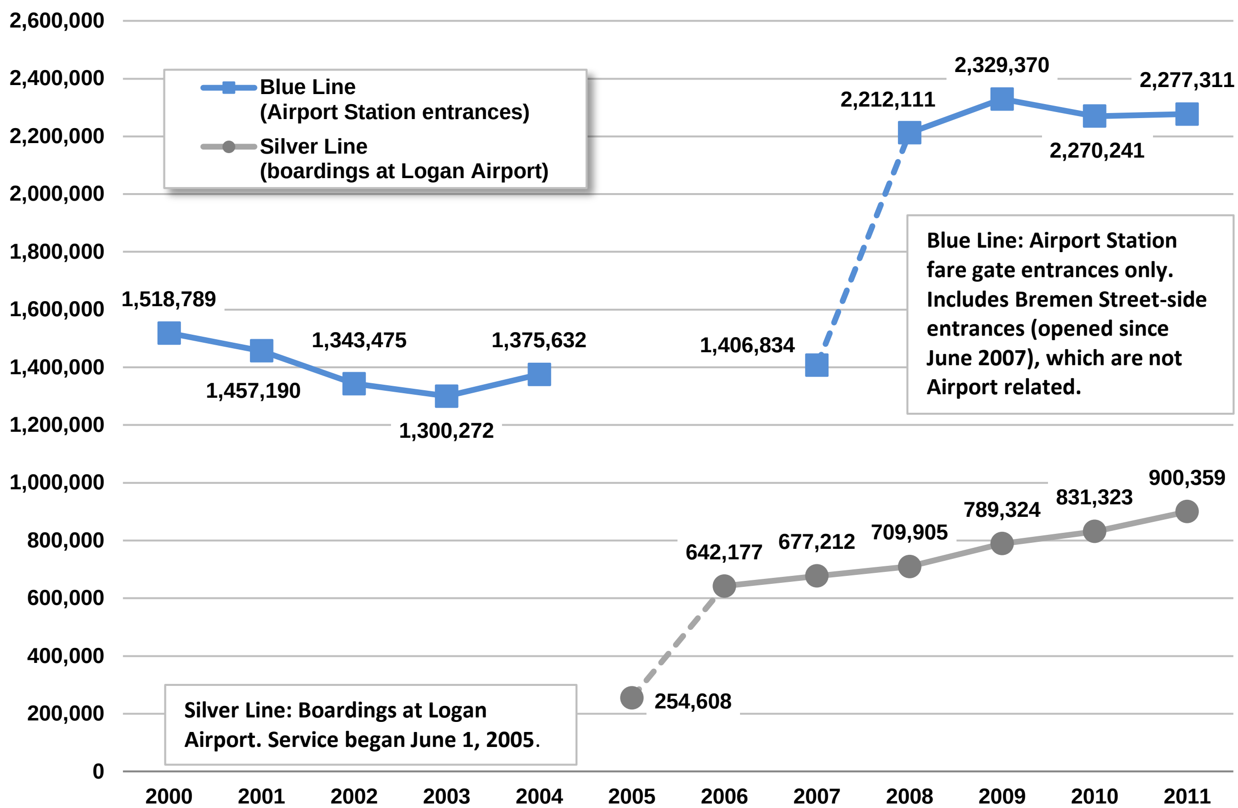
Silver Line Ridership

The Silver Line bus rapid transit service to Logan Airport provides a direct connection between South Station and the Airport terminals via the South Boston Transitway and the TWT. In 2011, a record 900,000 passengers boarded the Silver Line at Logan Airport. Silver Line Airport buses (SL1) are owned by Massport and are operated by the MBTA with a Massport subsidy. The Silver Line is the only MBTA rapid transit service that provides a direct, one-seat connection to each Airport terminal. (The Blue Line requires a second-seat ride on a free Massport shuttle to connect riders to terminals, while express transit buses connect only at Terminal C, and local bus service to the Airport is very limited.) Transfers between the Silver Line and the Red Line at South Station are free. At South Station, passengers may also connect to the MBTA commuter rail, Amtrak, and regional intercity buses.

As shown in Table 5-7 and Figure 5-6, Silver Line ridership to/from the Airport continues to increase; ridership has increased every year since full inception of the service in June 2005.

11 Based on automated fare gate entrance counts, approximately 50 percent of entrances occur via the Bremen Street Park fare gates at Airport Station. Based on Massport curbside observations, approximately 45 percent of Airport Station entrances are by airport users.

Figure 5-6 Annual MBTA Boardings at Logan Airport: Blue Line and Silver Line



Note: Blue Line ridership data were not available for 2005 and 2006. In 2007, new fare gate equipment was installed to allow for more reliable ridership data collection.

Logan Express Bus Service

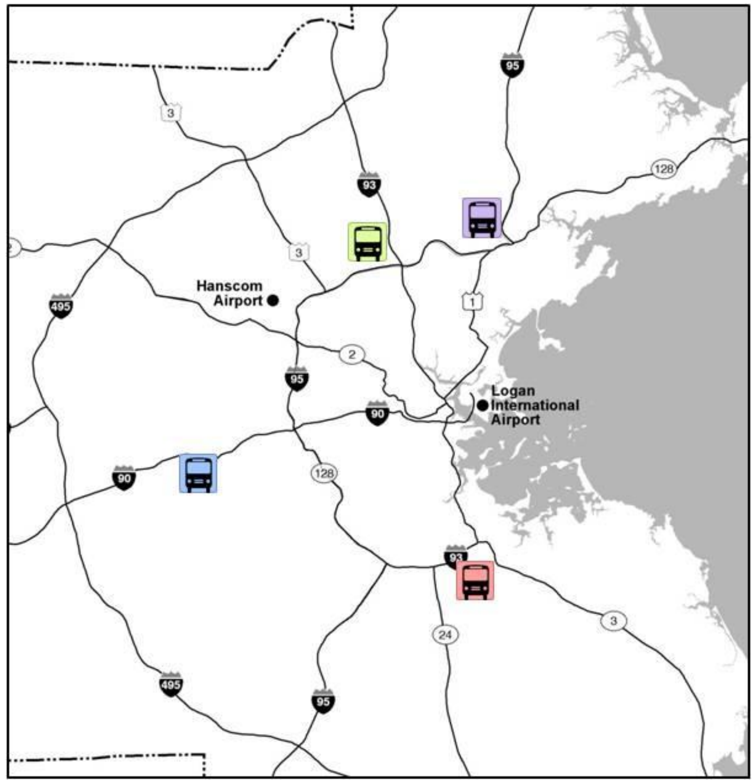
Massport provides frequent, scheduled, express bus service to Logan Airport for air passengers and Logan Airport employees from park-and-ride lots in Braintree, Framingham, Woburn, and Peabody. Full service bus terminals and secure parking are provided at all four locations.

The round-trip adult fare is $22; reduced fares are offered to seniors and children under the age of 12 ride free with an adult. To encourage greater ridership, a parking rate restructuring went into effect on March 1, 2012, which lowered parking rates to $7 per day from $11 per day at Logan Express parking lots.

A Logan Express bus on an Airport roadway. Source: Massport.

On weekdays and Sunday afternoons/evenings, scheduled half-hour headways are provided between the Braintree, Woburn, and Framingham locations and Logan Airport; one-hour headways are provided at these locations on Saturdays and Sunday mornings. In September 2009, the scheduled bus service to/from Peabody changed in response to low ridership and is now provided hourly on weekdays and every 1.5 hours during the weekend. Service hours for all four locations are roughly 3:15 AM to midnight.

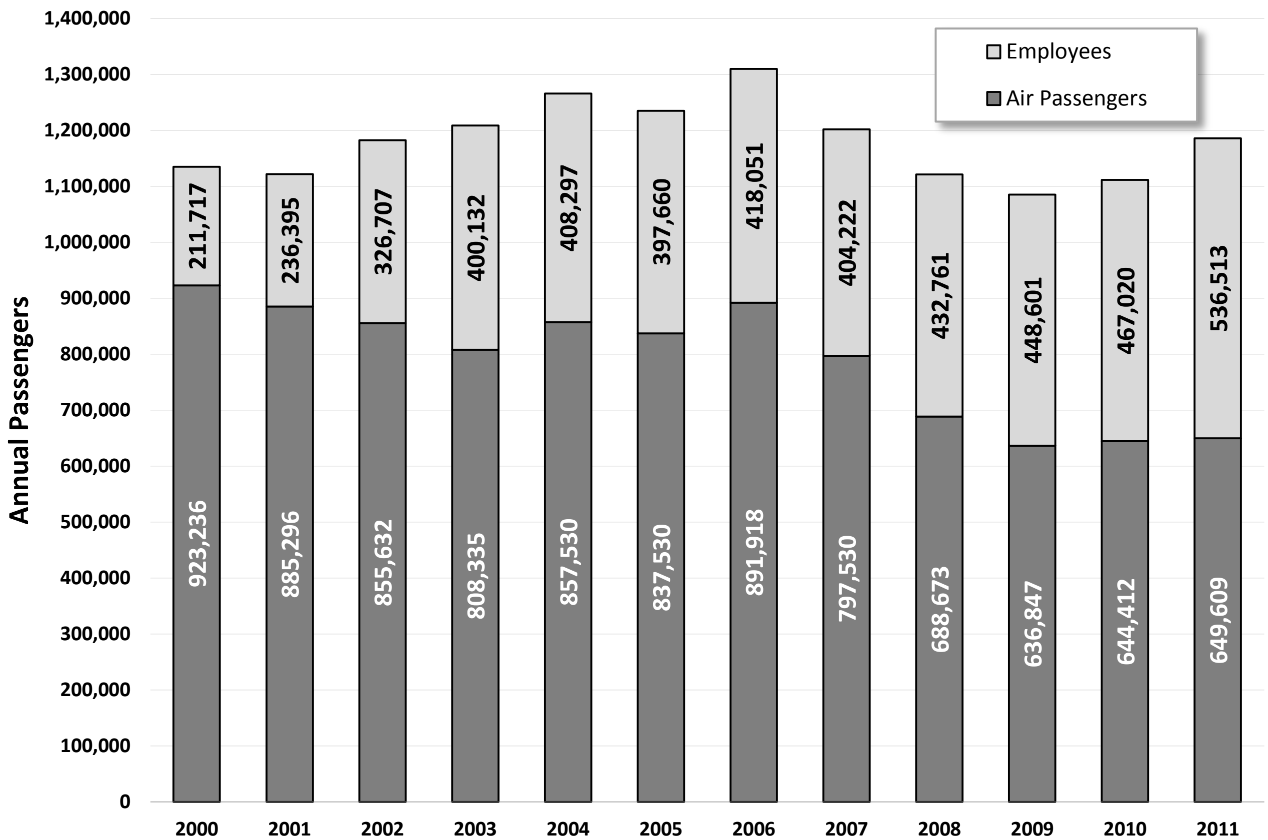
In the fall of 2011, two changes in the Logan Express system had a positive effect on use of the service for both air passengers and Airport employees. The first change took place in October with the addition of early morning buses from the Logan Express terminals and the addition of buses after midnight departing from Logan Airport. These buses primarily have drawn passengers from the airline employees, but a significant number of air travelers ride these buses as well. In addition to extra bus service, Massport introduced a monthly pass for airline employees, which reduced the cost of parking and riding the bus from $140 to $100. The cost of a 44-ride employee pass remains unchanged at $75, but the separately purchased monthly Logan Express parking pass was reduced from $65 to $40. Logan Airport employees have responded positively to these pricing incentives.



Logan Express Bus Terminals and Park-and-Ride Lots. Source: Massport.

Recent annual ridership trends for Logan Express are shown on Figure 5-7 and Table 5-7. Air passenger ridership on Logan Express increased about 1 percent from 2010 to 2011, while employee ridership increased 15 percent. A detailed breakdown of the Logan Express ridership is presented in *Appendix G, Ground Access*. Logan Express is used by about 4 percent of Logan Airport's air passengers, according to the *2010 Logan Airport Air Passenger Ground Access Survey*.

Figure 5-7 Logan Express Bus Annual Ridership, 2000 - 2011



Note: In 2006, the TWT was fully and partially closed for inspections and repairs, which led to many travelers pursuing alternative modes of travel to Logan Airport, including Logan Express.

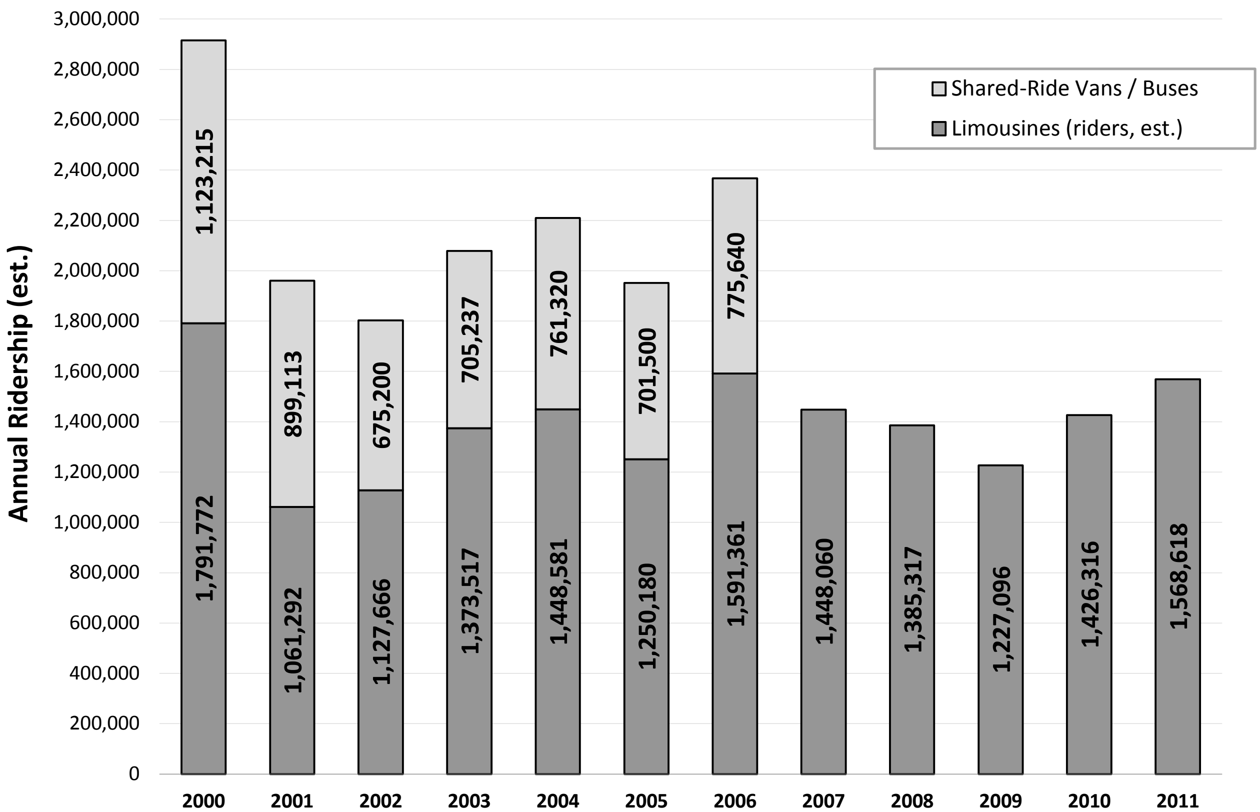
Scheduled Buses, Shared-Ride Vans, and Limousines

Massport provides designated curb areas at all Airport terminals to support the use of HOV modes, including privately-operated scheduled buses and shared-ride vans and limousine services. About 15 percent of air passengers use these shared-ride services to arrive at Logan Airport based on the *2010 Logan Airport Air Passenger Ground Access Survey*.

The majority of scheduled shared-ride carriers use a combination of 15- to 40-passenger vehicles and 40+ passenger coach buses. Scheduled express bus service is offered by several privately-operated carriers from outlying areas of the Boston metropolitan area and neighboring states. Shared-ride van services include services between Logan Airport and many hotels in the Greater Boston area. Shared-ride vans also provide service from western Massachusetts and other regional points throughout New England. As shown in Table 5-7 and Figure 5-8, the use of limousines increased by approximately 10 percent in 2011.

Massport offers a 50 percent discount on the ground access fees for alternative fuel vehicles that use compressed natural gas (CNG) or are powered by electricity.

Figure 5-8 Shared-Ride Bus, Van and Limousine Annual Ridership/Activity[1]



1 Shared-ride bus/van ridership reporting is voluntary; due to incomplete figures reported to Massport, these numbers are no longer reported for the scheduled shared-ride services table/graph. Limousines riders include outbound passengers only; ridership estimate is based on limousine dispatches and an established average vehicle occupancy.

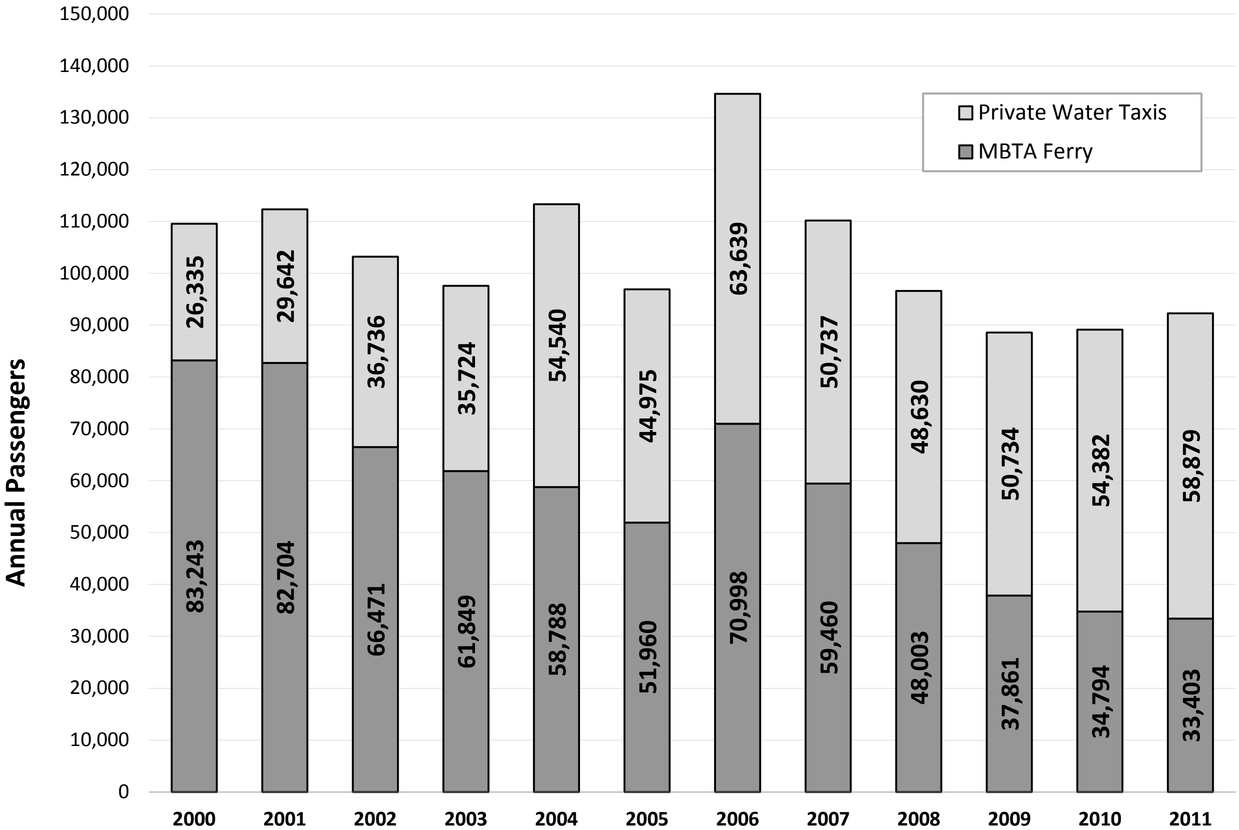
Water Transportation: Water Taxis and Ferries

Three companies provide water transportation within the Boston area: City Water Taxi, Rowes Wharf Water Shuttle, and the MBTA's Harbor Express. Collectively, these companies serve numerous destinations throughout Boston Inner Harbor. The water taxi landing locations include: Long, Rowes, and Central Wharfs; the World Trade Center and the Moakley Courthouse in South Boston; Lovejoy Wharf near North Station; and stops in the North End, Charlestown, Chelsea, and East Boston. The MBTA Harbor Express provides services to Long Wharf and destinations outside of the Inner Harbor, including Quincy and Hull. [12] The water transportation services stop at the Logan Airport dock on Harborside Drive. Massport provides a courtesy shuttle bus service between the Logan Airport dock, the MBTA Airport Station, and all Airport terminals.

Water transportation accounts for less than 1 percent of the mode share to Logan Airport, according to the *2010 Logan Airport Air Passenger Ground Access Survey*. Annual ridership on water transportation experienced an increase of over 3 percent in 2011 compared to 2010, as shown in Figure 5-9.

12 The MBTA ferry schedule from Quincy/Hull to the Logan Ferry Dock is not as frequent as Blue Line and Silver Line services, and does not run on frequent and consistent headways throughout the day. Headways between ferries on weekdays range from 20 minutes to 1 hour 20 minutes, or on weekends from 1.5 hours to 2.5 hours. There are 20 MBTA ferries to Logan Airport on weekdays, however there are no MBTA ferries direct to Logan from the South Shore during morning commuting times. The one-way fare to cross the Boston Harbor from Long Wharf to Logan Airport costs $10, and $12 from Quincy/Hull (twice the regular fare to Boston).

Figure 5-9 Water Transportation Annual Ridership, 2000 - 2011



Note: In 2005, available water transportation services decreased from four companies to two. In 2006, the TWT was intermittently closed for inspections and repairs, which diverted many travelers to alternative modes of travel to Logan Airport.

Non-HOV (Automobile) Modes

Logan Airport passengers can access the Airport by a number of automobile modes, including private automobiles, taxis, and rental cars. These modes account for about 70 percent of the access modes used by air passengers, based on the *2010 Logan Airport Air Passenger Ground Access Survey*, down 2 percent from the 2007 survey. Although these modes are categorized as non-HOV, they frequently carry more than one passenger per vehicle. Based on the 2010 survey results, the average vehicle occupancy for these automobile modes is estimated at 2.1 passengers per vehicle.

Automobile Access

Private automobile access to the Airport is classified as either curbside drop-off, or parked on-Airport (terminal area or remote/Economy). Traffic conditions associated with these trips are described in the previous section on traffic conditions.

Rental Car

Currently, nine rental car brands serve Logan Airport. Seven (Alamo, Avis, Budget, Dollar, Enterprise, Hertz, and National) are located on-Airport in the SWSA. The two rental car brands that operate from sites on Route 1A north of the Airport (Advantage, Thrifty) will relocate onto the Airport into the ConRAC facility currently under construction in the SWSA.

Each rental car brand operates its own diesel-fueled shuttle bus fleet that runs between all terminals and their respective on or off-Airport facilities. The SWSA Redevelopment project will eliminate the existing diesel-fueled RAC bus fleet, and those passengers will be served by Massport's new clean diesel-electric hybrid and CNG fleet serving all terminals, the ConRAC, and Airport Station.

The results from the *2010 Logan Airport Air Passenger Ground Access Survey* indicate that approximately 11 percent of air passengers used rental cars to access the Airport.

Taxis

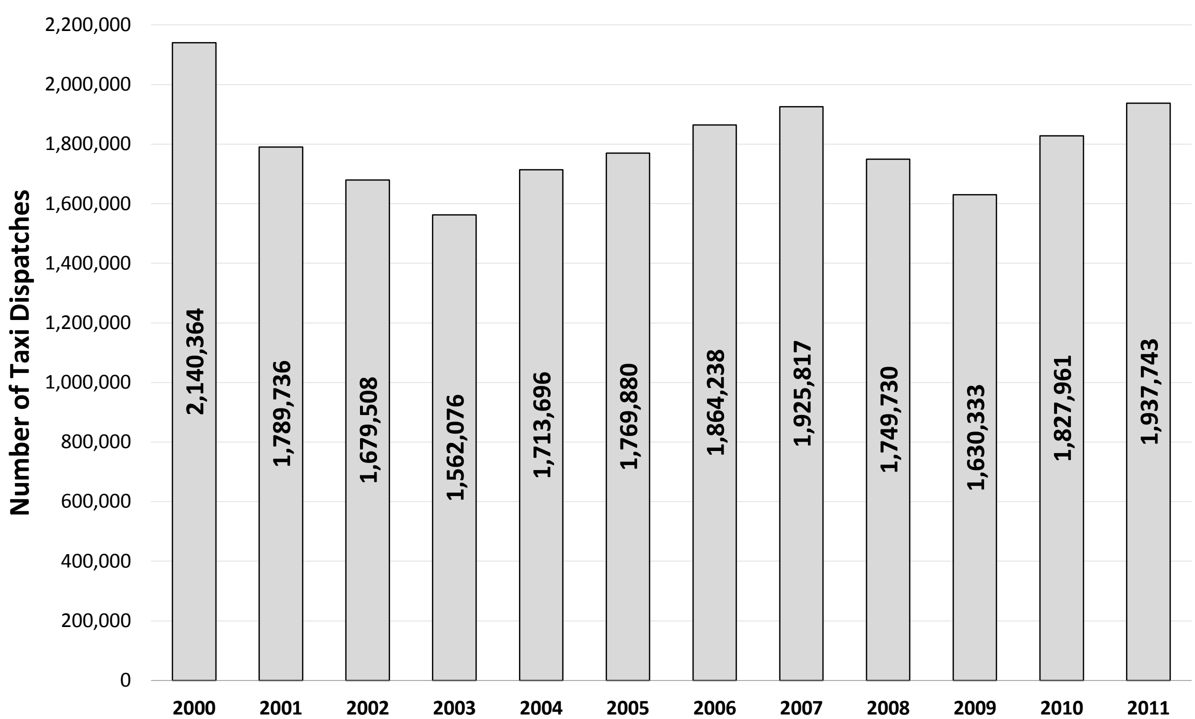
Taxi ridership trends are reflected in the total number of taxis dispatched from Logan Airport (serving outbound passengers). As shown in Figure 5-10, the total number of taxis dispatched rose in 2011 by 6 percent over the 2010 level. Taxi dispatches reflect the increase in air passenger levels. Nevertheless, taxi use remains below the highest recorded level (2.14 million dispatches in 2000 when Logan Airport served 27.7 million annual air passengers).

The *2010 Air Passenger Ground Access Survey* found that approximately 19 percent of air passengers accessed the Airport via taxi, which is similar to the numbers from the 2007 survey. Taxi vehicle occupancy is approximately 1.9 passengers per vehicle according to the *2010 Air Passenger Ground Access Survey*.

Green Cab Program

Since 2007, Massport has sponsored a "Head-of-Line" hybrid vehicle taxi incentive program, in partnership with the City of Boston. Under this program Boston taxis that qualify as a clean-fuel vehicle may obtain permission to proceed to the short job lane at Logan Airport's taxi pool; this allows these "green cabs" to be dispatched to the terminals in a shorter amount of time.

Figure 5-10 Annual Taxi Dispatches



Note: The available taxi data only reports dispatches from Logan Airport's taxi pool. The data do not include suburban or city taxis that drop passengers at Logan Airport and depart empty, as these companies are not required to provide their ridership statistics to Massport.

Logan Airport Air Passenger Ground Access Survey

Massport periodically administers an extensive survey of air passengers in order to better understand the ground access travel characteristics of air passengers to and from Logan Airport and to track historical trends of these characteristics. Since the late 1970s, the *Logan Airport Air Passenger Ground Access Survey* has been Massport's primary tool for understanding the changes in ground access patterns and the effectiveness of its policies and services. The survey is also used to shape the direction of ongoing and new Massport planning efforts to encourage Logan Airport travelers to use HOV/shared-ride modes instead automobile modes. The survey is the principal means of measuring air passenger HOV mode share. Since the *2004 ESPR*, a survey was administered in 2007 and again in 2010. (A new survey is planned for the spring of 2013.)

Results of the *2010 Logan Airport Air Passenger Ground Access Survey* that relate to mode share are presented in this section. For a more complete summary, please refer to the *2010 EDR* or to the final report of the survey, available on Massport's website.[13] This section also compares the 2010 passenger survey findings to those of previous surveys.

Ground Access Modes of Travel

As discussed previously, air passengers traveling to and from Logan Airport have several ground access modes available to them, which are often categorized as follows:

- Private Automobile: Includes all passengers that are dropped-off by a privately-owned automobile, and all passengers who drive and park their vehicles at the Airport.
- Taxi: A passenger driven to Logan Airport in a licensed, commercial taxi.
- Rental Car: A passenger who rents a car from an on-Airport or nearby off-Airport rental car agency.
- Scheduled HOV Service: A passenger who arrives at Logan Airport via scheduled bus or limousine or van service, including privately-operated services and Massport's Logan Express.
- Unscheduled HOV Service: Includes passengers who travel to Logan Airport via unscheduled limousine or van carriers.
- Transit: A passenger who takes an MBTA public transit service (including the Blue Line subway, Silver Line bus rapid transit) or one of the water transportation services (operated in conjunction with a dedicated Massport shuttle bus to/from Logan Airport terminals).
- Courtesy Shuttle: A passenger who arrives at the Airport in a courtesy shuttle, such as those offered by nearby hotels.
- Other: Includes passengers that access the Airport by walking, riding a bicycle, or taking a charter bus.

Table 5-8 presents these aggregated air passenger ground access mode shares for survey years 1999 through 2010. As the data indicate, the overall HOV mode share for air passengers has fluctuated around the 30 percent mark in each of the survey years during this time period. Thus, even with air passenger growth, the HOV-Automobile mode share split has remained relatively stable.

13 Massport. Logan Airport Air Passenger Ground-Access Survey. www.massport.com/environment/environmental_reporting/Pages/LoganAirportAirPassengerGround-AccessSurvey.aspx.

Table 5-8 Ground Access Mode Share (All Passengers) by Survey Year				
Ground Access Mode	**1999**	**2004**	**2007**	**2010**
Non-HOV/Automobile				
Private Automobile	36.5%	36.0%	40.2%	40.4%
Taxi	20.6%	22.8%	19.7%	18.8%
Rental car	12.2%	10.9%	12.4%	10.9%
Total Non-HOV Share	**69.3%**	**69.7%**	**72.3%**	**70.1%**
HOV/Shared-Ride				
Unscheduled HOV	8.9%	8.1%	7.3%	7.6%
Scheduled HOV	9.5%	10.6%	6.9%	8.2%
Transit	9.7%	6.5%	6.7%	7.6%
Courtesy Shuttle	2.1%	3.1%	3.5%	4.6%
Other	0.5%	2.0%	3.4%	1.8%
Total HOV Share	**30.7%**	**30.3%**	**27.8%**	**29.9%**

Source: Spring 1999, 2004, 2007, and 2010 Air Passenger Ground Access Surveys.

Average Vehicle Occupancy (Air Passengers) by Ground Access Vehicle Modes

Table 5-9 presents estimates of average vehicle occupancy and the share of ground-access trips made by single-occupant vehicles by various ground access modes (transit modes and charter buses are excluded). These estimates are made using the responses provided in the *2010 Logan Airport Air Passenger Ground-Access Survey*. The average occupancy for automobile vehicle modes is about 2.1 passengers per vehicle, while the average occupancy for the shared-ride vehicle modes is about 3.9 passengers per vehicle. In other words, trips made by private automobile often carry more than one passenger per vehicle.

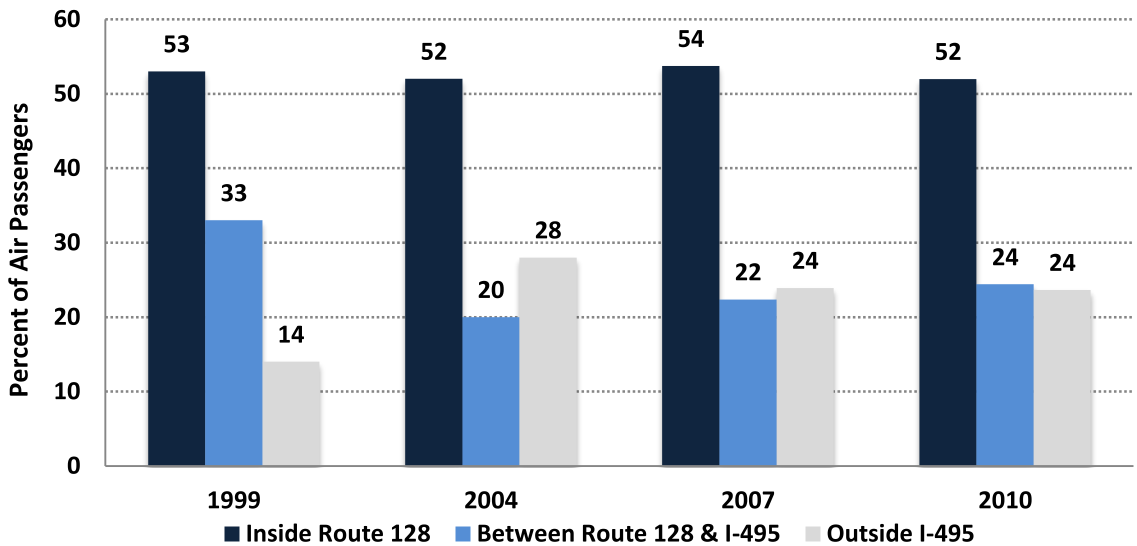
Table 5-9 Average Vehicle Occupancy by Ground Access Mode (2007 and 2010, weekday)		
Mode	**2007** **Vehicle Occupancy**	**2010** **Vehicle Occupancy**
Private Vehicle	2.4	2.3
Taxi	1.7	1.9
Rental Vehicle	2.0	2.2
Subtotal for Automobile Modes	**2.1**	**2.1**
Van or Limousine by Reservation	2.2	2.9
Courtesy Shuttle	4.8	6.7
Van or Limousine Running on Fixed Schedule	3.5	4.4
Subtotal for the Above Shared-Ride Vehicle Modes	**2.9**	**3.9**

Source: Massport, 2007 and 2010 Logan Airport Air Passenger Ground-Access Surveys.
Note: The true average occupancy per vehicle arriving at the Airport cannot be computed from the responses to the survey because it is not possible to identify multiple travel parties arriving in a single vehicle. Average occupancy in this table was calculated as the average occupancy of arriving vehicles across survey respondents.
An SOV passenger is defined as an air passenger that arrives at the Airport with no other air passengers in the vehicle. Air passengers can arrive as the only traveling air passenger in any of the above modes; thus, drivers and/or occupants who are not traveling are excluded from the occupancy calculation.

Ground Access Origins of Air Passengers

Figure 5-11 indicates how the distribution of air passenger trips by geographic area has changed since 1999. The majority of trips still originate in Boston and other communities within Route 128. Nevertheless, Logan Airport draws nearly a quarter of its passengers from areas outside of Route 128/I-495.

Figure 5-11 Logan Airport Air Passenger Ground Access Trip Origins



Source: Spring 1999, 2004, 2007, and 2010 Logan Airport Air Passenger Ground Access Surveys.
Note: Based on air passengers departing on both weekdays and weekend days.

Market Segment: Trip Purpose and Residency

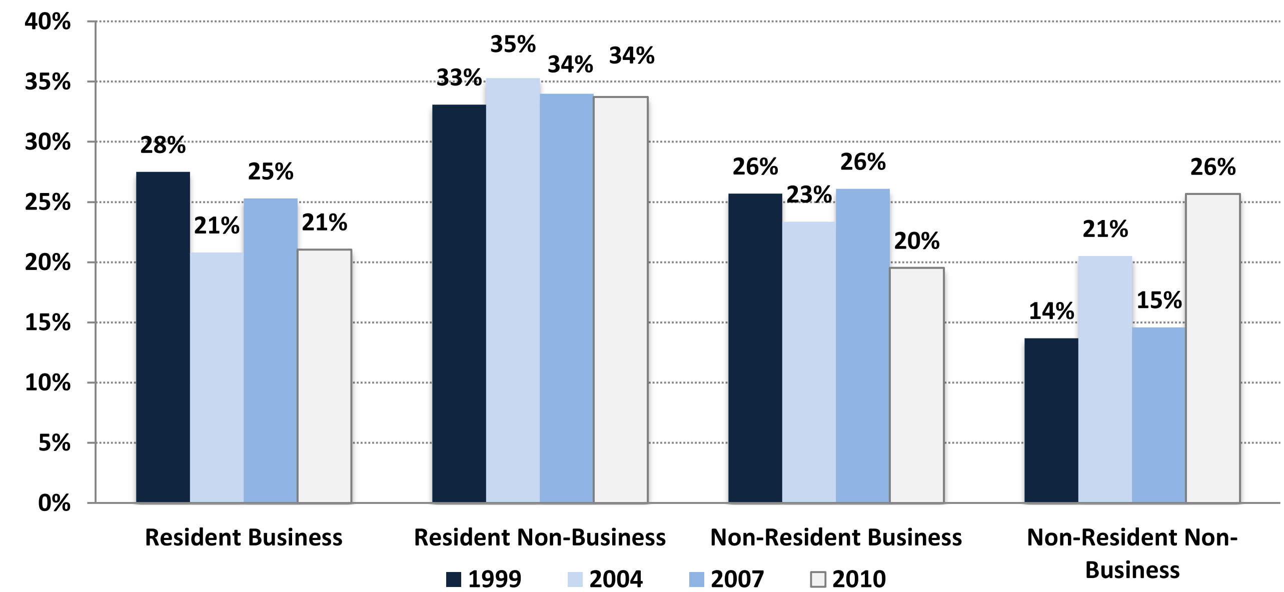
Massport characterizes air passengers into four distinct market segments:

- Resident Business: passengers living within the region served by Logan Airport and traveling for business reasons.
- Resident Non-Business: passengers living within the region served by Logan Airport and conducting personal travel (e.g., leisure trip).
- Non-Resident Business: passengers living outside the region served by Logan Airport and traveling to conduct business.
- Non-Resident Non-Business: passengers living outside the region served by Logan Airport and traveling for personal reasons (e.g., leisure or vacation travelers).

Residents are defined as passengers who use Logan Airport as their "home" airport, regardless of their proximity to other airports. It is important to study the passenger market in this manner because sensitivity to key factors that influence travel behavior such as convenience, time reliability, and pricing varies substantially among these passenger market segments. This information assists Massport in developing appropriate ground access services for passengers.

Figure 5-12 compares the share of weekday trips by market segment across four recent surveys. The resident non-business market is the largest market segment, contributing about one-third of all air passengers at Logan Airport. The market share of this segment remained roughly flat between 2007 and 2010. The percentage of non-resident non-business trips increased to about a 25 percent share of weekday travel, compared to about 15 percent in 2007. Since 2004, non-resident non-business travelers have almost doubled from 14 percent to 25 percent possibly due to the availability of low cost carrier service at Logan Airport, which has attracted air passengers from beyond the Airport's core market area.

Figure 5-12 Weekday Market Segments (Combined Trip Purpose and Residency)[1]



Source: Spring 1999, 2004, 2007, and 2010 Logan Airport Air Passenger Ground Access Surveys.
1 Based on air passengers departing on weekdays only. Figures rounded.

Table 5-10 presents mode shares by market segment. HOV mode share is lower among the business segments compared to the non-business segments. Business travelers typically have low HOV mode share because they have high sensitivity to time, require flexibility and schedule reliability, and often make decisions related more to convenience than to cost, which is often covered by their employer not by the passenger. The non-resident business market segment continues to choose taxis and rental cars as their primary ground access mode to Logan Airport and the resident business travelers are strongly private automobile users, with a strong preference for parking at the Airport. Public transit and scheduled HOV services (including Logan Express) have a higher share among the non-business market segments. Non-business market segments are more sensitive to ground transportation costs, travel less frequently but for longer time periods, and tend to travel at off-peak fly times/days.

Table 5-10 Ground Access Mode Share by Market Segment (All Passengers)

Ground Access Mode	Resident Business 1999	2004	2007	2010	Non-Resident Business 1999	2004	2007	2010
Automobile Modes	**74%**	**74%**	**74%**	**75.6%**	**74%**	**72%**	**76%**	**74.7%**
Private Automobile	50%	54%	54%	58.7%	9%	18%	12%	11.7%
Taxi	23%	19%	18%	16.2%	31%	30%	35%	36.1%
Rental Car	1%	1%	2%	0.6%	34%	24%	29%	26.8%
HOV Modes	**26%**	**26%**	**26%**	**24.4%**	**26%**	**28%**	**24%**	**25.3%**
Unscheduled HOV	12%	11%	13%	10.3%	6%	7%	8%	10.2%
Scheduled HOV	9%	8%	6%	6.1%	8%	7%	3%	3.0%
Transit	5%	5%	6%	4.4%	8%	6%	6%	5.0%
Courtesy shuttle	<1%	1%	<1%	2.3%	4%	7%	5%	4.7%
Other	<1%	1%	1%	1.2%	<1%	1%	2%	2.4%
Ground Access Mode	**Resident Non-Business 1999**	**2004**	**2007**	**2010**	**Non-Resident Non-Business 1999**	**2004**	**2007**	**2010**
Automobile Modes	**62%**	**68%**	**67%**	**63.1%**	**71%**	**70%**	**73%**	**70.8%**
Private Automobile	46%	49%	51%	48.7%	35%	38%	36%	35.9%
Taxi	15%	16%	14%	12.5%	16%	15%	19%	16.9%
Rental Car	1%	3%	2%	1.9%	20%	17%	19%	18.1%
HOV Modes	**38%**	**32%**	**33%**	**36.9%**	**29%**	**30%**	**27%**	**29.2%**
Unscheduled HOV	10%	9%	7%	8.1%	4%	5%	3%	3.7%
Scheduled HOV	11%	13%	12%	11.6%	10%	11%	6%	8.3%
Transit	14%	8%	11%	10.6%	12%	8%	9%	9.2%
Courtesy shuttle	2%	1%	3%	4.5%	3%	5%	5%	6.3%
Other	<1%	1%	1%	2.1%	<1%	1%	4%	1.7%

Source: Spring 1999, 2004, 2007, and 2010 Air Passenger Ground Access Surveys.

Air Passenger Ground Access Planning

Surface transportation modes have environmental impacts, and are considered a standard component of airport greenhouse gas (GHG) emissions inventories (see *Chapter 7, Air Quality/ Emissions Reduction*). Enhancing multimodal transportation options is one way an airport can reduce GHG emissions and improve its environmental footprint.

Potential emissions reductions are one reason why Massport is committed to a long-term goal to promote and support public and private HOV/shared-ride services aimed at serving air passengers, Airport users and employees. Other benefits include: (1) reducing congestion on the terminal roadways and curbside pick-up/drop-off areas, (2) alleviating limited parking facilities, and (3) customer service (providing a range of transportation options for different traveler markets).

Passenger HOV Mode Share Goal

Massport's ground access goal is to attain a 35.2 percent passenger HOV mode share when annual air passenger levels reach 37.5 million. The 35.2 percent HOV mode share figure was developed by a planning process involving Massport staff and was first presented in the Logan Growth and Impact Control (LOGIC) planning studies that were completed in the early 1990s.[14] In subsequent environmental documents, the 35.2 percent HOV mode share became a declared goal related to ground access to Logan Airport.[15]

Progress toward this goal is measured using the triennial air passenger ground-access survey. The latest survey, which was conducted in 2010, revealed an air passenger ground-access mode share of 30 percent for HOV/shared-ride modes, which is a share consistent with past surveys. (See detailed discussion in the previous section in this chapter.) This result demonstrates that Logan Airport has been able to maintain its HOV mode share in concert with improvements to roadway access to the Airport and despite increases in air passenger levels. Also, the result confirms Logan Airport's rank among the top U.S. airports with respect to HOV/shared-ride mode share.

It is useful to note that there is no standard aviation industry definition with respect to categorizing ground access modes as HOV versus SOV. While some modes (e.g., Logan Express and the Silver Line) clearly fall into the HOV mode category, the proper category for a limousine or taxi is less clear. For example, if Logan Airport ground access mode shares were recalculated using the same category definitions as are used by SFO, the Airport's HOV mode share would exceed 40 percent, ranking Logan Airport higher than SFO for HOV mode share.

Although generally useful, the calculation of overall HOV mode share is limited in that some modes can operate as both high occupancy and low occupancy vehicles. (Please refer to Table 5-11 below.) Many automobile modes carry multiple passengers; for example, as seen in Table 5-11, the 2010 survey results indicate an average occupancy of 2.3 air passengers per private vehicle used for airport ground access. Thus, if we were to view ground access share based on vehicle occupancy (and defining HOV as two or more air travelers) rather than type of vehicle category, the overall Logan Airport ground-access HOV share would rise to 71 percent and the SOV share would be 29 percent.

Table 5-11 Average Vehicle Occupancy by Ground Access Mode (2010, weekday)

Ground Access Mode	Average Vehicle Occupancy	% SOV	% HOV
Private Vehicle	2.3	31%	69%
Rental Vehicle	2.2	23%	77%
Taxicab	1.9	58%	42%
Van or Limousine by Reservation	2.9	40%	60%
Van or Limo Running on Fixed Schedule	4.4	24%	76%

Source: Massport calculations based on 2010 Logan Airport Air Passenger Ground-Access Survey

Another example of the shortcoming of calculating the ground-access goal in terms of mode only, without regard to occupancy, would be: two travel parties (i.e., passengers with different ground-access origins or different flight itineraries) sharing a taxi (effectively carpooling) to the Airport. This travel behavior, as

14 Logan Growth & Impact Control Study (LOGIC) Phase I Report (1990) and Logan Growth & Impact Control Study (LOGIC), Phase II Final Report (June 1993).

15 West Garage Final EIR (January 31, 1995) and 1994 & 1995 Annual Update of the Final Generic Environmental Impact Report (GEIR), vol. 1 (July 1996), which presents for the first time "Massport's Ground Access Management Plan" and states that its goals are "to achieve a 35 percent high-occupancy vehicle (HOV) mode share by air passengers…" [p. I-7-4]

currently measured, does not qualify as HOV and therefore does not contribute to achieving the mode share goal, because all travelers are still in an automobile, and not in a vehicle within the current definition of a HOV mode. As a result, even though sharing a taxi halved the number of vehicle trips that would otherwise have been required (i.e., one taxi ride was eliminated) and the number of pollutants emitted per passenger is halved, the trip by taxi would be counted in the automobile mode category. Simply using HOV mode share as a metric does not correlate to the number of vehicle trips generated or avoided by air passengers.

Massport is investigating alternative methods to describe the mode use and travel patterns of air passengers using Logan Airport in order to better reflect the vehicle occupancy and associated environmental outcomes.

Initiatives Underway

Massport promotes ridership on HOV/shared-ride modes and maintains efficient transportation access and parking options in and around Logan Airport to reduce the reliance on automobile modes as a means to achieving the HOV mode share goal. Measures implemented by Massport include a blend of strategies related to pricing (incentives and disincentives), service availability, service quality, marketing, and traveler information. Because of the diverse market segments of the air passenger traveler, not one single measure will accomplish the goal.

The March 2012 parking rate changes for Logan Airport commercial parking and Logan Express are a part of the recent package of initiatives to promote HOV/shared-ride ridership, as are the purchase of new low-floor, clean-fuel buses (which were placed into service in October 2012), the implementation of the unified shuttle bus system operation (fall of 2013), deployment of "next bus" arrival notification signs at the terminals and the MBTA Blue Line Airport Station (ongoing in 2012).

Beginning in the spring of 2012, Massport, in partnership with the MBTA and the Massachusetts Department of Transportation (MassDOT), introduced an intensive promotion of public transit to airport users. Marketing and promotion of public transit and Logan Express consisted of a multimedia campaign (including radio announcements, web advertising, banners, bus cards, bus wraps, etc.) and enhanced in-terminal signs, column wraps, and terminal floor decals, directed at arriving passengers.

These elements supported the introduction of a Silver Line pilot program on June 6, 2012, which permitted free boarding of the Silver Line buses at Logan Airport, in conjunction with added customer service staff during peak arrivals periods. This initial four-month pilot program was evaluated to assess the impacts on customer service, dwell times and curb operations, ridership changes and mode shifts, safety impacts, and fiscal impacts. The promising results of reduced dwell times and faster travel times through the terminal area led to the extension of the free-fare program through June 1, 2013.

Planning for Passenger Ground Access

Massport recognizes that a reduction in the use of passenger vehicles—principally taxis and private vehicles for curbside pick-up/drop-off—is necessary to ensure safe and uncongested operation of the terminal curbs and area roadways, while reducing the environmental impacts. To that end, Massport staff uses updated ground access data and the *2010 Logan Airport Air Passenger Ground Access Survey* to develop analytical tools than can inform ground access planning efforts.

For example, an analysis of passenger demographics and mode choice led to the creation of a parking pricing elasticity model. In essence, this analytical tool has demonstrated that on-Airport parking demand is strongly inelastic relative to pricing, and that the single strategy of adjusting parking rates will not dampen demand for on-Airport parking. The model also illustrates that reducing parking demand actually increases curbside drop-off activity in higher proportions than increases in the use of any other modal alternative. Therefore, one conclusion from this analysis is that future ground-access initiatives should seek to primarily reduce demand for the use of curbside drop-off by private automobiles and taxis, in order to effectively reduce overall automobile mode share and make progress toward the HOV mode share goal.

The work to-date also produced an analysis of curbside and roadway level-of-service. This analysis has highlighted the need to address congestion at the Arrivals Level curbs of both Terminal B and Terminal C with both short-term measures and long-term initiatives. Massport is currently investigating some short-term measures expected to be placed in effect as early as the fall of 2013. This on-going work is providing the tools and establishing a framework to inform a broader, strategic, and long-range planning effort.

Employee Ground Access Planning

Airport employee transportation has different ground access considerations than passenger transportation. Airport employees often have non-traditional (and often unpredictable) working hours that are difficult to match to typical transit service hours. Due to the time-sensitive nature of airline operations, on-time reliability is important for employee transportation, as is flexibility during severe weather or other delays which may extend a typical employee workday or workshift.

Massport strives to reduce the number of Airport employees commuting by private automobile, to enhance commuter options, and to reduce traffic and parking demands at Logan Airport. To help accomplish these objectives Massport continues to:

- Provide off-Airport employee parking in Chelsea, which is served by frequent shuttle bus service to the terminals (Route 77).
- Run free employee shuttle buses between Airport Station and employment areas in the SWSA and the SCA locations (Routes 44, 66, and Logan Office Center).
- Operate early morning and late night Logan Express bus trips for commuters.
- Support the Logan Transportation Management Association (TMA).
- Support the Sunrise Shuttle for early morning bus service from East Boston.
- Create and maintain a comprehensive sidewalk/walkway system on Logan Airport to facilitate pedestrian access.
- Provide bicycle racks.[16]

16 Bicycle racks are provided at Terminal A, Terminal E, Logan Office Center, MBTA's Airport Station, Economy Parking Garage, Signature general aviation terminal, and the Green Bus Depot (Bus Maintenance Facility). Additional racks are planned in 2013 for the ConRAC facility.


Terminal A (left) and Terminal E (right) bike racks.
Source: Massport.

Logan Transportation Management Association (TMA)

Massport established the Logan TMA in 1997 with the following goals:

- Reduce Airport employee parking needs, traffic congestion, air pollution, and commuting costs by organizing/supporting alternatives to drive-alone commuting;
- Enhance public and private transportation services to Logan Airport through advocacy and support for expanded HOV/shared-ride services and discount fares for Airport employees;
- Provide a forum for Logan Airport tenants and employees to address common transportation concerns; and
- Work with government entities to create coordinated transportation management programs.

The Logan TMA advises Airport employers on transit benefits and provides information on available commuting transportation alternatives, ride-matching services, and reduced-rate HOV/transit fare options. Massport contributes $65,000 annually to the Logan TMA. The Logan TMA works with airlines, rental car companies, cargo transport companies, and other tenants at Logan Airport to encourage and offer commuting incentives to employees. Several companies offer a subsidy to employees using public transit or Logan Express to travel to work at the Airport. The TMA is open to all companies and their employees at Logan Airport. Therefore all employees are eligible to benefit from its services.

Benefits and services provided by the Logan TMA to Logan employees in 2011 included:

- East Boston early morning shuttle service (Sunrise Shuttle). (Further details are provided below.)
- Computerized ride-matching services for participating in carpools and vanpools.
- Advocacy for improved service and reduced fares for its members from Massport, the MBTA, or other providers of mass transit and other alternative forms of transportation.

Sunrise Shuttle

Originally launched in August 2007, this shuttle service provides low-cost transportation to Airport employees who live in nearby East Boston and Winthrop. A second shuttle route was added in October 2011 that serves East Boston's Orient Heights neighborhood and Winthrop. Both are partnerships between Massport and the Logan TMA to operate the Sunrise Shuttle; the second service was added with assistance from the Jobs Access and Reverse Commute (JARC) federal funding program.

The Sunrise Shuttle services operate outside of MBTA service hours between 3:00 AM and 6:00 AM, with shuttles every half-hour transporting employees to the Airport terminals. Ridership levels have steadily increased since the shuttle's launch. The two-route service has reached over 1,000 riders per month (up from 636 per month in 2010 on the single route).

Ground Access in 2030

The 2030 predictions for VMT and parking demand discussed below are based on forecast passenger activity levels in 2030 as detailed in *Chapter 2, Activity Levels.*

2030 VMT Analysis

The VMT analysis is based primarily on the predicted number of air passengers in 2030. In 2011, annual air passengers were 28.8 million; in 2030, air passengers are expected to reach 39.8 million. A VMT analysis was conducted for the year 2030 using the VISSIM model of Logan Airport. The number of air passengers and cargo operations for 2030 reflect an assumed average annual growth rate of approximately 1.7 percent or approximately 37.8 percent over 19 years. The annual growth rate in passengers and cargo operations was applied to the current gateway volumes with the mode shares remaining constant. Additionally, all remaining planned roadway improvements are assumed to be in place, including the completed ConRAC facility infrastructure, the surface to departure level ramp (an "official use only" recirculating roadway connecting from Harborside Drive directly to the departure level terminal road), and improvements to the Airport bus and shuttle system and routes. The 2030 VMT analysis also assumes that the bus/limousine pool has been moved to the SWSA.

Total VMT on the Airport roadway network is projected to increase by approximately 0.8 percent annually from 2011 through 2030. The increase in VMT is projected to grow at a rate lower than the growth in air passengers and cargo operations. This lower rate of VMT growth is due to the transition over to the new ConRAC facility scheduled to open in 2013 and the new surface to departure level ramp. One improvement associated with ConRAC is the relocation of a number of rental car providers and the taxi pool. These improvements help to either eliminate or shorten many existing trips. Table 5-12 summarizes the VMT results for 2030.

In 2030, annual air passengers are projected to increase to approximately 39,850,000. This represents an additional 11 million passengers (92 percent of whom are expected to use ground transportation at the Airport) that will have to be accommodated on the Airport roadway system and in its parking facilities.[17] In prior planning for the future development at Logan Airport as part of the Logan Modernization Program and subsequent planning efforts, facilities, roads and infrastructure were sized on a planning standard of 45 million annual air passengers. Thus, the Airport roadways were planned to accommodate currently anticipated increases in VMT and traffic volumes.

17 The remaining 8 percent are intra-terminal transfer passengers, therefore, they would not use the ground transportation network.

Table 5-12 Airport Air Passengers and Airport Study Area VMT for Airport-Related Traffic 2011 and 2030							
Analysis Year	**Annual Air Passengers**	**Morning Peak Hour**	**Evening Peak Hour**	**High 8-Hour**	**Average Weekday**	**Average Weekday Percent Change**	**Annual Average Percent Change**
2011	28.8 million	8,391	10,978	76,920	167,647	—	—
2030	39.8 million	10,099	14,273	90,843	195,762	16.8 %	0.8%

Source: VHB and Massport.

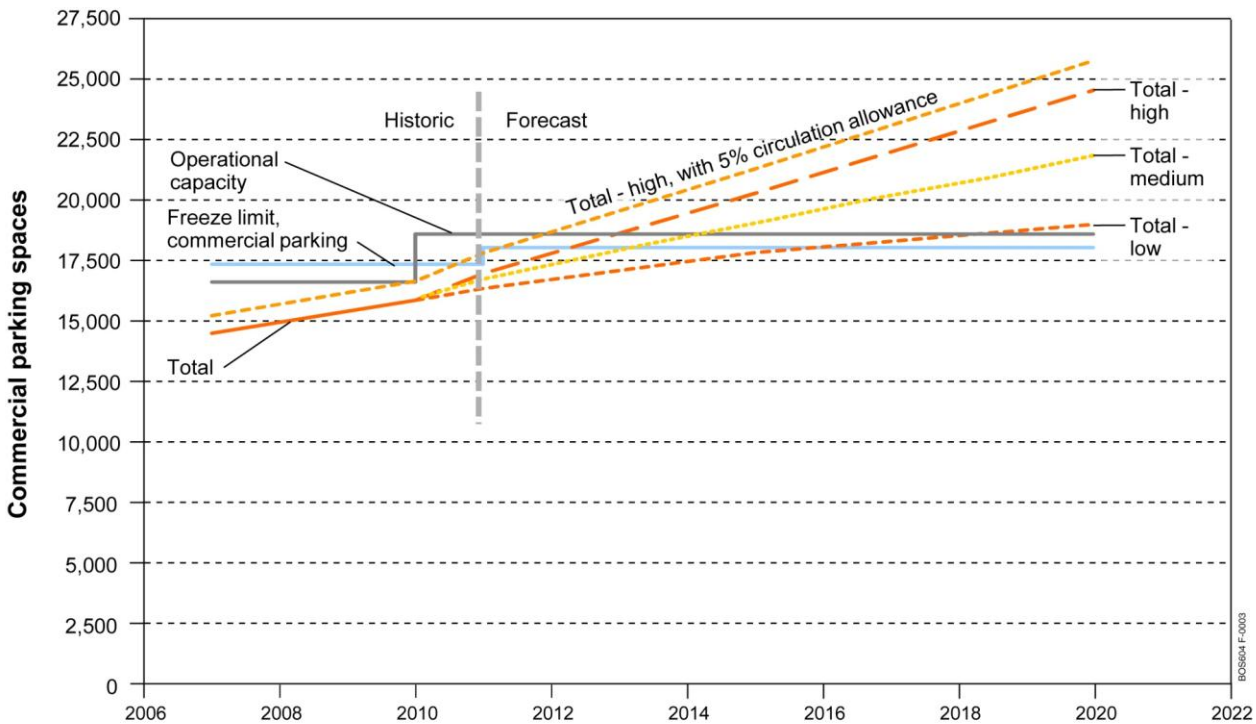
Future Parking Demand and Conditions Under Constrained Parking

According to research conducted for Massport, Logan Airport is already the only airport in the country where a traveler may not find a parking space of their choice on the Airport.[18] As described in the 2011 parking assessment summarized earlier in this chapter, on many weeks in 2011 and 2012, vehicles were periodically diverted from Central Parking to Economy Parking or Terminal E Lot 3. Early indications suggest that peak-day demand has not dampened since the March 2012 parking rate increases for on-Airport parking. However, parking demand may have decreased for non-peak days, such as Fridays and Saturdays.

With the Logan Airport Parking Freeze (and thus current capacity levels) remaining in place, demand will soon outpace supply on a regular basis. By 2014, if trends continue, parking demand will exceed available capacity on over half of the weeks of the year. With overflow conditions becoming such a regular occurrence, the ratio of growth in overall parking demand may begin to wane, but parking space utilization early in each week will remain at high levels. Under such conditions, travelers arriving at the Airport to park on Tuesdays and Wednesdays would find themselves unable to park their cars on Airport. The demand would simply exceed the available on-Airport spaces. Figure 5-13 illustrates the projected trend under three growth scenarios.

18 LeighFisher, August 2011.

Figure 5-13 Commercial Parking Forecast: "Design Day" Capacity Requirements



Source: LeighFisher, October 2011.

Although the uncertainty of on-Airport parking availability will lead some travelers to seek alternatives (modes, or perhaps airports), the share of HOV modes may not increase if the alternatives chosen are taxis and curbside drop-off by private vehicles. One model has indicated that this undesired behavior could occur: a predictive tool using elasticities between parking demand and pricing suggests that at higher parking rates three-quarters of those travelers who previously parked at the Airport for their flight would choose to be dropped-off at the curb (by taxi or private vehicle), and only a quarter of them would seek HOV/shared-ride modes.[19] Accordingly, private-vehicle travel and on-Airport VMT would increase under constrained parking supply or restrictive parking conditions.

Therefore, the challenge is how to influence a mode shift so that the passengers generating the excess parking demand are encouraged to use sustainable transportation modes (including public transit, high-occupancy vehicles (HOVs), and shared-ride services) rather than increase taxi and private vehicle drop-off and pick-up activity that would generate unacceptable levels of curbside congestion (and associated emissions). This is a key planning issue that Massport will address in future airport-wide planning efforts. Massport's longer-range ground access strategy will carefully consider both the parking constraint and new HOV initiatives.

19 LeighFisher parking demand modeling exercise, August 2011.

Historical Context and Trends

Historical trends are a useful way to assess how changes to the Logan Airport infrastructure affect ground transportation over time, however, they are based on projected future passenger levels and a status quo of all modes of access to the Airport. Therefore, 20-year projections of gateway volumes and VMT are not reliable enough to be used for transportation planning changes at this time.

A review of historical annual daily traffic volumes at the Airport gateways shows a moderate increase in traffic volume when compared to the projected increase in passengers. Since 1990, the number of annual air passengers has increased by about 20 percent, while gateway traffic has increased by 15 percent. By 2030, passenger levels are expected to increase by 45 percent, with a corresponding 29 percent increase in average daily traffic. This forecast assumes a constant mode share among the different modes providing ground transportation to/from the Airport. Table 5-13 summarizes historical and projected gateway Airport-related annual daily traffic.

Table 5-13 Gateway Airport-Related Annual Daily Traffic

Year	AADT	AWDT	AWEDT	Annual Air Passengers	Commercial Parking Spaces
1990	81,400	86,000	70,000	22,878,191	12,215
2000	95,058	101,446	78,358	27,412,926	14,090
2010	94,179	98,968	82,595	27,428,962	17,319
2030	**121,422**	**127,198**	**106,938**	**39,850,000**	

Source: Massport
Note: Parking spaces defined as commercial parking spaces allowed under the Logan Airport Parking Freeze.
AADT Annual average daily traffic.
AWDT Annual average weekday daily traffic.
AWEDT Annual average weekend daily traffic.

When comparing VMT, a 20 percent increase is projected in the 20-year period between 2010 and 2030 compared to the nearly 9 percent decrease realized over the past 10 years (even as annual air passenger levels in 2000 and 2010 were about the same). This VMT projection reflects air passenger level growth while minimizing increases in VMT due to improved terminal roadway connections and reduced on-Airport rental car company shuttle bus activity expected in the future. While the high 8-hour and average weekday VMT are higher in 2030, it is interesting to note that morning and evening peak hour VMT levels are approximately what they were historically in 2000 and 2001. This is attributed to the spreading of peak passenger arrival and departure at the Airport. Table 5-14 summarizes historical and project VMT for Airport-related traffic.

Table 5-14 Vehicle Miles Traveled (VMT) for Airport-Related Traffic

Analysis Year	Morning Peak Hour	Evening Peak Hour	High 8-Hour	Average Weekday
1990	5,700	7,700	50,100	104,500
2000	11,213	13,252	85,823	178,798
2010	8,451	10,887	78,185	162,885
2030	**10,099**	**14,273**	**90,843**	**195,762**

Source: Massport

Roadway Infrastructure: Changes since 1990

Significant changes have been made to the Airport's roadway infrastructure since 1990. In 1990, all Airport access was provided from Route 1A. A simple loop roadway provided terminal access along either side of East Boston Stadium. Terminals A and E were smaller, with large parking areas in front; and the Airport did not have separate arrival and departure levels. The Hilton Hotel was in a different location and the Hyatt Hotel and West Garage had not yet been constructed.

By 2000, major construction of the Logan Modernization project was underway and construction of the Central Artery/Tunnel project (CA/T) was mostly complete; both efforts were completed by mid-decade. The TWT, which had opened in 1995 only to authorized commercial vehicles, was now open for general traffic use on weekends, holidays, and off-peak times (as well as to certain authorized users at any time). In addition to providing a new way of accessing Route 1A, the TWT quickly became the primary gateway of access to the Airport. Furthermore, construction of the relocated Hilton Hotel, Hyatt Conference Center, and the West Garage was complete. Construction on the new MBTA Airport Station, Terminal E, and elevated walkways to Terminals B and C was underway. The current terminal roadway infrastructure was also mostly complete, although unopened to traffic. Plans to demolish Terminal A and connecting roadways were underway and set to begin reconstruction in the summer of 2002.

In 2010, the CA/T and Logan Modernization projects were complete. The infrastructure serving Airport access and supporting Airport operations is now immensely different from 1990, with the majority of the original loop roadway demolished. All Airport terminals now have separate arrival and departure levels and the more intricate, complex roadway system allows for better circulation between terminals and other Airport facilities, reducing VMT within the Airport limits. Moreover, consolidation of most surface Economy and overflow lots was completed in 2011, with the opening of the Economy Parking Garage.

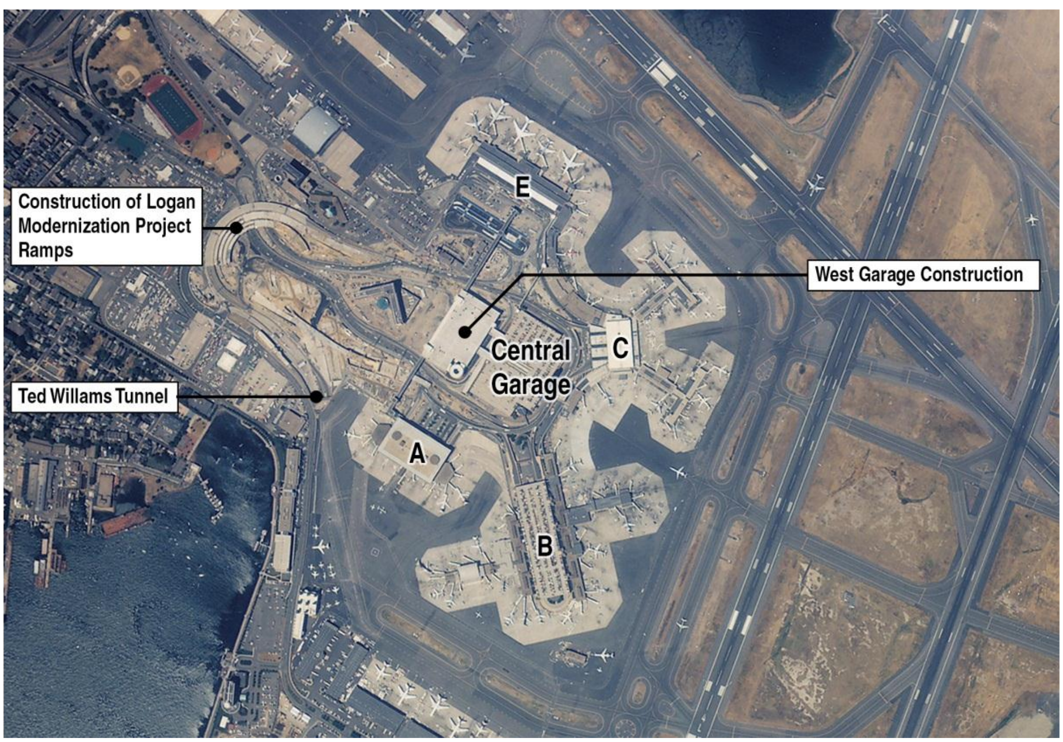
Figure 5-14 provides historic aerial references and key changes to the Logan Airport roadway network for the years described above.

Future Roadway and Infrastructure Projects

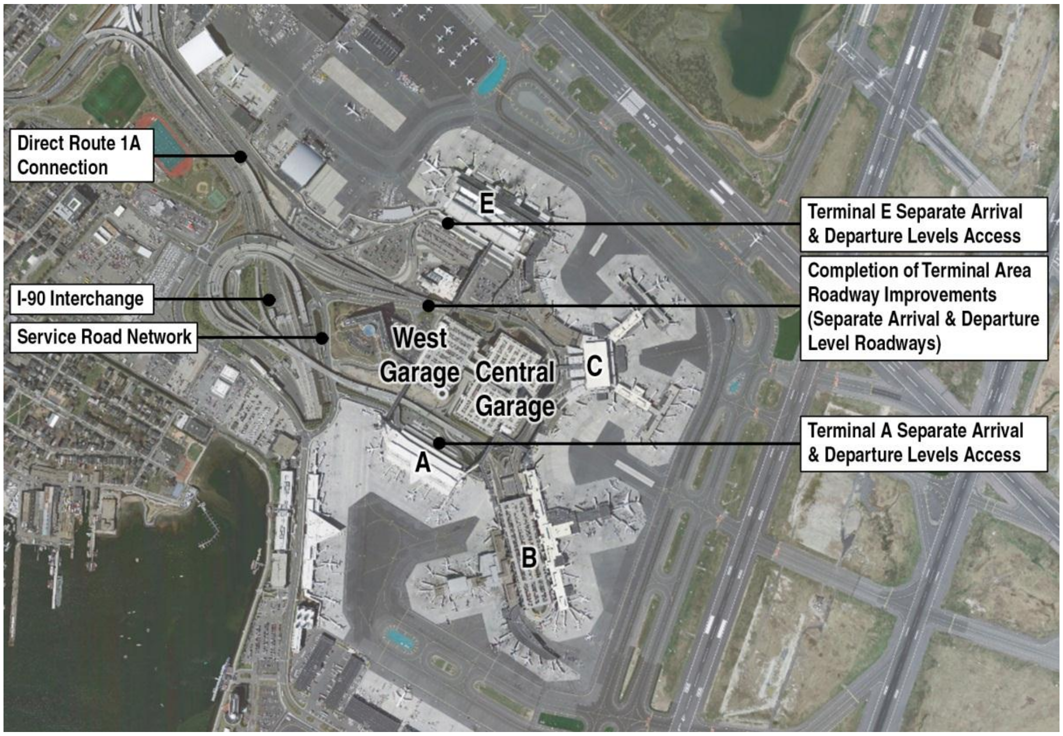
Although no major roadway changes are currently planned between now and 2030, Massport will be advancing a series of curb infrastructure improvements that will improve operations, HOV access, curb utilization, reduce curb dwell times, customer service, safety, and the environment beginning later in 2013. In addition, several additional projects that affect Airport traffic and circulation have recently been completed. Additional projects that are expected to be completed in the near future include: Terminal B improvements; improved connections between Terminals C and E; the SWSA Redevelopment; the relocation of the taxi and limousine pool; the East Boston- Chelsea Bypass Project; and the North Service Area Roadway Corridor project. The West Concourse at Terminal E is expected to be completed by 2030. Through these projects, Massport continues to improve efficiency on the Airport roadway system while minimizing Logan Airport's impacts off-Airport.

Figure 5-14 Logan Airport Roadway Network Changes, 1990-2010

1990



2000



2010 (Today)

Source: Massport

Ground Access Goals

Several elements of Massport's sustainability initiatives are reflected in the ground access planning activities, which are primarily aimed at reducing reliance on automobile modes by passengers, employees and other Airport users. These measures include:

- Provide, promote, and support HOV/shared-ride and non-motorized modes;
- Support and actively participate in the Logan TMA; and
- Improve terminal curbside access for HOV/shared-ride and non-motorized modes.

Table 5-15 lists each ground access goal and updates Massport's initiatives associated with each goal. Initiatives are planned, designed, implemented and continuously refined to account for the changing national, regional and local environments that affect Logan Airport and its users.

Table 5-15 Ground Access Planning Goals and Progress

Goal	2011 & 2012 Update
Increase air passenger ground access (high-occupancy vehicle) HOV mode share to 35.2 percent by the time Logan Airport accommodates 37.5 million annual air passengers	The *2010 Logan Airport Air Passenger Ground Access Survey* revealed that 30 percent of air passengers use HOV/shared-ride modes to access the Airport. Massport continues to provide and actively promote numerous HOV/shared-ride options to air passengers, including Logan Express bus service, the Silver Line, water shuttle service, and frequent, free shuttle bus service to and from the Massachusetts Bay Transportation Authority (MBTA) Blue Line rapid transit Airport Station. Massport is investigating ways to increase HOV mode share. In early 2012, Massport lowered its parking rates at the Logan Express sites in order to encourage use of the HOV/shared-ride service; early indications are showing increases in ridership. Also in early 2012, Massport increased its advertising and marketing of Logan Express and public transportation access to Logan Airport. This included radio ads, online banner ads, and ads in MBTA subway stations. In the summer of 2012, Massport partnered with the MBTA to offer free boardings of the Silver Line bus at the Airport; this pilot program will be evaluated to assess the effectiveness in increasing MBTA ridership, among other performance measures. Next-bus arrival digital dynamic signs have been added to the Terminal curb bus stops for the Silver Line, and are expected to later include Logan Express and other buses. Massport has taken a fresh look at wayfinding for ground transportation (with an emphasis on public transportation) within the terminals, resulting in enhanced directional signs in the terminals for arriving air passengers.
Reduce employee reliance on commuting alone by private automobile	Massport continues to fully support the Logan Transportation Management Association (TMA) with $65,000 annually (no dues are collected from Airport employers). Massport has also partnered with the Massachusetts Department of Transportation's (MassDOT) MassRIDES program, for further support of the Logan TMA coordinator. Massport uses funds from the Logan TMA to operate the early morning Sunrise Shuttle serving East Boston. In 2010, Massport and the Logan TMA successfully obtained Job Access and Reverse Commute (JARC) grant funding administered by the Federal Transit Administration to start a second Sunrise Shuttle route; this new service launched in the fall of 2011. For employees who reside in neighborhoods and communities closer to the Airport, bicycle parking options have increased with the installation of bicycle racks at Terminal E, the Economy Garage, and the Green Bus Depot in 2012. Additional racks are located at Terminal A, the Logan Office Center, and the Signature general aviation terminal. Racks are also planned for the new consolidated rental car facility (ConRAC) in 2013. Massport is also investigating ways to improve bicycle access to Logan Airport facilities, in addition to the infrastructure already planned/under-construction for the ConRAC.

Table 5-15 Ground Access Planning Goals and Progress (Continued)	
Goal	**2011 & 2012 Update**
Increase the overall efficiency of the metropolitan transportation system through interagency coordination	Massport participates in the Metropolitan Planning Organization (MPO) to promote planning and funding of transportation system options that enhance access to the Airport. Massport and the MBTA have worked together on several initiatives including the renovated Blue Line Airport Station and the Silver Line service to Logan Airport. Following MassDOT's acquisition of a critical rail right-of-way, Massport constructed the East Boston-Chelsea bypass road (formally named Martin A. Coughlin Bypass Road), which adds an important roadway link to the Logan Airport ground access network. The road enhances both transit and commercial vehicle access to the Airport while reducing traffic and emissions in local East Boston neighborhoods. (The road opened to traffic in November of 2012.)
Improve management of on-Airport ground access and infrastructure through technology	Massport disseminates ground access and parking information through the Internet (www.massport.com), social media (Twitter and Facebook), a toll-free telephone number (1-800-23-LOGAN), Smartraveler, and in-Airport kiosks. Massport's redesigned website has an interactive tool that helps users access Logan Airport, while providing multimodal options.[20] Massport is designing a Ground Transportation Operations Center (GTOC) to be located in the new Consolidated Rental Car facility; this GTOC will incorporate state-of-the-practice intelligent transportation system (ITS) features for managing the unified shuttle bus system as well as other ground transport operations. In 2012, Massport began an evaluation of a Digital Passenger Information Program (DPIP). An objective of the program is to deploy digital signs to help customers with wayfinding in (and between) the terminals, including wayfinding to curbside transportation. The signs will provide flight information, ground transit/transportation information (including real-time bus arrivals for Logan Express and Silver Line buses), and assist with meeting some ADA goals of the Airport for visual paging. In 2012, Massport completed the development of its first mobile device-optimized website. The website, http://m.massport.com, offers Logan Airport-specific content reformatted for a small screen mobile device. Content includes information on flights, ground transportation, concessions, and parking. An improved mobile-optimized site is planned for release in 2013, which will include added features such as geo-aware wayfinding and improved ground transit functionality.
Provide adequate, long-term parking within the limits of the Logan Airport Parking Freeze	Massport consolidated several smaller overflow lots into a two-deck parking structure at the former Robie parcel. The Economy Parking Garage facility fully opened in March 2011. (The total number of parking spaces at the Airport remains within the Logan Airport Parking Freeze. Refer to the comprehensive discussion of parking allocations in this chapter and shown in Table 5-4.)

Source: Massport

20 Massport, GetUthereApp, www.massport.com/massport/gtu/Pages/default.aspx.

6

Noise Abatement

Introduction

The Massachusetts Port Authority (Massport) strives to minimize the noise effects of Logan Airport operations on its neighbors through the use of a variety of noise abatement programs, procedures, and other tools. Logan Airport has one of the most extensive noise abatement programs of any airport in the nation. Massport's comprehensive noise abatement program includes residential and school sound insulation programs; flight tracks designed to optimize over-water operations (especially during nighttime hours); and preferential runway use goals. The foundation of Massport's program is the *Logan Airport Noise Abatement Rules and Regulations*[1] (the Noise Rules), which have been in effect since 1986. Massport's Noise Abatement Office is responsible for implementing noise abatement measures and generally monitoring community complaints and other aspects of the noise effects from Logan Airport operations.

This chapter describes predicted noise conditions at Logan Airport related to operations during 2011 and compares the findings to those for 2010 and anticipated future conditions in 2030. This *2011 Environmental Status and Planning Report (ESPR)* provides an opportunity to revisit previous forecasts completed in 2004 and update them based on current and predicted conditions. Massport's updated forecast is for the long-range planning horizon, 2030. As such, the 2030 noise analyses are based on the likely aircraft operations and fleet mix in 2030. ESPRs, which provide a comprehensive, cumulative analysis of noise conditions at Logan Airport, are completed roughly every five years and Environmental Data Reports (EDRs) are completed annually. There will be opportunities to revisit the 2030 forecast based on the most current data available at the next ESPR cycle if necessary. For further information on the development of the 2030 long-range forecast, refer to *Chapter 2, Activity Levels.*

Noise conditions for 2011 were assessed primarily through computer modeling, supplemented by the analysis of measured noise levels from Logan Airport's noise monitoring system. The chapter presents summaries of the operational data used in the noise modeling, as well as the resultant average annual Day-Night Sound Level (DNL) noise contours, a comparison of the modeled results with measured levels from the noise monitoring system, and estimates of the population residing within various increments of noise exposure. Analyses also include a number of supplemental noise metrics including Logan Airport's Cumulative Noise Index (CNI) and reporting on the time above (TA) various threshold sound levels and periods of dwell and persistence of noise levels. Massport's progress on implementing noise abatement measures also is presented.

1 *Logan Airport Noise Abatement Rules and Regulations* are codified at 740 CMR 24.01 et seq.

This chapter also reports on noise conditions developed for the most recent long-range forecast (2030) developed for Logan Airport. Levels of operations from the forecast and future runway use developed from Federal Aviation Administration (FAA) long term simulation modeling are reported. Computer modeling was used to develop a set of DNL noise contours for 2030. This long term forecast and modeling provides a good outlook of the future noise environment. The 2030 noise results are compared to 2011 and 2000, which is the last year Logan Airport had operational levels above 1,300 operations per day. This DNL contour is also presented with DNL contours from each decade since 1980 to show a historical context.

Appendix H, Noise Abatement provides historical details of operations, runway use, the sound insulation program and noise exposed population back to 1990. The appendix also contains the Flight Track Monitoring Report for 2011 and a Fundamentals of Acoustics and Environmental Noise section, which gives an introduction to key noise issues and terminology for the general reader.

Key Findings

In 2011, the following changes occurred in the airport and noise environment:

- Annual aircraft operations increased from 352,643 in 2010 to 368,987 in 2011 (4.6 percent increase) with commercial operations increasing by only 0.8 percent and an increase in general aviation (GA) operations responsible for the remaining increase. GA operations almost doubled from 2010 from 14,682 operations in 2010 to 28,230 operations in 2011. GA operations are recovering from the large declines experienced over the past two years and are returning to average levels at the Airport. GA operations still represent only a small percentage (7.7 percent) of total operations at Logan Airport.
- The number of aircraft operations in 2011 remained well below historic peak levels (1,396 operations per day in 1998). Since 2000, the number of aircraft operations has declined 25.4 percent (from 1,355 operations per day in 2000 to 1,011 operations per day in 2011) while passenger levels have reached a new peak. Daily operations in 2011 averaged approximately 1,011 operations per day compared to approximately 966 operations per day in 2010.
- Compared to 2010, the 2011 DNL decibel (dB) contours were smaller in East Boston and over Boston Harbor toward Hull. The DNL 65 dB contour was slightly larger in Revere, South Boston, and in most of Winthrop for 2011. There are several factors that influenced the contour changes, including:
  - Runway 15R-33L, which is the nighttime noise abatement runway, was temporarily closed from July through September and during the daytime in June, October and November of 2011 to allow for construction of the enhanced Runway 33L Runway Safety Area (RSA). 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.
  - During the Runway 15R-33L closure period, night operations primarily used Runway 22R and Runway 9 for departures and Runway 4R and 22L for arrivals.
  - The Runway 15-33L closure resulted in the reduction in noise levels in East Boston and the slight increase in noise levels in Revere and Winthrop.

- The overall number of people exposed to DNL values greater than 65 dB increased to 3,947 people in 2011 from 3,830 people in 2010 (an increase of 117 people).[2] The number of people residing within the DNL 70 dB contour remained at 130 people. These levels are well below the numbers 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.
- The 2011 CNI of 152.1 Effective Perceived Noise Decibels (EPNdB) remained well below the cap of 156.5 EPNdB established under Massport's noise regulations. This small increase from the 2010 level is due to a small increase in overall operations and a small increase in nighttime operations.
- In 2011, Massport provided sound insulation to 114 homes, 84 percent of which were in Chelsea. The focus of the program in Chelsea was to fulfill federal and state mitigation commitments related to the opening of Runway 14-32. Since the inception of Massport's residential sound insulation program (RSIP), 11,333 homes have received sound insulation treatment in East Boston, South Boston, Winthrop, Revere, and Chelsea.
- 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 2011 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.

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, were fully in use in 2011. 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.[3] The Runway 33L departure is the last RNAV procedure to be implemented. FAA completed an Environmental Assessment (EA) in January 2013, and the comment period for the EA was extended to March 15, 2013 (from February 15, 2013), with a 6-month reevaluation of the RNAV. All other major Logan Airport runways that are capable of accommodating RNAVs have been implemented by the FAA and are in operation today.
- The 2011 Flight Track Monitoring report in *Appendix H, Noise Abatement* shows that over 98 percent of shoreline crossings are by aircraft above 6,000 feet, reflecting a slight increase from 2010. The average altitude from 2010 to 2011 increased 790 feet to 11,508 feet above mean sea level (MSL).
- The recent changes to the Runway 27 departure procedure and aircraft technology improvements have improved the compliance with the Runway 27 Record of Decision (ROD). The FAA has determined that no further evaluation is needed.[4] Massport will continue to monitor and publish compliance with the procedure in the annual Flight Track Monitoring Report in the EDRs and ESPRs. The visual approach procedure (Light Visual Approach) to Runway 33L which began during the summer of 2009, continued in 2011. 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.

2 Population data was derived from the most recent 2010 United States (U.S.) Census.
3 For more information, visit the Boston Logan Airport Noise Study (BLANS) Website at www.bostonoverflightnoisestudy.com/index.aspx.
4 FAA Rwy 27 Advisory Committee Meeting Notes 01/23/12; published March 5, 2012.

Based on the 2030 forecast of aircraft operations and expected aircraft fleet mix, the following conditions are expected in 2030:

- There is forecast to be a larger number of operations and a higher percent jet fleet than in 2011. The higher level of operations is not a capacity challenge as the Airport has operated in the past with over 1,300 operations per day. For example, there were 1,355 operations per day in 2000 when there were only five runways instead of the current six.
- The 2030 fleet mix consists of 81 percent commercial jets whereas the 2011 fleet mix consists of 78 percent commercial jets. The 2000 fleet mix had a lower proportion of commercial jets at 62 percent of the fleet.
- Total operations are expected to increase by 29 percent or 290 operations per day from 2011 to 2030, from 1,011 operations per day in 2011 to 1,301 operations per day in 2030. Compared to 2000, which is the last year that Logan Airport had over 1,300 daily operations, 2030 is forecasted to have 54 fewer daily operations (1,355 in 2000 and 1,301 in 2030). Daytime commercial operations are projected to increase by 254 operations per day from 819 in 2011 to 1,073 in 2030, however this is still fewer than the 1,142 daytime operations in 2000. Nighttime commercial operations are projected to increase from 114 in 2011 to 154 in 2030. This is an increase compared to 2000 when 126 daily operations occurred at night.
- Daytime GA operations are projected to decrease slightly from 71 per day in 2011 to 67 per day in 2030 (a decrease of 6 percent) and nighttime GA operations are projected to also decrease slightly from 6.7 in 2011 to 6.5 in 2030 (a decrease of 3 percent). In 2000, daytime GA operations were significantly higher at 82 daily operations with nighttime GA daily operations slightly lower at 5.7 operations.
- The 2030 forecast assumes the continued use of the highest capacity runway configurations (Runway 4L and 4R for arrivals and Runway 9 for departures and Runway 27 for arrivals and Runway 22L and 22R for departures) consistent with today's runway use. The same higher capacity runway combinations were used in 2000 (78 percent of the arrivals used Runways 4L, 4R, 22L and 27 with 68 percent of the departures on Runways 9, 22L and 22R).
- The 2030 operations forecast produced a larger set of DNL noise contours with the number of people exposed to noise levels greater than DNL 65 dB increasing from 3,947 in 2011 to 12,211 people in 2030. This is still significantly fewer than the number of people exposed in 2000 (17,745 people). The number of people within the DNL 70 dB is also projected to increase from 130 in 2011 to 352 people in 2030 but still remaining well below the 1,551 people within the DNL 70 dB in 2000. All of the residences within the forecasted 2030 DNL 65 dB contour are in areas where Massport has implemented its sound insulation program.

Noise Metrics

The common metrics used to describe and evaluate aircraft noise in this chapter are:

- The Decibel (dB) – The standard unit of measure for sound. It is a logarithmic quantity reflecting the ratio of the pressure of the sound source of interest and a reference pressure. This logarithmic conversion of sound pressure to sound pressure level results in a sound pressure level of about zero dB for the quietest sounds that one can detect and sound pressure levels of about 120 dB for the loudest sounds we can hear without pain. Many sounds in our daily environment have sound pressure levels on the order of 30 to 100 dB.
- The Day-Night Average Sound Level (DNL) – A measure of the cumulative noise exposure over a 24-hour day. It is the 24-hour, logarithmic (or energy) average, A-weighted sound pressure level with a 10 dB penalty applied to the nighttime event levels that occur between 10:00 PM and 7:00 AM. The DNL is the FAA-defined metric for evaluating noise and land use compatibility.

- Time-Above a Specified Level (TA) – The TA metric describes the total number of minutes that instantaneous sound levels (usually from aircraft) are above a given threshold. For example, if 65 dB is the specified threshold, the metric would be referred to as "TA65." The TA metric is typically associated with a 24-hour annual average day but can be used to represent any time period. Any threshold may be chosen for the TA calculation. For this study, TA65, TA75, and TA85 were computed at each of the monitoring sites.
- Effective Perceived Noise Level (EPNL) – A time series of "tone corrected" perceived noise levels are used to compute EPNL which is expressed in units of EPNdB. The tone corrected perceived noise level is determined by measuring the perceived noise level and adding to that value a "pure-tone" correction of up 6 dB. The EPNL is an international standard for the noise certification of aircraft and is used in this report in the calculation of the CNI.

Regulatory Framework

FAR Part 36

Logan Airport operates within a framework of federal aviation regulations that limits an airport operator's ability to control noise. For example, the FAA's Federal Aviation Regulation (FAR) Part 36[5] sets noise limits for aircraft certification and the procedures by which aircraft noise emission levels must be measured to determine compliance. The regulation defines noise emission limits for turbojets, turboprops, and helicopters, classifying turbojets into categories referred to as stages based on noise levels at each of three locations: takeoff, landing, and to the side of the runway during takeoff (sideline). The stages are:

- Stage 1 aircraft are the oldest and usually have the loudest operations, having preceded the existence of any noise emission regulation. Rare examples include old, restored civil or military aircraft. There are no Stage 1 aircraft operating at Logan Airport.
- Stage 2 aircraft are less old and less noisy than Stage 1; they were the first aircraft types required to meet a noise limit. A subsequent regulation, FAR Part 91 (described in the next section), prohibits the operation of a Stage 2 aircraft in the continental U.S. unless its takeoff weight is 75,000 pounds or less. The FAA Reauthorization bill of 2012 also mandates the phase out of Stage 2 aircraft with a takeoff weight less than 75,000 pounds by 2015. Less than 0.1 operations per day (approximately 33 operations) occurred at Logan Airport in 2011.
- Stage 3 aircraft were certified for service before 2006 and have relatively quiet jets, although some are Stage 2 aircraft that have been re-engined or have been fitted with hushkits which enable them to meet Stage 3 noise limits.
- Stage 4 aircraft are the newest and quietest of the jets. These aircraft will be required to operate with noise levels at least 10 dB quieter than Stage 3 aircraft at three prescribed measurement points. Jet aircraft certificated after January 1, 2006 must meet the Stage 4 limits. Although not required, the majority of aircraft in the 2011 Logan Airport fleet would also meet the new Stage 4 noise limits if they were recertificated.

5 14 CFR Part 36, "Noise Standards: Aircraft Type and Air Worthiness Certification."

FAR Part 150

First implemented in February 1981, FAR Part 150[6] defines procedures that an airport operator must follow if it chooses to conduct and implement an airport noise and land use compatibility plan. Part 150 Noise Compatibility studies require the use of DNL to evaluate the airport noise environment. FAR Part 150 identifies noise compatibility guidelines for different land uses depending on their sensitivity. Key values include a DNL of 75 dB, above which no residences, schools, hospitals, or churches are considered compatible, and a DNL of 65 dB, above which those land uses are considered compatible only if they are sound insulated.

Noise abatement or mitigation measures that an airport operator must consider in a Part 150 study include acquisition of incompatible land, construction of noise barriers, sound insulation of buildings, implementation of a preferential runway program, use of noise abatement flight tracks, implementation of airport use restrictions, and any other actions that would have a beneficial effect on the public.

While Massport has implemented variations of all of these and additional measures at Logan Airport, Massport has not filed an official Part 150 noise compatibility study with the FAA because all of Logan Airport's program elements, while regularly reviewed and updated, preceded the promulgation of Part 150 and are effectively grandfathered under the regulation.

FAR Parts 91 and 161

The Airport Noise and Capacity Act of 1990 (ANCA)[7] directed the U.S. Secretary of Transportation to undertake three key noise-related actions:

- Establish a schedule for a phase out of Part 36 Stage 2 aircraft by the year 2000;
- Establish a program for FAA review of all new airport noise and access restrictions limiting operations of Stage 2 aircraft; and
- Establish a program for FAA review and approval of any restriction that limits operations of Stage 3 aircraft, including public notice requirements.

The FAA addressed these requirements through amendment of an existing federal regulation, "Part 91,"[8] and establishment of a new regulation, "Part 161."[9] ANCA effectively ended Massport's pursuit of any additional operational restrictions outside of this program.

Amendment to Part 91

The FAA establishes and regulates operating noise limits for civil aircraft operation in Subpart I, "Operating Noise Limits," of 14 CFR Part 91, "General Operating and Flight Rules." The noise limits are based on aircraft noise certification criteria set forth in 14 CFR Part 36, "Noise Standards: Aircraft Type and Airworthiness Certification." For transport category "large" aircraft (with maximum takeoff weights of 12,500 pounds or more) and for all turbojet-powered aircraft, Part 36 identifies four "stages" of aircraft with respect to their relative noisiness:

- Stage 1 aircraft, which have never been shown to meet any noise standards, because they have never been tested, or because they have been tested and failed to meet any established standards;
- Stage 2 aircraft, which meet original noise limits, set in 1969;
- Stage 3 aircraft, which meet more stringent limits, established in 1977; and

6 14 CFR Part 150, "Airport Noise Compatibility Planning."
7 Pub. L. No. 101-508, 104 Stat. 1388, as recodified at 49 United States Code (U.S.C.) 47521- 47533
8 14 CFR Part 91, "General Operating and Flight Rules".
9 14 CFR Part 161, "Notice and Approval of Airport Noise and Access Restrictions".

- Stage 4 aircraft, which meet the most stringent limits, established in 2005.

In 1976, the FAA ordered a phase out of all Stage 1 aircraft with a maximum gross takeoff weight (MGTOW) over 75,000 pounds, to be completed on January 1, 1985. After that date, Stage 1 civil aircraft over 75,000 pounds MGTOW were banned from operating in the U.S. (with limited exemptions related to commercial service at "small communities," which has since expired in 1988). ANCA required a similar phase out of Stage 2 aircraft over 75,000 pounds by December 31, 1999. The 75,000 pound weight limit exempts most "business" (or "corporate") jets and a very small number of the very smallest "air carrier" type jets until December 31, 2015 when a full ban will take effect.[10] Aircraft operators responded to the Stage 1 and 2 phase outs by retiring their non-compliant aircraft or modifying some of their aircraft to meet the more stringent standards. The modifications undertaken include installation of quieter engines, noise-reducing physical modifications to the airframe and/or existing engines, and limitation of operating weights and procedures so as to meet the applicable Part 36 limits. Some former Stage 2 airline aircraft that were "recertificated" as Stage 3 with these modifications still operate at Logan Airport, but are generally declining due to the aircrafts' age and high operating costs (in particular due to the generally low fuel efficiency of these older aircraft).

Part 161

FAA implemented the ANCA requirements related to notice, analysis, and approval of use restrictions affecting Stage 2 and 3 aircraft through the establishment of a new regulation, 14 CFR Part 161, "Notice and Approval of Airport Noise and Access Restrictions." In simple terms, Part 161 requires an airport operator that proposes to implement a restriction on Stage 2 or 3 aircraft operations to undertake, document, and publicize certain benefit-cost analyses, comparing the noise benefits of the restriction to its economic costs. Operators must obtain specific FAA approvals of the analysis, documentation, and notice processes, and – for Stage 3 restrictions – approval of the restriction itself.

Part 161 and ANCA define more demanding requirements and explicit guidance for Stage 3 restrictions. To implement a Stage 3 restriction, formal FAA approval is required. The FAA's role for Stage 2 restrictions is limited to commenting on compliance with Part 161 notice and analysis procedural requirements. Part 161 provides guidance regarding appropriate information to provide in support of these findings. While Part 161 does not require this information for a Stage 2 restriction, Part 161 states that it would be "useful." Moreover, the FAA has required airports to provide this same information for Stage 2 restrictions (and even for Stage 1 restrictions pursued under FAR Part 150), on the grounds that they are required for airports to comply with grant assurance 22(a), "Economic Nondiscrimination," which states that an airport operator "will make its airport available as an airport for public use on fair and reasonable terms and without unjust discrimination to all types, kinds, and classes of aeronautical use."[11]

Although several (on the order of a dozen) airports have embarked on efforts to adopt both Stage 2 and 3 restrictions in the past two decades, the FAA has found that only one, Naples Municipal Airport, a GA airport in Naples, Florida, has fully complied with Part 161 analysis, notice, and documentation requirements for a ban on Stage 2 jet operations. FAA found the airport was in violation of prior FAA grant assurances. The airport operator successfully sued the FAA to overturn that ruling and has implemented the restriction.

ANCA and Part 161 specifically exempt Stage 3 use restrictions that were effective on or before October 1, 1990 and Stage 2 restrictions that were proposed before that date. The Logan Airport Noise Rules were

10 The FAA Modernization and Reform Act of 2012 sets a January 1, 2016 ban of Stage 2 aircraft less than 75,000 lbs.

11 FAA Order 5196, "Airport Compliance Requirements," Chapter 4, Section 2, paragraph 4-8f states that to satisfy this grant assurance requirement: Airport use restrictions: (1) must be reasonably consistent with reducing noncompatibility of land uses around the airport; (2) must not create an undue burden on interstate or foreign commerce; (3) must not be unjustly discriminatory; (4) must not derogate safety or adversely affect the safe and efficient use of airspace; (5) meet both local needs and the needs of the national air transportation system to the extent practicable; and (6) must not adversely affect any other powers or responsibilities of the FAA Administrator prescribed by the law or any other program established in accordance with the law.

promulgated in 1986; therefore, ANCA and Part 161 have no bearing on their continued implementation in their current form. Any future proposals to make the rules more stringent with regard to Stage 2 operations or to restrict Stage 3 operations in any way would almost certainly trigger Part 161 notice, analysis, and approval processes for Stage 3 restrictions. In 2006, Massport requested an opinion from the FAA regarding the pursuit of a Part 161 waiver or exemption to allow Massport to implement a curfew of nighttime operations of hush-kitted Stage 3 aircraft. FAA informed Massport that a waiver or exemption from the requirements of Part 161 is not authorized under, or consistent with, federal statutory and regulatory requirements. A copy of FAA's letter to Massport was provided in *Appendix H, Noise Abatement* of the *2005 EDR.*

Logan Airport Noise Abatement Rules and Regulations

Massport's primary mechanism for reducing noise impacts from Logan Airport's operations is the Noise Rules. The Noise Rules were designed to reduce noise impacts by encouraging use of quieter aircraft by requiring decreased use of noisier aircraft and by limiting nighttime activity by louder Stage 2 types. Many secondary goals aimed at limiting noise in specific areas also were stated.

Specific provisions of the Noise Rules, which continue to serve these goals, include:

- Limiting cumulative noise exposure at Logan Airport (as measured by Massport's CNI) to a maximum of 156.5 EPNdB;
- Maximizing use of Stage 3 aircraft;
- Restricting nighttime operations by Stage 2 aircraft;
- Placing limitations on times and locations of engine run-ups and use of auxiliary power units (APU); and
- Restricting use of certain runways by noisier aircraft and time of day.

Noise Modeling Process

The DNL, CNI, and TA noise metrics reported annually by Massport provide various means of interpreting and comparing Logan Airport's complex noise environment from one year to the next. The noise context is influenced by numbers of operations, types of aircraft operating during the day and at night, use of various runway configurations, and the location and frequency of use of flight paths to and from the runways. Changes in any one of these operational parameters from one year to the next can cause changes in the values of the noise metrics and alter the shapes of the noise exposure contours that represent the accumulation of noise events during an average day.

Massport continues to make use of state-of-the-art improvements in the noise modeling process, which has been updated each year. These developments in noise modeling technologies and techniques, which were first employed in the preparation of the *2005 EDR*, and have continued through this *2011 ESPR,* include:

- Continued use of the latest version update to the FAA's Integrated Noise Model (INM), while retaining the unique capability to account for over-water sound propagation and hill effects at Logan Airport. Massport's use of the latest FAA-approved version of the INM (INMv7.0c)[12] to model the 2011 noise conditions, along with additional provisions approved by FAA to accommodate the Airport's unique water and terrain characteristics that have been shown through earlier technical studies to affect sound

12 INM Version 7.0c was released in January 2011.

propagation into surrounding neighborhoods, has improved the modeling results. Logan Airport is the only airport in the world that incorporates these features into its approved modeling process.

- This *2011 ESPR* is the third year the AirScene.com data has been used for all aspects of the modeling process. The measured noise and the flight track data all come from the Massport (Noise and Operations Management System) NOMS.
- The flight operations data from the NOMS system includes more information with each flight record, such as aircraft registration numbers, wherever possible providing better INM aircraft type selection. This allows for the assignment of the modeled INM aircraft type based on the specific aircraft and engine combination used on each flight at Logan Airport during 2011.
- The modeling process includes continued use of U.S. Geological Survey (USGS) digital terrain data. INMv7.0c uses the detailed terrain data to evaluate each receptor location at its proper elevation, which enhances the accuracy of the results.
- Inputs to the modeling process include use of automated altitude profile and noise contour generation software. Massport purchased licenses to run two additional software packages, RealProfiles™ and RealContours™.[13] The *2004 ESPR* included a comparative analysis of the results of the standard INM modeling approach with RealProfiles™ and RealContours™.
  - RealContours™ automates the production of noise contours directly from every individual radar trace. Approximately 371,162 traces were collected from the system and 350,343 traces retained enough information to be modeled in the RealContours™ system. Each radar trace was converted to an INM model track, ensuring that the lateral dispersion of radar tracks was retained in the modeling. The operations on these radar traces were then scaled to account for all of the 368,987operations in 2011. This method also helps to develop more accurate noise contours by retaining the actual runway used and time of each operation.
  - RealProfiles™ analyzes each radar trace and automatically produces custom aircraft performance profiles using the INM aircraft database. The INM typically uses pre-defined profiles to "fly" each aircraft along the ground track. The custom profiles are designed to follow the actual flight of each aircraft allowing the INM to model each flight at its actual location on the ground and in the sky. Due to changes in the INM model (Airbus aircraft now have new arrival data to support RealProfiles™), many more arrival profiles are available for use with RealProfiles™. A total of 335,950 flight tracks (95.7 percent) used these specially designed profiles of which 174,700 (99.7 percent) of the available departure profiles and 161,250 (91.4 percent) of the available arrival profiles are profiles developed from the actual radar data.
- Accurate altitude modeling by using the aircraft performance profiles developed by RealProfiles™ from the radar data enhances the modeled noise results at each of the monitoring sites. This software incorporates the FAA-approved INMv7.0c as the computational engine for calculating noise, but provides greater detail through the uses of individual flight tracks taken directly from radar systems rather than relying on consolidated, representative flight tracks data.

RealContours™ improves the precision of modeling by:

- Directly converting the radar flight track for every identified aircraft operation to an INM track, rather than assigning all operations to a limited number of prototypical or representative tracks;

13 RealProfilesTM and RealContoursTM are methods to provide more accurate inputs to the INM but do not change or modify the algorithms of the FAA-required INM.

- Modeling each operation on the specific runway that it actually used, rather than applying a generalized distribution to broad ranges of aircraft types;
- Selecting the specific airframe and engine combination to model, on an operation-by-operation basis, based on the published composition of the fleets of the specific airlines operating at Logan Airport; and
- Using each aircraft's actual performance and altitude profile to develop inputs to the model which define the actual arrival or departure profile.

RealContours™ uses INMv7.0c to produce computations for each day of radar data and then compiles annual average noise exposure contours and supplemental metrics from each of the 365 days of computations. All of these enhancements are examples of Massport's continued commitment to improving the monitoring, reporting, and understanding the noise environment at Logan Airport. The following section of this chapter summarizes the basic operational data used to compute the DNL, CNI, and TA noise metrics reported for 2011.

Noise Model Inputs

The FAA's INMv7.0c was released for general use on January 3, 2011, and has been used for the *2010 EDR* and the *2011 ESPR* as the primary analytical tool to assess the noise environment at Logan Airport. A comparison of the enhancements between INMv7.0c, and the prior version of INM, INMv7.0b was included in the *2010 EDR*.

The INM requires detailed operational data as inputs for its noise calculations, including numbers of operations per day by aircraft type and by time of day, which runway for each arrival and for each departure, and flight track geometry for each track. These data are summarized in tables that follow or are included in *Appendix H, Noise Abatement.* The following section summarizes the average-day operations for 2011 used in the noise modeling and compares them to 2010 data. Operations and fleet mix assumptions for 2030 are described later in this chapter.

Fleet Mix

Since 2004, Massport has relied primarily on radar data as the main source of input for noise calculations, since radar data typically are more accurate than the information reported by air carriers. The radar data result in a list of approximately 500 different aircraft types that use Logan Airport during a year, including the wide variety of small corporate jets and propeller aircraft flown by GA users, as well as the large passenger and cargo jets operated by air carriers. For 2011, the aircraft types identified by the radar data were matched to the INMv7.0c database, which contains individual noise and performance profiles for 265 different fixed-wing aircraft types, 150 of which represent civilian aircraft, the balance being military aircraft.[14] For those aircraft recorded in radar data that are not in the INM's database, the radar type is paired with the best available alternative using a standard FAA-approved substitution list. The final list of modeled aircraft, used as an input to the INM, is presented in detail in *Appendix H, Noise Abatement*.

As in previous ESPRs and EDRs, operations by aircraft types have been summarized into several key categories: commercial (passenger and cargo) operations, Stage 2 or Stage 3 jet aircraft, and turboprop and propeller (non-jet) aircraft. Aircraft that meet Stage 4 jet requirements are also broken out from the Stage 3 jet aircraft data for 2010 and 2011. These Stage 4 aircraft are defined as aircraft certified as Stage 4 and all Stage 3 aircraft which, if recertified, would qualify as Stage 4 aircraft. FAA does not require aircraft to be recertified and there are no plans at this time to restrict Stage 3 operations. In addition, the operations are split into daytime and nighttime periods, where nighttime hours are defined as 10:00 PM to 7:00 AM, consistent with the definition of DNL. Table 6-1 summarizes the numbers

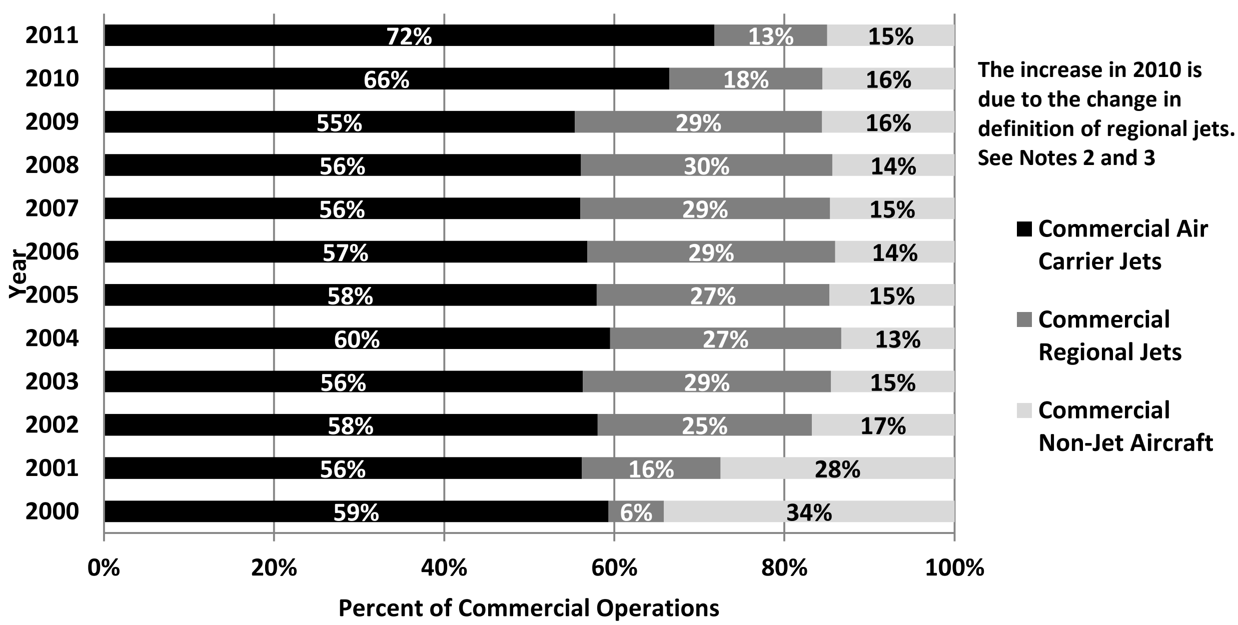
14 Some of these are military types as well as older Stage 1 and 2 airplanes that no longer operate in the U.S. or do not operate at Logan Airport. There are ordinarily no military aircraft operations at Logan Airport.

of operations by categories of aircraft operating at Logan Airport in 2011 and includes similar data for 2010 and prior years back to 2000. Data prior to 2000 are included in *Appendix H, Noise Abatement*.

Commercial Operations

Regional jets (RJs) are defined as those aircraft with 90 or less seats, consistent with the categorization in *Chapter 2, Activity Levels*.[15] For years prior to 2010, the RJs in this chapter were classified as aircraft with less than 100 seats. When RJs first started gaining popularity, the aircraft types available were typically 50 seats or less with the traditional air carrier jet being 100 seats and higher. As newer aircraft types have become available, the smaller 35 to 50 seat types have been replaced by 70 to 99-seat types, with the 90 and above seat types flying many of the traditional air carrier routes. The majority of the newer types fall into two categories: the 70 to 75-seat category which remain categorized as RJs, and the 91 to 99-seat category which are categorized as air carrier jets. The redefinition of the popular Embraer 190 at Logan Airport results in the increase of modeled air carrier jets to 66 percent in 2010 and 72 percent in 2011.[16] The air carrier jet increase was almost entirely offset by the decrease in RJs with all commercial jets increasing to 85 percent overall in 2011 (a 1 percent increase from 2010). Non-jet commercial operations decreased slightly at 15 percent of the overall commercial fleet. This change in definition of some of the commercial jet types does not affect the noise modeling results, simply how the attribution of noise sources are reported in the tables. Figure 6-1 presents the commercial operations groups in terms of percent of the total for each year. Figure 6-1 also shows the decrease in commercial non-jet operations after 2000 (34 percent of the fleet) and the rise of RJs, which were just 6 percent of the fleet in 2000 and increased to almost 30 percent of the fleet between 2003 to 2009.

Figure 6-1 Fleet Mix of Commercial Operations (Passenger and Cargo) at Logan Airport



Source: HMMH, 2011.
1 Includes both passenger and cargo operations.
2 After 2009, the split between Air Carrier Jets and RJs is 90 seats with RJs having less than 90 seats.
3 Prior to 2010, the split between Air Carrier Jets and RJs is 100 seats with RJs having less than 100 seats.

15 United States Code, 2006 Edition, Supplement 3, Title 49 – Transportation Subtitle VII – Aviation Programs Part A – Air Commerce and Safety, Subpart II, Economic Regulation, Chapter 417 - Operations or Carriers, Subchapter III - Regional Air Service Incentive Program, Sec. 41762 – Definitions – defines regional jet air carrier service to be aircraft with a maximum of 75 seats. Therefore, this *2011 ESPR* categorizes aircraft with 70-75 seats and below as regional jets and aircraft with 90 seats and higher aircraft as air carrier (Note: there are no types with 75 to 90 seats).

16 The CRJ-900 was identified as having over 90 seats in the *2010 EDR*, which has been corrected in this *2011 ESPR.*

Compared to 2010, the number of average daily operations (Table 6-1) indicates a modest increase in air carrier activity, with overall commercial traffic increasing by 0.8 percent in 2011. The continued shift of operations away from the smaller RJ aircraft continued in 2011 with an increase of 54.6 modeled operations per day and a large decrease in modeled RJ operations by 43.2 operations per day. However, the increase in air carrier jets was almost entirely offset by the decrease in RJs. The total commercial jet increase from 2010 to 2011 is 11.4 operations per day. Non-jet commercial operations decreased by 3.8 operations per day to almost 140 per day. Nighttime commercial operations (between 10:00 PM and 7:00 AM) in 2011 increased by 0.9 percent compared to 2010. Overall, commercial operations are still recovering from the 2008/2009 Economic Recession.

General Aviation Operations

Modeled GA activity exhibited a 92.5 percent increase, from approximately 40 daily operations in 2010 to 77 daily operations in 2011 (Table 6-1). Use of Stage 2 GA jets decreased to less than 30 operations per year and use of Stage 3 GA jets increased by 86.6 percent. Non-jet GA activity levels in 2011 increased 118.4 percent compared to 2010. Overall GA nighttime operations increased by 67.5 percent, from 4.0 operations per night in 2010 to 6.6 per night in 2011. However, this comparison should be put into context: GA operations in 2009 and 2010 were at a historic lows. Although the overall increase in GA activity compared to 2010 may seem large from a historical perspective, 2011 GA operations were similar to 2007 and demonstrate a return to levels prior to the economic downturn. Nighttime GA operations also increased but remained a smaller percentage of the GA total than prior years (Nighttime GA operations were 9.9 percent of the total in 2010 and dropped to 8.6 percent of the total in 2011). Data prior to 2000 are included in *Appendix H, Noise Abatement.*

Table 6-1 Modeled Average Daily Operations by Commercial and General Aviation Aircraft[1]

		2000[3]	2001[3]	2002[3]	2003[3]	2004[3]	2005[3]
Commercial Aircraft							
Stage 2 Jets[5]	Day	5.13	1.18	0.05	0.08	0.03	0.05
	Night	0.26	0.05	0.00	0.00	0.01	0.01
	Total	**5.39**	**1.23**	**0,05**	**0.08**	**0.04**	**0.06**
Stage 3 Jets (All)	Day	727.09	756.24	740.75	717.85	772.39	765.76
	Night	103.66	109.77	97.04	92.69	113.24	113.66
	Total	**830.75**	**866.01**	**837.79**	**810.54**	**885.63**	**879.42**
Air Carrier Jets	Day	648.95	569.99	500.70	461.06	518.96	505.48
	Night	99.79	101.30	83.52	72.69	89.24	91.99
	Total	**748.74**	**671.29**	**584.22**	**533.75**	**608.20**	**597.47**
Regional Jets	Day	78.14	186.25	240.05	256.80	253.43	260.34
	Night	3.87	8.47	13.52	19.99	24.00	21.68
	Total	**82.01**	**194.72**	**253.57**	**276.79**	**277.43**	**282.01**
Non-Jet Aircraft	Day	409.62	317.62	165.45	135.18	133.24	148.77
	Night	21.58	10.97	3.45	2.41	3.03	3.02
	Total	**431.20**	**328.58**	**168.89**	**137.59**	**136.28**	**151.79**
Total Commercial	Day	1,141.84	1,075.04	906.25	853.10	905.66	914.59
Operations	Night	125.51	120.79	100.49	95.10	116.29	116.68
	Total	**1,267.35**	**1,195.82**	**1,006.73**	**948.20**	**1021.95**	**1031.27**
GA Aircraft							
Stage 2 Jets[5]	Day	7.29	5.15	3.65	2.84	0.94	2.29
	Night	0.64	.50	0.41	0.26	0.14	0.25
	Total	**7.93**	**5.65**	**4.08**	**3.10**	**1.08**	**2.54**
Stage 3 Jets	Day	40.08	34.23	37.83	46.21	53.72	58.84
	Night	3.21	3.28	6.42	6.98	8.37	9.33
	Total	**43.29**	**37.51**	**44.25**	**53.19**	**62.09**	**68.16**
Non-Jets	Day	34.57	37.31	17.36	17.81	16.95	14.00
	Night	1.83	1.92	4.45	4.40	5.20	4.75
	Total	**36.40**	**39.23**	**21.81**	**22.21**	**22.14**	**18.75**
Total GA	Day	81.94	76.68	58.84	66.88	71.60	75.12
Operations	Night	5.68	5.71	11.29	11.64	13.71	14.33
	Total	**87.62**	**82.39**	**70.13**	**78.52**	**85.31**	**89.46**
Total	Day	1,223.78	1,151.72	965.09	919.98	977.27	989.71
	Night	131.19	126.50	11.78	106.74	130.00	131.02
	Total[3]	**1,354.97**	**1,278.21**	**1,076.86**	**1,026.72**	**1,107.07**	**1120.73**

Table 6-1 Modeled Average Daily Operations by Commercial and General Aviation Aircraft[1] (Continued)

		2006[3]	2007[3]	2008[3]	2009[3]	2010[2]	2011[2]
Commercial Aircraft							
Stage 2 Jets[4]	Day	0.03	0.03	0.01	0.00	0.01	0.01
	Night	0.00	0.01	0.01	0.00	0.01	0.00
	Total	**0.03**	**0.04**	**0.02**	**0.00**	**0.02**	**0.01**
Stage 3 Jets (All)	Day	767.55	748.13	699.39	667.45	674.25	684.19
	Night	114.81	118.29	114.30	103.05	107.92	109.38
	Total	**882.36**	**866.42**	**813.69**	**770.50**	**782.17**	**793.57**
Air Carrier Jets	Day	490.63	472.39	443.15	422.92	521.64	571.03
	Night	92.71	96.28	89.89	82.21	93.98	99.17
	Total	**583.34**	**568.66**	**533.04**	**505.14**	**615.62**	**670.20**
Regional Jets	Day	276.95	275.77	256.24	244.53	152.61	113.16
	Night	22.11	22.03	24.40	20.84	13.94	10.21
	Total	**299.06**	**297.80**	**280.64**	**265.37**	**166.55**	**123.37**
Non-Jet Aircraft	Day	140.81	145.27	132.52	136.43	138.53	135.18
	Night	3.26	3.47	4.00	5.56	5.21	4.73
	Total	**144.07**	**148.73**	**136.52**	**141.99**	**143.74**	**139.91**
Total Commercial	Day	908.41	893.43	831.92	803.88	812.78	819.39
Operations	Night	118.09	121.77	118.31	108.62	113.13	114.11
	Total	**1026.51**	**1015.19**	**950.23**	**912.50**	**925.91**	**933.50**
GA Aircraft							
Stage 2 Jets[4]	Day	1.90	1.24	0.36	0.09	0.27	0.08
	Night	0.17	0.19	0.03	0.01	0.04	0.00
	Total	**2.07**	**1.43**	**0.38**	**0.10**	**0.30**	**0.08**
Stage 3 Jets	Day	61.08	54.82	43.98	22.18	27.80	52.51
	Night	6.57	6.39	4.52	2.33	3.21	5.35
	Total	**67.65**	**61.21**	**48.49**	**24.51**	**31.01**	**57.87**
Non-Jets	Day	15.05	11.98	15.13	8.19	8.19	18.18
	Night	1.39	3.61	1.08	0.75	0.72	1.29
	Total	**16.44**	**15.58**	**16.20**	**8.93**	**8.92**	**19.48**
Total GA	Day	78.03	68.04	59.46	30.46	36.26	70.78
Operations	Night	8.13	10.19	5.62	3.08	3.97	6.65
	Total	**86.15**	**78.22**	**65.08**	**33.54**	**40.22**	**77.43**
Total	Day	986.43	961.46	891.39	834.33	849.03	890.16
	Night	126.22	131.96	123.93	111.70	117.10	120.76
	Total[3]	**1112.66**	**1093.42**	**1015.31**	**946.03**	**966.13**	**1010.92**

Source: Massport's Noise Monitoring System, Revenue Office numbers, HMMH 2011.
1 Operations include scheduled and unscheduled operations and data for years prior to 2000 is available in *Appendix H, Noise Abatement*.
2 After 2010, the split between Air Carrier Jets and RJs is 90 seats with RJs having less than 90 seats.
3 Prior to 2010, the split between Air Carrier Jets and RJs is 100 seats with RJs having less than 100 seats.
4 Stage 2 aircraft are exempt from meeting newer federal Stage 3 noise limits when their certificated maximum gross takeoff weight (MGTOW) is less than or equal to 75,000 pounds.

Stage 2, Stage 3, and Stage 4 Jet Aircraft

Jet aircraft currently operating at Logan Airport are categorized by FAA into the three groups: Stage 2, Stage 3, and Stage 4. As described previously, the designation refers to a noise classification specified in FAR Part 36 that sets noise emission standards based on an aircraft's maximum certificated weight. Generally, the heavier the aircraft, the more noise it is permitted to make within the limits set established by FAR Part 36.

The *ANCA of 1990* required operators of Stage 2 airplanes weighing more than 75,000 pounds to transition to Stage 3 aircraft by phasing out the older, noisier airplanes by December 31, 1999. Stage 2 aircraft weighing less than or equal to 75,000 pounds (most of them used in GA or for small commercial activities such as transporting checks between Federal Reserve Banks) are exempt from the phase-out deadline and have continued to fly after December 31, 1999.

Stage 4 aircraft are currently being added to the airlines' fleets as airlines add new aircraft. The new Stage 4 noise standard applies to any new jet aircraft type designs over 12,500 pounds requiring FAA approval after January 1, 2006. The International Civil Aviation Organization (ICAO) has already adopted a similar regulation for international operators, but neither the FAA nor ICAO have indicated there will be restrictions on the remaining recertificated Stage 3 aircraft from carrier fleets. Because of the noise differences between Stage 2, recertificated Stage 3, Stage 3 aircraft, and aircraft that meet Stage 4 requirements, Massport tracks operations by these categories to follow their trends. Table 6-2 provides the percentage of commercial jet operations by stage since 2000. As noted by Table 6-2, the majority of the commercial jet fleet at Logan Airport meets Stage 4 requirements. Certificated Stage 3 aircraft as a percentage of the commercial jet fleet increased compared to 2010 accounting for 99.5 percent of the commercial jet fleet in 2011.

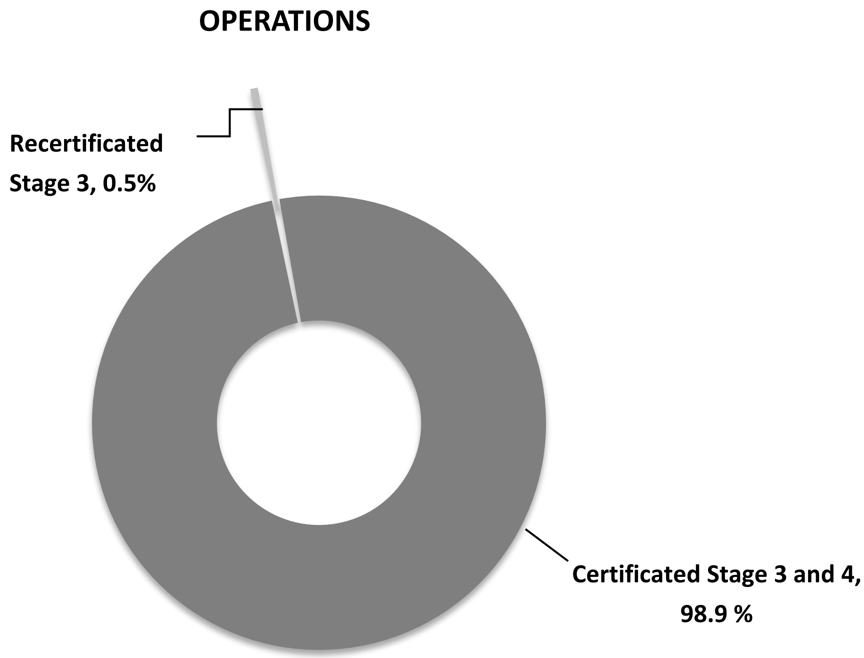
Table 6-2 Percentage of Commercial Jet Operations by Part 36 Stage Category[1]

Year	Stage 4 Requirements[2]	Certificated Stage 3	Recertificated Stage 3[4]	Stage 2 Greater than 75,000 lbs.	Total
2000	NA	75.0%	24.0%	1.0%	100%
2001	NA	86.3%	13.6	0.1%	100%
2002	NA	92.8%	7.2%	0.0%	100%
2003	NA	85.8%	4.1%	0.0%	100%
2004	NA	97.8%	2.2%	0.0%	100%
2005	NA	98.0%	2.0%	0.0%	100%
2006	-	98.6%	1.4%	0.0%	100%
2007	-	98.9%	1.1%	0.0%	100%
2008	-	99.1%	0.9%	0.0%	100%
2009	87.8%[3]	99.1%[3]	0.9%	0.0%	100%
2010	93.2%[3]	98.9%[3]	1.1%[5]	0.0%	100%
2011	95.5%[3]	99.5%[3]	0.5%	0.0%	100%

Source: Massport's Noise Monitoring System, Revenue Office numbers, HMMH 2011.
1 Data for years prior to 2000 is available in *Appendix H, Noise Abatement.*
2 Aircraft that meet Stage 4 requirements are aircraft which are certificated Stage 4 or would qualify if recertificated. Certificated Stage 4 aircraft were not available until 2006 and the level of aircraft that meet Stage 4 requirements has not been determined for 2006 through 2008.
3 All aircraft listed as meeting Stage 4 requirements are also listed as Stage 3 aircraft.
4 Recertificated Stage 3 aircraft are aircraft originally manufactured as a certificated Stage 1 or 2 aircraft under FAR Part 36 which have been either retrofitted with hushkits or have been re-engined to meet Stage 3 requirements.
5 Only three commercial carriers, with more than 100 annual operations, continue to use recertificated Stage 3 aircraft at Logan Airport (Delta Air Lines, Capital Cargo International, FedEx). A few charter operators also use these aircraft.

Figure 6-2 shows the relative contributions of these aircraft groups to total commercial operations at Logan Airport compared to their contribution to total noise. The comparison illustrates the stronger than average influence that recertificated aircraft have on noise exposure, accounting for almost 0.5 percent of the commercial jet operations but creating approximately 1.1 percent of the noise exposure.

Figure 6-2 Relative Contributions of Commercial Jet Operations at Logan Airport, 2011



Source: Massport, HMMH Analysis 2011
Notes: Includes only jet operations
Recertificated Stage 3 includes aircraft that were original manufactured as Stage 1 or 2 aircraft and then modified to and re-certificated to meet Stage 3
Certificated Stage 3 & 4 includes aircraft that were originally manufactured certificated to meet Stage 3 or Stage 4.
Stage 2 operations contribute less than 0.1 percent of operations.

Nighttime Operations

Although Stage 2 aircraft over 75,000 pounds have been banned since January 1, 2000, aircraft certificated as Stage 2, which weigh less than 75,000 pounds, have continued to operate in the U.S. Stage 2 aircraft currently allowed to operate are small corporate jet aircraft that are primarily in the GA fleet. However, the final FAA reauthorization bill includes a phase-out of these types of operations by December 31, 2015. Logan Airport's Noise Rules prohibit Stage 2 aircraft of less than 75,000 pounds from using the Airport between the hours of 11:00 PM and 7:00 AM. Massport's PREFLIGHT™ system[17] alerts Noise Office staff of potential non-compliant flights when they occur. The Noise Office staff review these reports and can investigate the potential non-compliant flights. These violations are usually flight exempt from the Noise Rules such as medical or emergency flights. PREFLIGHT™ software is used to assist in compiling fleet, day/night splits, and runway use information from Massport's Passive Surveillance Radar System (PASSUR) radar data. This data is used as a secondary source to the International Telephone & Telegraph (ITT Excelis) Airscene NOMS, which is the Noise Office's primary source of data.

17 PREFLIGHT is the prior Flight track processing system which is still operating using PASSUR radar data.

In addition, Massport monitors flights that operate between the broader DNL nighttime periods of 10:00 PM to 7:00 AM, when each flight is penalized 10 dB in calculations of noise exposure. Table 6-3 shows this nighttime activity by different groups of aircraft. Nighttime flights by commercial jet operations increased by 1.3 percent from 107.9 operations per night in 2010 to 109.4 operations per night in 2011 and nighttime flights by commercial non-jet operators decreased by 0.5 percent from 5.2 operations per night in 2010 to 4.7 operations per night in 2011, but were still the second lowest since 2005. Nighttime GA operations rose 67.5 percent. These changes resulted in an overall increase in nighttime operations of 3.1 percent in 2011. The majority of nighttime operations (between 10:00 PM and 7:00 AM) occurred either before midnight or after 5:00 AM. These nighttime operations represent 11.9 percent of total operations at Logan Airport.

Table 6-3 Modeled Nighttime Operations (10:00 PM to 7:00 AM) at Logan Airport Per Night[1]

	Commercial Jets	Commercial Non-Jets	General Aviation[1]	Total
2000	103.92	21.58	5.68	131.19
2001	109.82	10.97	5.71	126.50
2002	97.04	3.45	11.29	111.78
2003	92.69	2.41	11.64	106.74
2004	113.26	3.03	13.73	130.02
2005	113.67	3.02	14.33	131.02
2006	114.81	3.26	8.13	126.22
2007	118.30	3.47	10.19	131.96
2008	114.31	4.00	5.62	123.93
2009	103.05	5.56	3.08	111.70
2010	107.93	5.21	3.97	117.10
2011	109.38	4.73	6.65	120.76
Change (2010 to 2011)	**1.45**	**(0.48)**	**2.68**	**3.66**
Percent Change	**1.34%**	**(9.21%)**	**67.51%**	**3.13%**

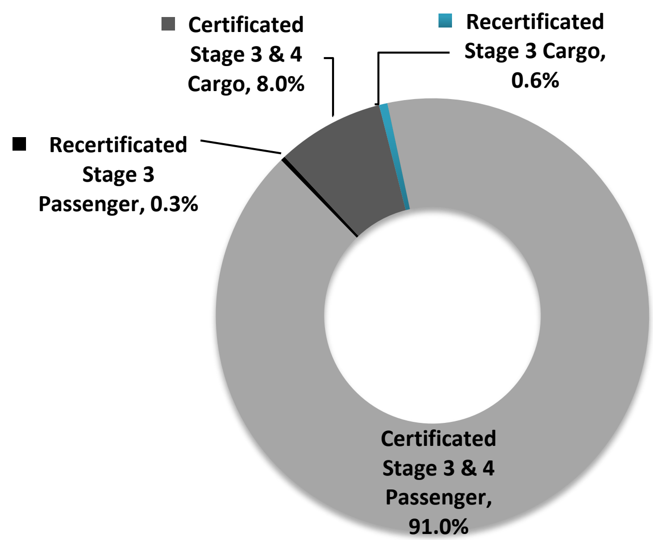
Source: Massport and International Telephone & Telegraph (ITT) radar data. HMMH, 2011.
1 Data for years prior to 2000 is available in *Appendix H, Noise Abatement*.

Figure 6-3 shows the nighttime jet commercial activity by air carrier and cargo operators and shows the following findings:

- Cargo operations accounted for 8.0 percent of all commercial nighttime operations in 2011.
- There was a small increase in overall in nighttime cargo flights which comprised 7.8 percent of the total commercial night operations in 2010, and in 2011 comprised 8.0 percent of the total. This small increase is due to the improved economy. This also resulted in a reduction in the share of passenger operations as part of total commercial nighttime flights which decreased from 92.2 percent in 2010 to 91.0 percent in 2011. For context, in 2000, the share of cargo jet operations comprised 18.4 percent of the total night operations while the share of passenger jet operations at night was only 81.6 percent.
- Flights by cargo operators using recertificated Stage 3 aircraft comprised 0.6 percent of the commercial nighttime activity compared to the 1.0 percent reported for 2010 and 8 percent in the 2000.
- Even though there was an increase in night operations in passenger aircraft operations in 2011, passenger airlines flew only 0.3 percent of total night commercial jet operations in recertificated Stage 3 aircraft compared to 0.6 percent in 2010 and 13 percent in 2000.
- The continued reduction in the use of recertificated Stage 3 aircraft at night helped to offset the increase in overall jet operations at night on the noise environment.

Though ICAO and the FAA are not expected to require the phase-out of the remaining recertificated operations prevalent among cargo operators, the use of these aircraft will continue to decline in the future as these aging aircraft age and are taken out of service.

Figure 6-3 Commercial Nighttime Jet Operations Part 36 Stage Breakdown, 2011

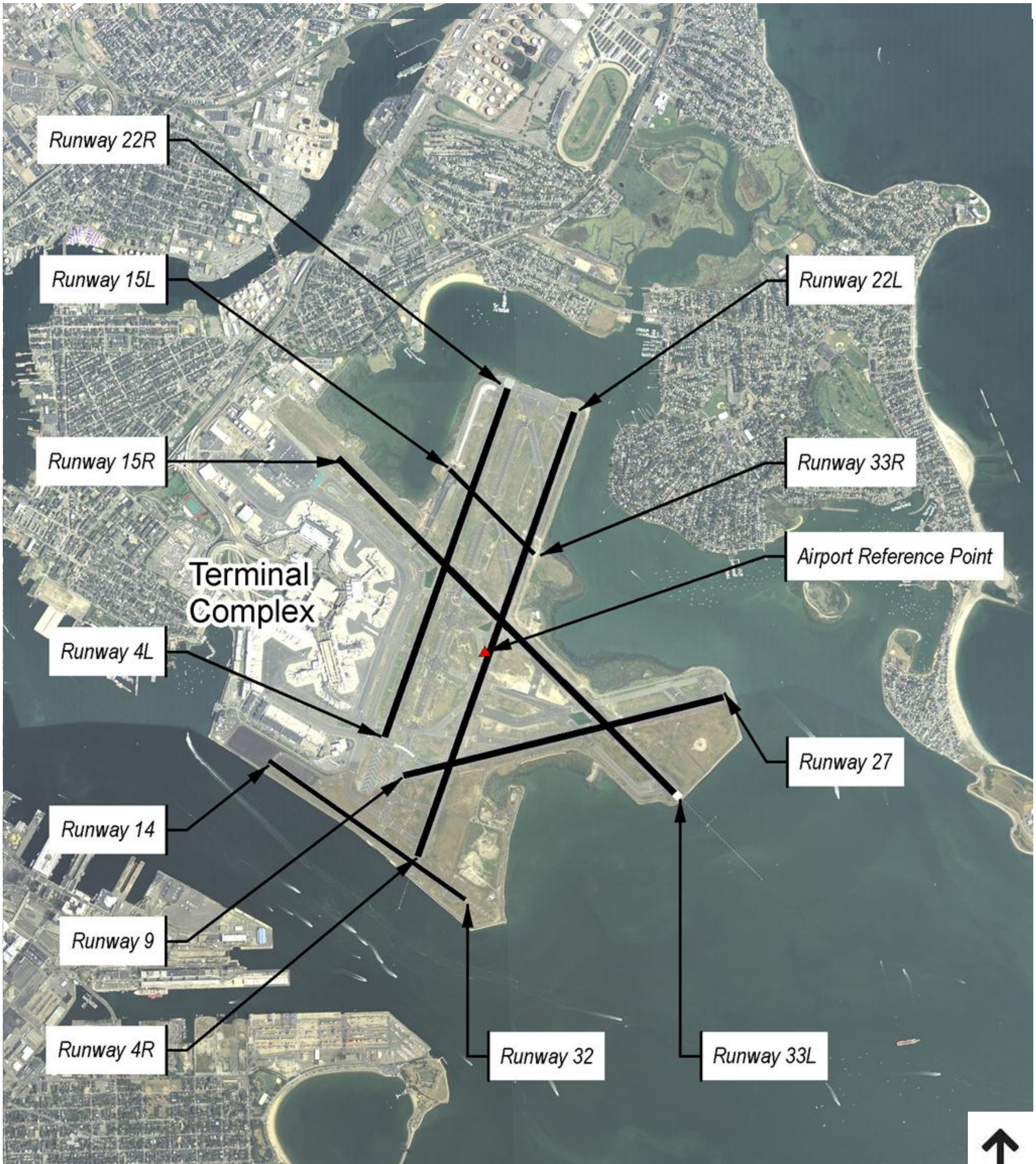


Source: Massport, HMMH Analysis, 2011.
Notes: Recertificated Stage 3 includes aircraft that were original manufactured as Stage 1 or 2 aircraft and then modified to and re-certificated to meet Stage 3 requirements. Certificated Stage 3 & 4 includes aircraft that were originally manufactured certificated to meet Stage 3 or Stage 4.
Stage 2 Night operations contribute less than 0.1 percent of operations.
Noise calculations include the 10 dB nighttime penalty.

Runway Use

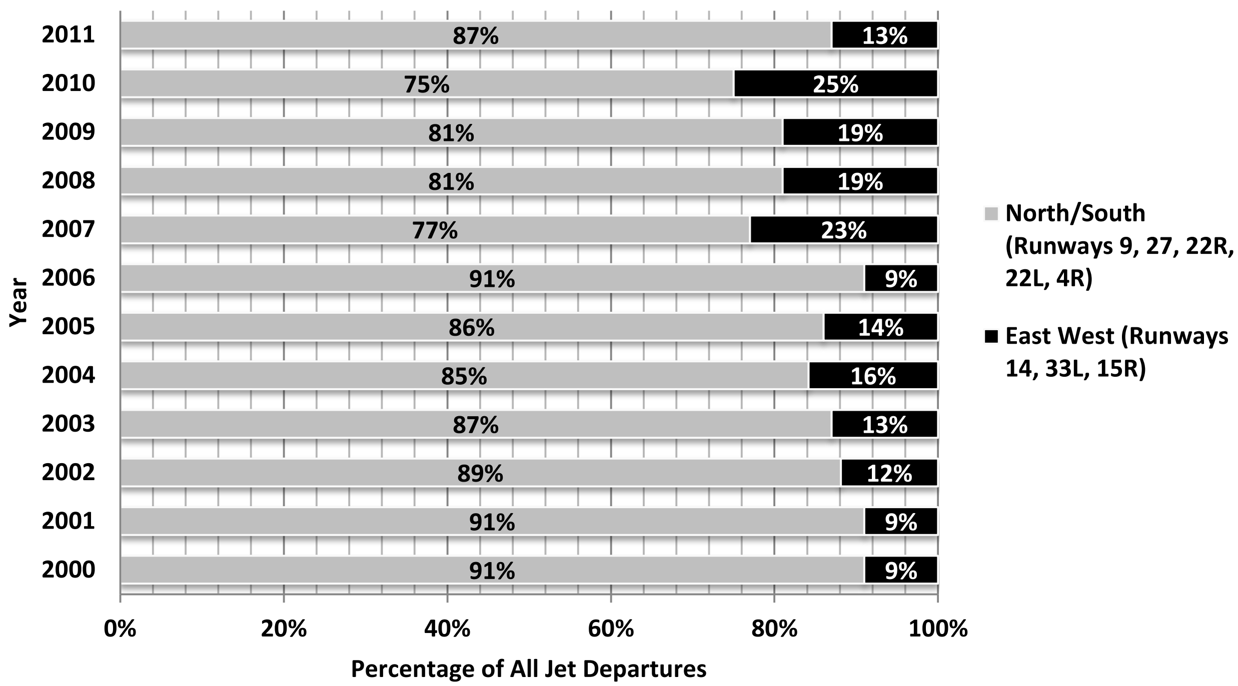
Logan Airport's runways and the Centerfield Taxiway are shown in Figure 6-4. The Centerfield Taxiway runs parallel to and between Runways 4L-22R and 4R-22L and is designed to improve efficiency at the Airport. Runway use refers to the frequency of which aircraft utilize each of these runways during the course of the year, as dictated or permitted by availability, wind, weather, aircraft performance, demand, and air traffic control conditions. Runway 15R-33L and Runway 4R-22L are Logan Airport's longest runways; each is just over 10,000 feet in length. Runway 15R-33L is the preferred runway at night, with arrivals to Runway 33L and departures from Runway 15R, thus keeping flights over Boston Harbor. Runway 22R is used primarily for departures, and Runway 22L is used primarily for arrivals. Runway 9 is used for departures, and Runways 15R, 27, and 33L are used for both arrivals and departures. Runway 14-32 is unidirectional; there are no arrivals to Runway 14 and no departures from Runway 32. Additionally, Runway 14-32 can be used only during northwest wind conditions when winds are 10 knots or greater. Under certain northwest wind conditions, Runway 32 provides the FAA with a second arrival runway, thereby reducing delays at the Airport. Runway 14 is available for departures but is rarely used. Also shown on Figure 6-4, is the Airport Reference Point (ARP), which is the geographic center of all of the runway ends and is used to determine the distances to the noise monitoring terminals in this *2011 ESPR*.

Figure 6-4 Logan Airport Runways



Source: HMMH, Inc. 2011, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP), 2010.

Figure 6-5 Jet Departures by Operating Direction



Source: Massport ITT data, HMMH 2011 Analysis.
Note: Runway 14-32 is unidirectional with no arrivals to Runway 14 and no departures from Runway 32.

Figure 6-5 shows the operating direction for all jet departures, which shows that Logan Airport continues to be characterized by a north-south operating flow. Table 6-4 presents consolidated annual runway use by jets. Runway use conditions in 2011 were as follows:

- The average use of the north-south flow is 80.2 percent since the opening of Runway 14-32.
- Jet aircraft departures used a north-south flow 87 percent of the time, a 12 percent increase compared to 2010 (and the prior three years) as shown in Figure 6-5. This is mainly due to the Runway 15R-33L closure during 2011.
- Combined arrivals to Runways 4L and 4R increased by 11 percent to 44 percent in use in 2011 compared to 2010. Departures from Runway 4R increased by 2 percent from 2010.
- Arrivals to Runway 22L increased by 1 percent in 2011 with departures remaining at 2 percent. Runway 22R departures increased by 5 percent to 36 percent. Runways 22R and 9 remained consistently the most used departure runways at Logan Airport.
- Departures on Runway 27 decreased by 3 percent to 7 percent in 2011, and departures on Runway 9 increased 8 percent to 36 percent in 2011. Arrivals to Runway 27 decreased from 32 percent in 2010 to 28 percent in 2011.
- Since opening in late November 2006, Runway 14-32 was used primarily for arrivals of RJs and turboprops over Boston Harbor, accounting for one percent of annual jet arrivals, which is the same as in 2010.
- Runway 15R-33L was closed for three months during 2011 for the construction of the Runway 33L RSA improvements, which resulted in decreases in departures and arrivals on Runway 33L and Runway 15R compared to 2010.

Table 6-4 Summary of Annual Jet Aircraft Runway Use[1]

	Runway									
	4L	4R	9	14[2]	15R	22L	22R	27	32[2]	33L
2000										
Departures	0%	8%	35%	NA	4%	3%	30%	15%	NA	6%
Arrivals	4%	40%	0%	NA	1%	7%	0%	28%	NA	20%
2001										
Departures	0%	7%	34%	NA	4%	3%	35%	12%	NA	5%
Arrivals	5%	36%	05	NA	1%	8%	0%	32%	NA	18%
2002										
Departures	0%	4%	31%	NA	6%	3%	35%	16%	NA	6%
Arrivals	6%	31%	0%	NA	1%	12%	0%	30%	NA	21%
2003										
Departures	0%	4%	33%	NA	7%	2%	34%	14%	NA	6%
Arrivals	7%	33%	0%	NA	1%	14%	0%	28%	NA	18%
2004										
Departures	0%	5%	34%	NA	10%	4%	24%	18%	NA	6%
Arrivals	6%	34%	05	NA	1%	12%	0%	24%	0%	23%
2005										
Departures	0%	5%	36%	NA	7%	1%	31%	13%	-	7%
Arrivals	8%	33%	0%	-	1%	11%	0%	29%	NA	17%
2006										
Departures	0%	4%	33%	<0.1%	3%	1%	40%	13%	-	6%
Arrivals	7%	29%	0%	-	1%	14%	0%	33%	0.2%	16%
2007										
Departures	0%	5%	31%	<0.1%	4%	1%	33%	7%	-	19%
Arrivals	5%	31%	0%	-	1%	15%	0%	36%	2%	11%
2008										
Departures	0%	6%	33%	<0.1%	3%	<0.1%	36%	6%	-	16%
Arrivals	6%	30%	0%	-	2%	17%	0%	33%	2%	11%
2009										
Departures	0%	7%	32%[3]	0%	3%	2%	34%	6%[3]	-	16%
Arrivals	7%	31%	0%[3]	-	3%	17%	0%	30%[3]	1%	11%
2010										
Departures	0%	4%	28%	<1%	8%	2%	31%	10%	-	17%
Arrivals	5%	28%	0%	-	1%	15%	0%	32%	1%	16%
2011										
Departures	0%	6%	36%	<1%	5%[4]	2%	36%	7%	-	7%[4]
Arrivals	7%	37%	0%	-	<1%[4]	16%	0%	28%	1%	11%[4]

Source: Massport Noise Office and HMMH, 2011.

Notes: The data reflect actual percentages of jet aircraft operations on each runway end. They should not be confused with effective runway use which is used by the Preferential Runway Advisory System (PRAS) to derive recommendations for use of a particular runway.
Jet aircraft are not able to use Runway 15L or 33R due to its length of only 2,557 feet.
Values may not add to 100 percent due to rounding.

1 Data for years prior to 2000 is available in *Appendix H, Noise Abatement.*
2 Runway 14-32 opened in late November, 2006. (Runway 14-32 is unidirectional with no arrivals to Runway 14 and no departures from Runway 32).
3 Runway 9-27 had extended weekend closings for resurfacing during 2009.
4 Runway 15R-33L was closed for 3 months in 2011.
NA Runway was not available.

Preferential Runway Advisory System (PRAS)

Developed in 1982 and enhanced in 1990 and subsequent years, the PRAS is a set of short-term and long-term runway use goals that include the use of a computer program that recommends to FAA air traffic controllers, runway configurations that will meet weather and demand requirements and provide an equitable distribution of Logan Airport's noise impacts on surrounding communities. The two primary objectives of the PRAS goals are to distribute noise in on an annual basis, and to provide short-term relief from continuous operations over the same neighborhoods at the ends of the runways.

In February of 2004, the FAA upgraded to the Standard Terminal Automation Replacement System (STARS) and Integrated Information Display & Dissemination System version 5 (IDS5)[18] radar during the consolidation of the Boston Terminal Control Center (TRACON) at the new facility in Merrimack, New Hampshire. As a result of this upgrade, a shutdown of the PRAS system computer was necessary. Updated PRAS software was installed in 2007. Technical difficulties related to processing input from the FAA's IDS5 system have continued. During Phase 2 of the on-going BLANS the Logan Airport Community Advisory Committee (CAC) voted to abandon PRAS because it had not achieved the intended noise abatement.[19] For this *2011 ESPR*, Massport will continue to present the annual comparison to the PRAS goals.

PRAS Compliance

Under the PRAS, each runway end has a specific annual utilization goal, defined separately for departures and arrivals. The goals are defined in terms of effective usage, which applies a factor of 10 to nighttime (10:00 PM to 7:00 AM) operations, equivalent to increasing nighttime exposure by 10 dB so that a change in effective utilization is roughly proportional to the change in DNL.

Table 6-5 provides a comparison of effective runway use in 2011 to that of 2010, and to the PRAS goals. The 2011 utilizations shown in bold indicate improvements toward the goals for all runways. The effective jet runway use in 2011 diverged from the PRAS goals, with the three month runway closure of Runway 15R-33L for the runway safety area improvements construction. None of the arrival percentages moved closer to the PRAS goals in 2011, however, departures for Runways 4L, 4R, 22L, 22R, and 33L moved closer to the PRAS goals. Due to the Runway 33L-15R, there was a large decrease in departure effective runway use and increased use of the parallel Runways 4L, 4R, 22L and 22R for departures.

The Effective Usage provided in the last ESPR in 2004 showed progress toward the PRAS goals on all runways and is provided in Table 6-5 for context. In 2011, arrivals to Runways 4L, 4R, 22L, and 22R are all greater than 2004 and the PRAS goals. Arrivals to Runways 15R, 27 and 33L are all lower than 2004 and the PRAS goals. Departures from Runways 22L and 22R are greater than in 2004 and greater than the PRAS goals whereas departures from Runways 4L, 4R, 15R, and 33L are greater than in 2004 but less than the PRAS goals. Departures from Runway 9 are slightly less than in 2004 and greater than the PRAS goals with departures from Runway 27 much less than in 2004 which was equal to the PRAS goal.

18 Standard Terminal Automation Replacement System (STARS) is FAA's replacement radar equipment and software for terminal approach control (TRACON) and tower facilities. Integrated Information Display & Dissemination System version 5 (IDS5) is an advanced information management toolset designed for air traffic control by Systems Atlanta, which works with the STARS system.

19 Boston Logan Airport Noise Study Level 3 Screening Analysis, FAA, December 2012, Page E-2

Table 6-5 Effective Jet Aircraft Runway Use in Comparison to PRAS Goals

	PRAS Effective Usage Goals		2004 Effective Usage		2010 Effective Usage		2011 Effective Usage	
Runway End	**Arrivals**	**Departures**	**Arrivals**	**Departures**	**Arrivals**	**Departures**	**Arrivals**	**Departures**
4R/L	21.1%	5.6%	**32.9%**	**4.0%**	**26.9%**	3.6%	36.0%	**5.5%**
9	0.0%	13.3%	**0.0%**	**29.0%**	0.0%	**20.4%**	0.0%	28.8%
15R	8.4%	23.3%	**1.1%**	**15.4%**	1.2%	**24.1%**	0.2%	16.1%
22L/R	6.5%	28.0%	**15.4%**	**26.4%**	22.0%	**25.2%**	26.1%	**32.6%**
27	21.7%	17.9%	**21.8%**	**17.9%**	20.4%	**11.8%**	19.5%	7.5%
33L	42.3%	11.9%	**28.9%**	**7.3%**	**28.9%**	**14.9%**	17.9%	**9.4%**
14[1]	NA	NA	-	-	-	<0.1%	-	<0.1%
32[1]	NA	NA	-	-	0.6%	-	0.3%	-

Source: Massport Noise Office and HMMH, 2011.
Notes: PRAS goals are stated in terms of effective jet operations which exclude non-jet flights, but which multiply each nighttime (10:00 PM to 7:00 AM) operation by a factor of 10. PRAS goals have not yet been established for Runways 14 and 32.
Bold text indicates runways use which is closer to PRAS goals.
1 Runway 14-32 opened in late November, 2006. (Runway 14-32 is unidirectional with no arrivals to Runway 14 and no departures from Runway 32).

Flight Tracks

As described in the Methodology section, Massport continued to use the pair of software packages known as RealProfiles™ and RealContours™. *Appendix H, Noise Abatement* provides a summary discussion of RealProfiles™ and RealContours™ and the *2004 ESPR* described the software in greater detail, and compared the results between the new software and typical modeling. The software package RealContours™ is used to develop the INM inputs based on available radar track. Instead of using representative model tracks, RealContours™ converts each radar track to an INM model track and then models the scaled operation on that track.[20] This allows Massport to take into account runway closures and/or temporary or permanent airspace changes which occur during the year.

For the *2011 ESPR*, 350,343 flight tracks were modeled to calculate the noise levels surrounding Logan Airport. Figures 6-6 through 6-12 provide a representative sample of flight tracks used with RealContours™ to develop the 2011 contours.[21] The figures show arrivals and departures separately for each of three aircraft categories: air carrier jets, RJs, and non-jets. The following figures are from April 2011, when the runway use was similar to the 2011 yearly average presented previously. Additional figures, and associated text, at the end of this chapter describe the RNAV[22] Standard Instrument Departure Procedures (SIDS) changes that were in effect at the end of 2011.

- Figure 6-6 displays air carrier jet departures following the recommended departure routes. The RNAV departure procedures are evident in this graphic as the departures from Runways 4R, 22R, 27 and 9 do not show the dispersion that has been evident in prior years. The dispersion of departures passing over Nahant has narrowed compared to 2010 and also over the Boston Harbor islands. However, departures from Runway 22R also follow a more defined turn pattern which passes more aircraft closer to the west

20 This method provides a one to-one correspondence of radar tracks to model tracks and ensures that the lateral and vertical dispersion of aircraft types are consistent with the radar data.
21 Runway use from each month was developed and compared to the annual runway use information. April 2011 provided the closest match to annual results.
22 aRea NAVigation (RNAV) - RNAV enables aircraft to fly on any desired flight path within the coverage of ground- or spaced-based navigation aids, or within the limits of the capability of aircraft self-contained systems, or a combination of both capabilities.

side of Pleasure Bay in South Boston compared to 2010. Massport has evaluated this change and the report is provided in *Appendix H, Noise Abatement*

- Figure 6-7 displays air carrier jet arrivals. This graphic displays the east downwind configuration which the air carrier arrivals utilize to line up on final approach to the runways thus avoiding populated areas to the west of the Airport.
- Figure 6-8 displays the RJ departures following the recommended departure routes with flights remaining north of the Hull peninsula and passing over the Nahant Causeway.
- Figure 6-9 displays the RJ arrivals which utilize both east and west sides of the Airport for arrivals. Arrivals to Runway 32 are also displayed on this graphic.
- Figure 6-10 displays the non-jet departures which tend to turn early off the runways and do not follow the jet departure routes. Non-jet departures from Runways 4L, 22R, 33L, and 27 are allowed to turn over populated areas whereas the jet aircraft are not. This also keeps the non-jet aircraft out of the jet departure paths allowing for efficient jet departures. RNAV equipped turboprops follow the Runway 22R departure procedure, as shown in the graphic.
- Figure 6-11 displays the non-jet arrivals and includes the Boston Harbor route for non-jet aircraft arriving to Runway 4L. The graphic also displays the non-jet arrivals to Runways 22R and 33R in addition to the other runways which also accommodate jets.
- Figure 6-12 displays the night jet arrivals using the Light Visual Approach to Runway 33L during the sample period. These flights remain offshore and avoid overflying Cohasset and Hull at night. Flights arriving to Runway 33L from the west pass over Saugus and Nahant at a higher altitude and then head south over the Boston Harbor to intersect with the visual approach procedure.

Meteorological Data

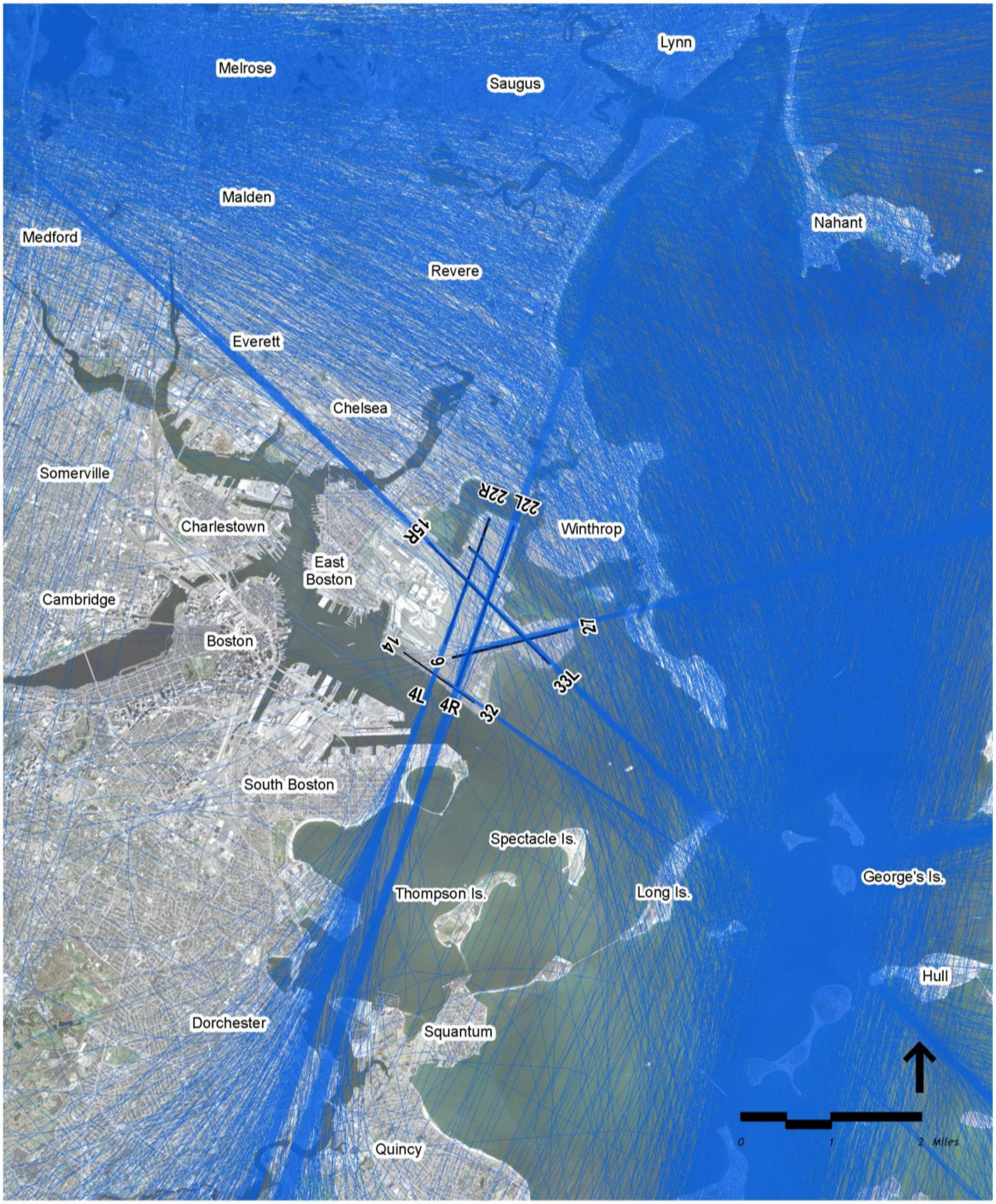
The INM has several settings that reflect aircraft performance profiles and sound propagation based on meteorological data. Meteorological settings include average temperature, barometric pressure, and relative humidity at the Airport. Massport obtained weather data for 2011 from the National Climatic Data Center (NCDC). Average daily values for each of the settings were used in the development of the 2011 noise conditions. The average conditions for each day allowed the modeling system used by Massport to develop performance profiles based on each day's conditions and allowed the INM model to use each day's conditions to assess the propagation of noise. This is an improvement in modeling over previous years (prior to 2008) which only used the annual average value to model these conditions. This improvement allowed the INM to better model aircraft profiles on days significantly different than the average such as during the winter and summer months.

Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Air Carrier Jet Departure Tracks (April 2011)

Figure 6-6

Departure Flight Tracks



Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Air Carrier Jet Arrival Tracks (April 2011)

Figure 6-7

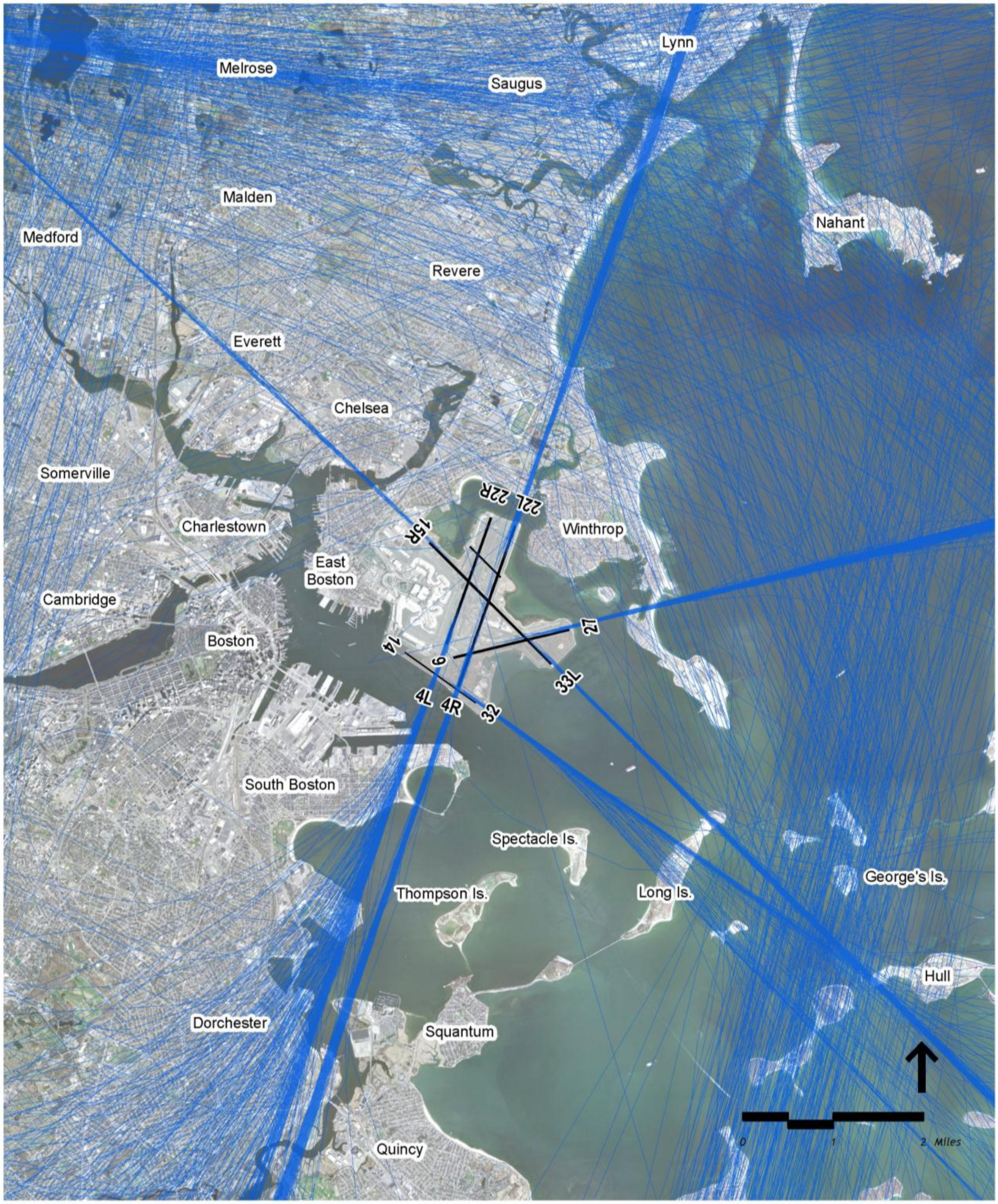
Arrival Flight Tracks

Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Regional Jet Departure Tracks (April 2011)

Figure 6-8

Departure Flight Tracks

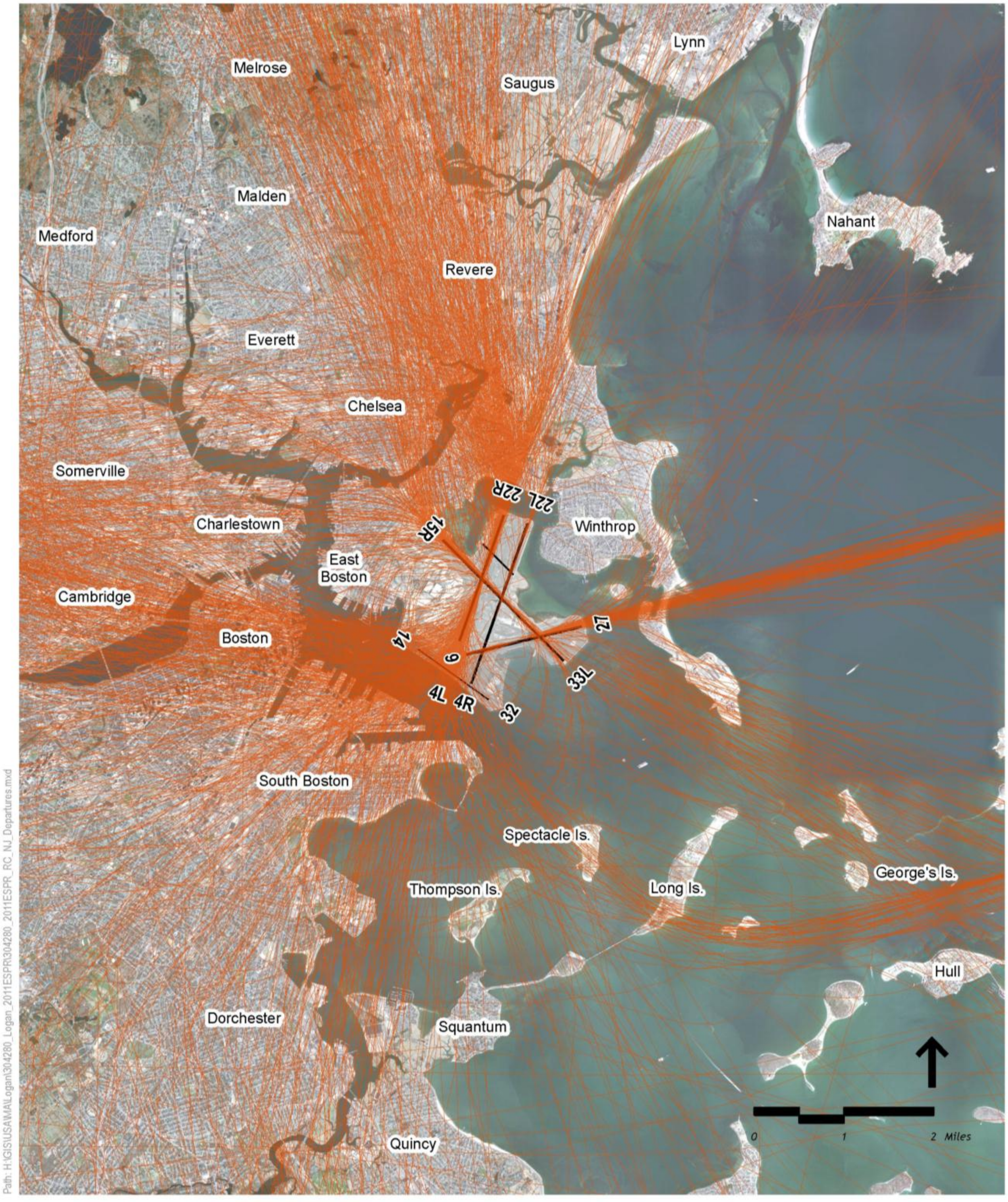


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Regional Jet Arrival Tracks (April 2011)

Figure 6-9

Arrival Flight Tracks

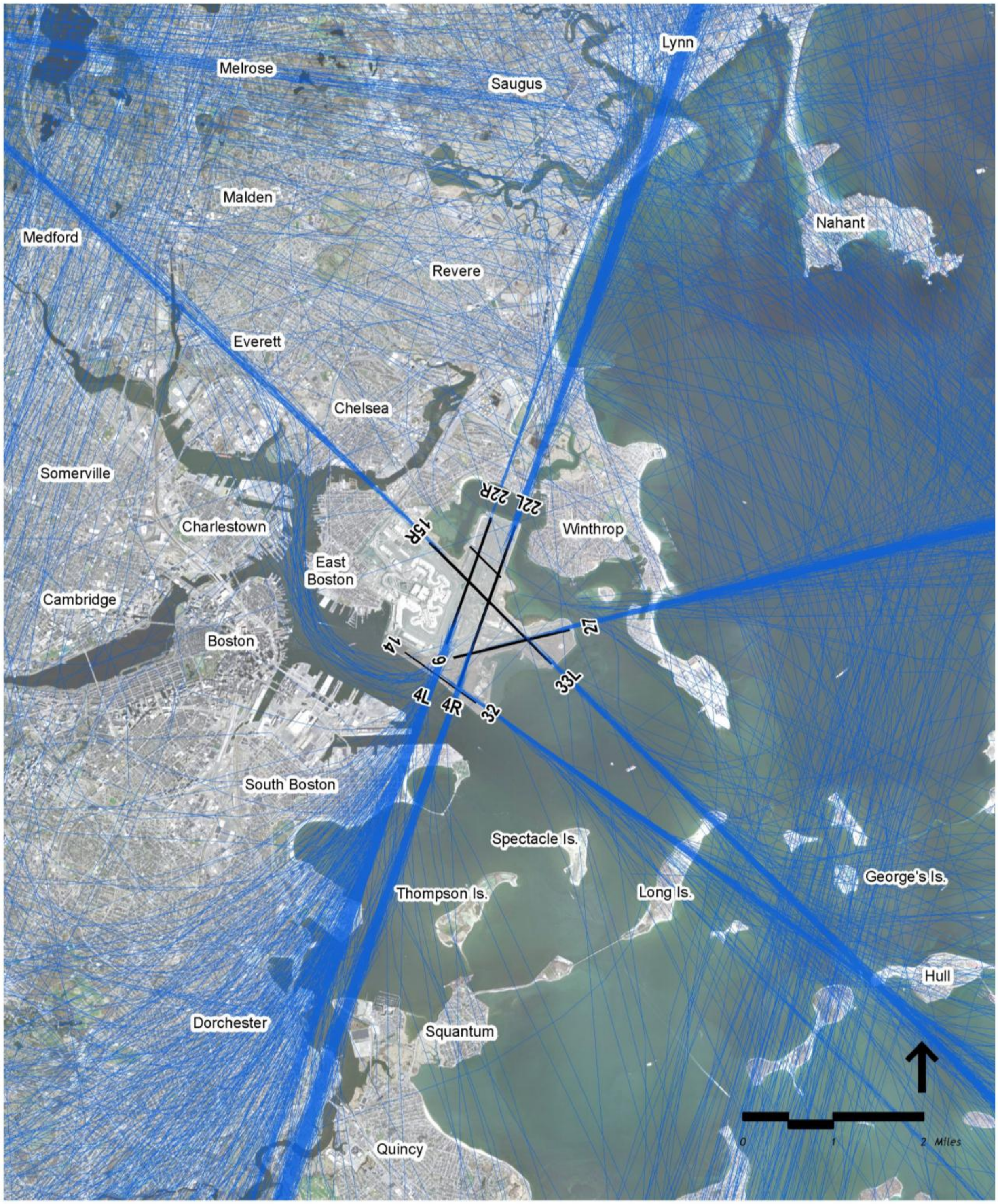


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Non-Jet Departure Tracks (April 2011)

Figure 6-10

Departure Flight Tracks

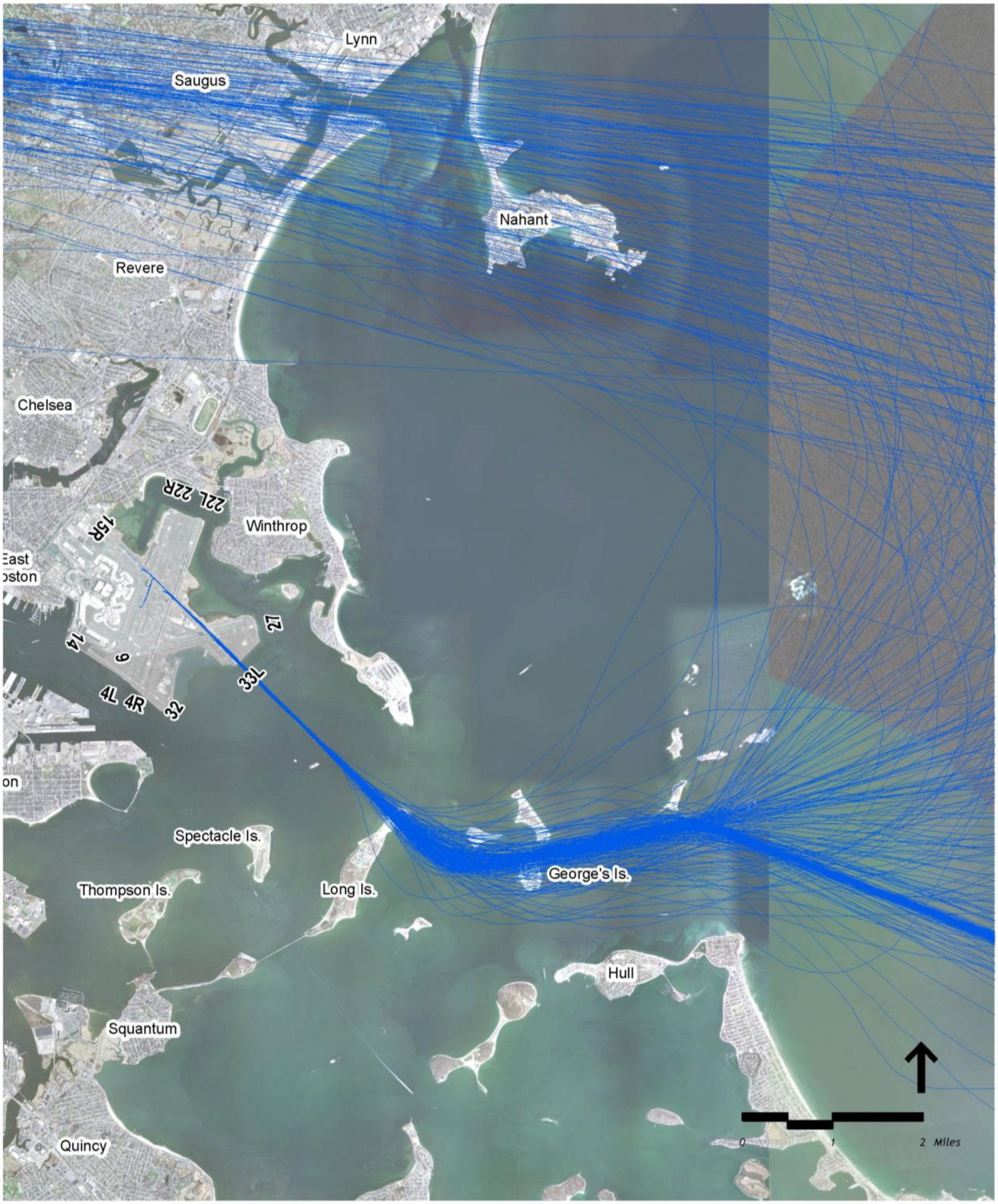


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Non-Jet Arrival Tracks (April 2011)

Figure 6-11

Arrival Flight Tracks



Path: H:\GIS\USA\MA\Logan\304280_Logan_2011ESPR\304280_2011ESPR_RWY_33L_Arrivals.mxd

Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

Runway 33L Night (10:00pm – 07:00am) Light Visual Approach Tracks (April 2011)

Figure 6-12

Arrival Flight Tracks

Noise Levels in 2011

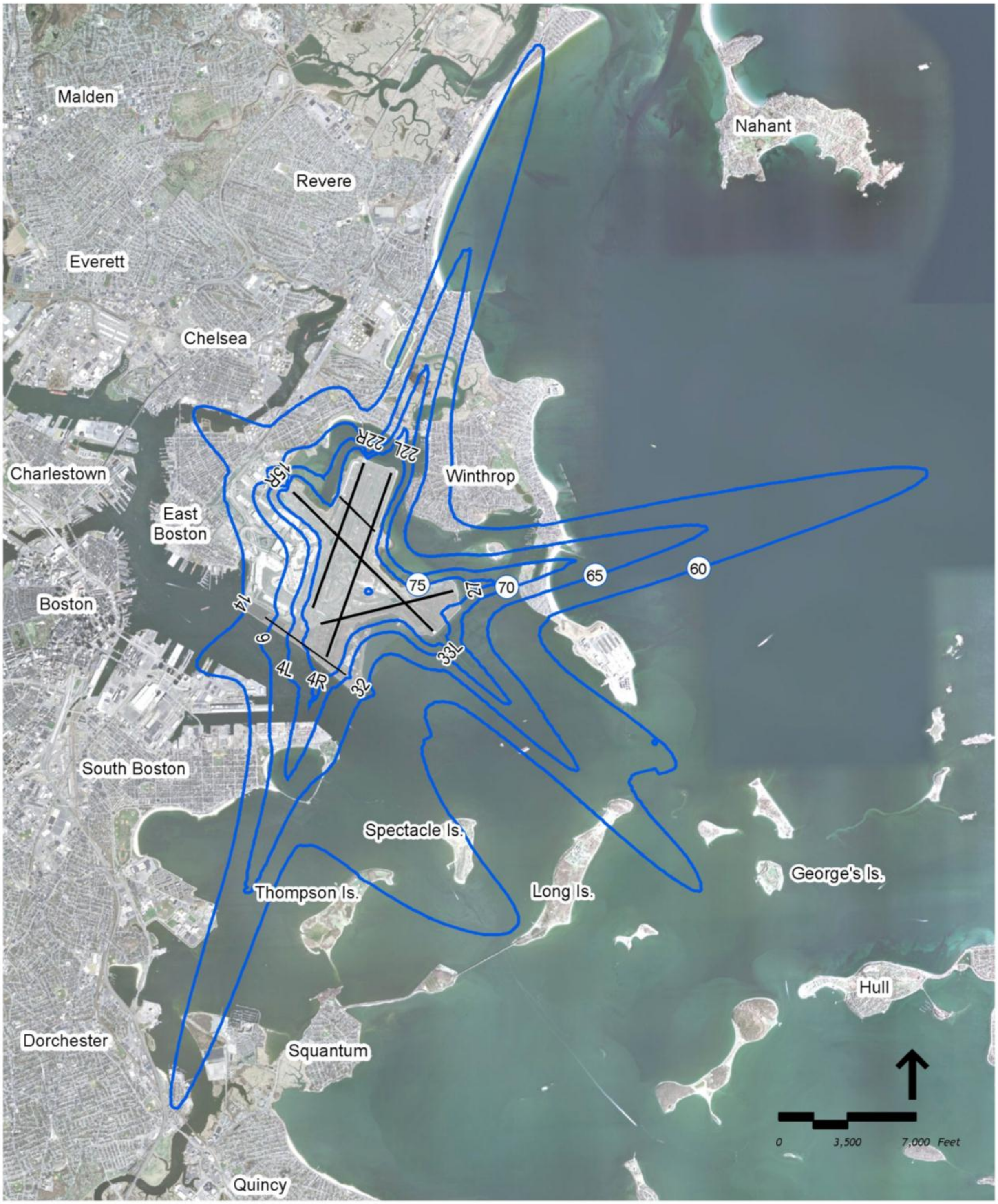
Day-Night Noise Contours for 2011

The 2011 DNL contours were prepared using FAA's most recently available version of the INM (INMv7.0c) and are shown in Figure 6-13 for DNL values of 60, 65, 70, and 75 dB. Figure 6-14 is a closer view of the Airport and compares the DNL 65 dB contours for 2011 and 2010. Differences between these annual contours are a result of two factors: the operational differences (increased operations, changes in fleet mix, and changes in runway use) from one year to the next, and an update to the INM noise model. Both the 2010 and 2011 contours continue to include the FAA-approved adjustments for over-water sound propagation and hill effects in Orient Heights, unique to Logan Airport.

In general, the shapes of the 2011 DNL 60 and 65 dB contours differ from the 2010 contours for two primary reasons. First, the cross-wind runway, Runway 15R-3L, was closed between July 1, 2011 and October 1, 2011 for construction of the Runway 33L RSA improvements. This closure shifted operations to the other runways, resulting in the DNL contour shrinking toward the airport in the northwest and expanding slightly to the northeast and southwest. The second reason for changed contours is the implementation of new FAA navigation procedures for Runway 22 departures at the end of 2010 as a result of the BLANS project. Departures turn east over the water in a more constrained, narrower corridor; hence the expansion of the DNL 60 dB contour over Spectacle Island.

Figure 6-15 provides a comparison between the 2011 DNL contours generated with INM 7.0c and INM 7.0b. Both contours use the same fleet mix and runway use only the model version has changed. The graphic shows the minor changes in the contour due to the model changes. Several new GA jets were added to the model replacing substitutes used in the prior version of the INM model. Also, several aircraft model type substitutions were changed between INM 7.0b and INM 7.0c. The Airbus noise approach data was also modified contributing to the very small increase in the arrival noise areas off each runway. The only area where there is a noticeable difference between the two contours is over water.

The DNL 65 dB contour is within populated areas already sound-insulated by Massport (refer to the Noise Abatement discussion presented later on in this chapter).

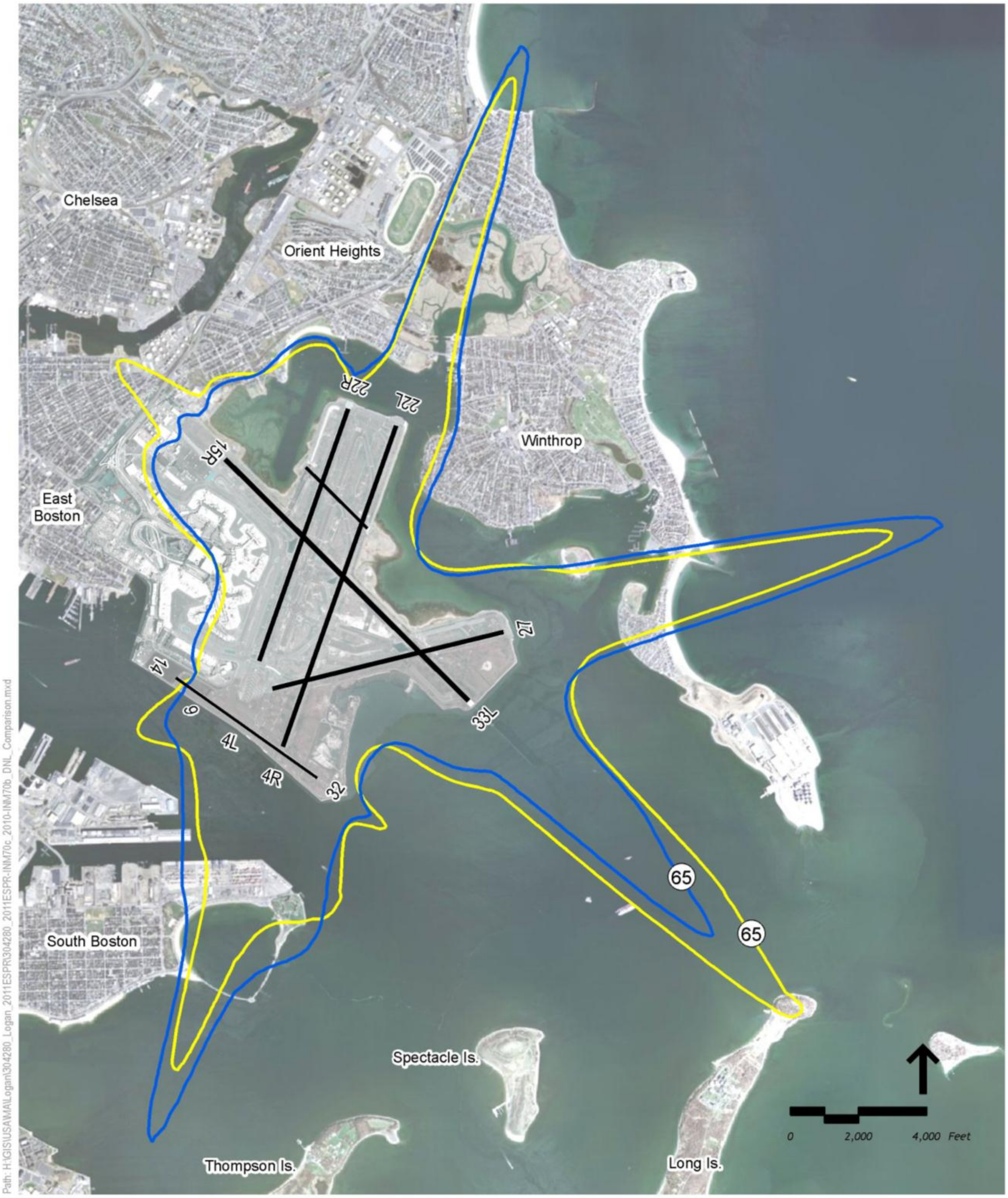


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

60-75 DNL Contours for 2011 Operations Using INM 7.0c

2011 DNL Contour (INM 7.0c)

Figure 6-13

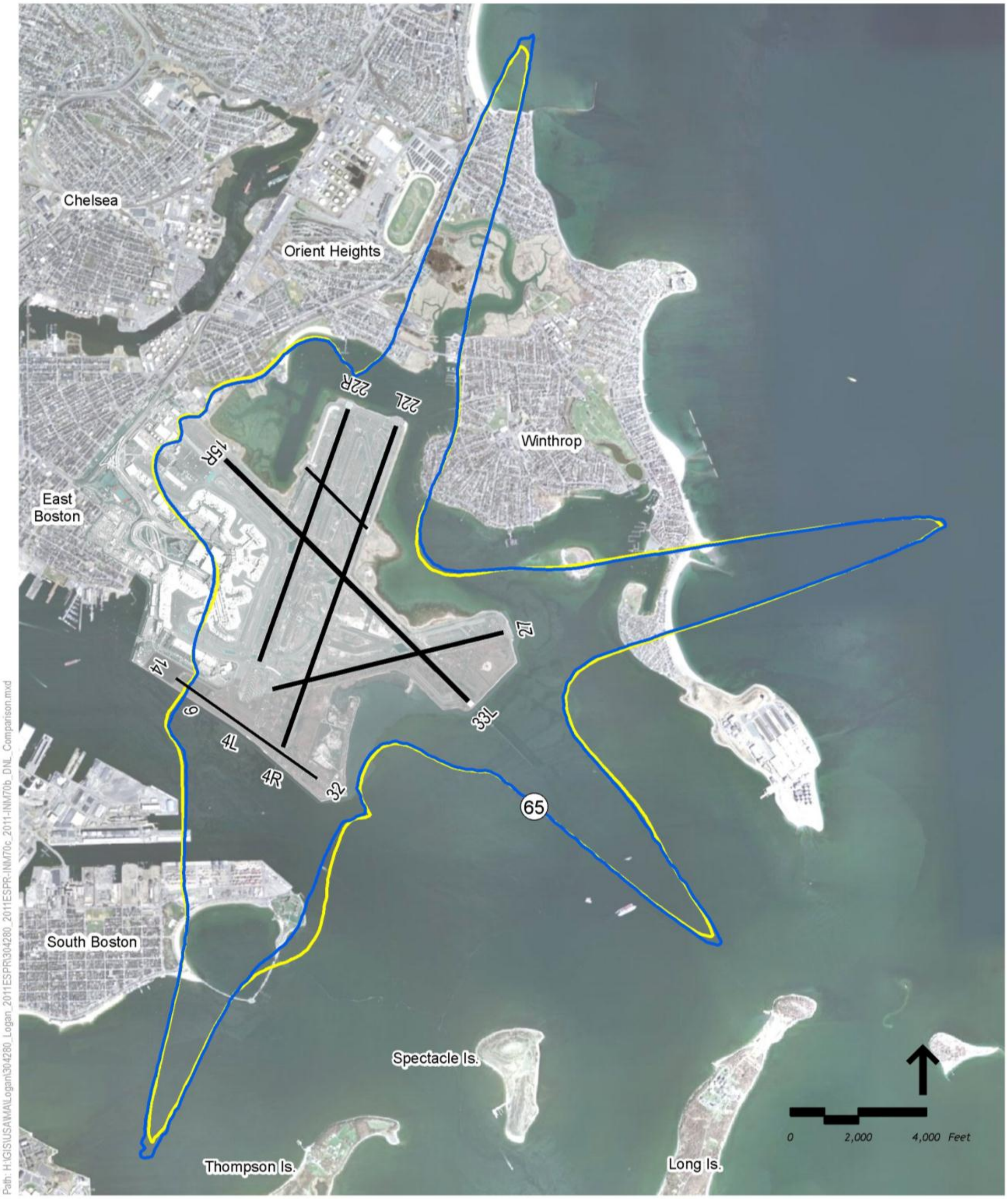


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

2011 DNL Contour (INM 7.0c)
2010 DNL Contour (INM 7.0b)

Comparison of the 65 dB DNL Contours for 2010 Operations Using INM 7.0b and 2011 Operations Using INM 7.0c

Figure 6-14



Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

2011 DNL Contour (INM 7.0c)
2011 DNL Contour (INM 7.0b)

Comparison of the 65 dB DNL Contours for 2011 Operations Using INM 7.0b and 2011 Operations Using INM 7.0c

Figure 6-15

Population Impact Assessment

Population counts within selected 5 dB increments of exposure are reported each year to indicate how Logan Airport's noise environment changes over time. Population counts for 2011 are shown in Table 6-6 by community and are compared to previous years. The 2010 U.S. Census data, previously reported in the *2010 EDR,* was used to determine population counts. Population counts from 2000 through 2009 are based on U.S. Census data for 2000. *Appendix H, Noise Abatement* presents counts for 2010 from both sets of Census data. The 2010 Census data includes updated population counts and can be used to demonstrate the changes in population in an area over a ten year period.

Both the FAA and the U.S. Department of Housing and Urban Development (HUD) consider DNL exposure levels above 65 dB to be incompatible with residential land use. Table 6-6 compares impacted populations for each year, using the latest INM results. The noise analysis is based upon the most recently FAA-approved INM (INMv7.0c). Table 6-7 provides an additional breakdown of the estimated population in East Boston and South Boston residing within the DNL 65 dB contour.

The differences in affected population between 2010 and 2011 in Tables 6-6 and 6-7 are due to fleet mix and runway use changes. There were no affected population differences within the DNL 65 dB contour between the two 2011 model runs (INM v7.0b and INM v7.0c). The differences in the contour, are attributed mostly to the difference in runway use due to the closure of Runway 15R-33L and shifts in the flight tracks due to the new RNAV procedures. These procedures also concentrate the flight tracks over a smaller area which tends to elongate the contours. The number of people within the DNL 65 dB increased by 117 people overall. In East Boston, there was a decrease of 358 people with a corresponding increase in Revere of 161 people and in Winthrop there was an increase of 341 people. The number of people remaining within the DNL 70 dB contour remains the same as 2010 with 130 people, located in Winthrop.

Table 6-6 Noise-exposed Population by Community[1]

Boston							Revere						
Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL	Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
2000	2000	0	0	234	9,014	9,248	2000	2000	0	0	0	2,496	2,496
2001	2000	0	0	315	6,515	6,700	2001	2000	0	0	0	2,496	2,496
2002	2000	0	0	257	2,625	2,757	2002	2000	0	0	0	2,822	2,822
2003	2000	0	0	164	1,730	1,894	2003	2000	0	0	0	2,994	2,994
2004	2000	0	0	132	5,374	5,5506	2004	2000	0	0	0	2,822	2,822
2005	2000	0	65	104	2,020 [3]	2,189 [3]	2005	2000	0	0	82	2,540	2,622
2006	2000	0	65	99	1,054 [3]	1,218 [3]	2006	2000	0	0	82	2,540	2,622
2007	**2000**	0	0	169	4,094	4,263	2007	**2000**	0	0	0	2,450	2,450
2008 (7.0a)	**2000**	0	0	0	2,376	2,376	**2008 (7.0a)**	**2000**	0	0	0	2,434	2,434
2008 (7.0b)	**2000**	0	5	0	3,487	3,492	**2008 (7.0b)**	**2000**	0	0	0	2,434	2,434
2009 (7.0b)	**2000**	0	5	67	937	1,009	**2009 (7.0b)**	**2000**	0	0	0	2,512	2,512
2010 (7.0b)	**2010**	0	0	0	689	689	**2010 (7.0b)**	**2010**	0	0	0	2,413	2,413
2011 (7.0b)	**2010**	0	0	0	331	331	**2011 (7.0b)**	**2010**	0	0	0	2,547	2,547
2011 (7.0c)	**2010**	0	0	0	331	331	**2011 (7.0c)**	**2010**	0	0	0	2,547	2,547

Table 6-6 Noise-exposed Population by Community[1] (Continued)

Chelsea

Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
2000	2000	0	0	0	0	0
2001	2000	0	0	0	0	0
2002	2000	0	0	0	0	0
2003	2000	0	0	0	0	0
2004	2000	0	0	0	0	0
2005	2000	0	0	0	0	0
2006	2000	0	0	0	0	0
2007	**2000**	0	0	0	0	0
2008 (7.0a)	**2000**	0	0	0	0	0
2008 (7.0b)	**2000**	0	0	0	0	0
2009 (7.0b)	**2000**	0	0	0	0	0
2010(7.0b)	**2010**	0	0	0	0	0
2011 (7.0b)	**2010**	0	0	0	0	0
2011 (7.0c)	**2010**	0	0	0	0	0

Winthrop

Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
2000	2000	0	247	1,070	4,637	6,001
2001	2000	0	244	683	4,123	5,050
2002	2000	0	2	481	2,247	2,730
2003	2000	0	0	339	1,956	2,295
2002	2000	0	2	412	1,978	2,392
2005	2000	0	39	347	1,280	1,666
2006	2000	0	39	416	1,288	1,743
2007	**2000**	0	0	247	1,139	1,386
2008 (7.0a)	**2000**	0	0	244	909	1,153
2008 (7.0b)	**2000**	0	0	244	1,409	1,653
2009 (7.0b)	**2000**	0	0	171	643	814
2010 (7.0b)	**2010**	0	0	130	598	728
2011 (7.0b)	**2010**	0	0	130	939	1,069
2011 (7.0c)	**2010**	0	0	130	939	1,069

Everett

Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
2000	2000	0	0	0	0	0
2001	2000	0	0	0	0	0
2002	2000	0	0	0	0	0
2003	2000	0	0	0	0	0
2004	2000	0	0	0	0	0
2005	2000	0	0	0	0	0
2006	2000	0	0	0	0	0
2007	**2000**	0	0	0	0	0
2008 (7.0a)	**2000**	0	0	0	0	0
2008 (7.0b)	**2000**	0	0	0	0	0
2009 (7.0b)	**2000**	0	0	0	0	0
2010 (7.0b)	**2010**	0	0	0	0	0
2011 (7.0b)	**2010**	0	0	0	0	0
2011 (7.0c)	**2010**	0	0	0	0	0

All Communities

Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
2000	2000	0	247	1,304	16,147	17,745
2001	2000	0	244	998	13,004	14,246
2002	2000	0	2	613	7,694	8,309
2003	2000	0	0	503	6,680	7,183
2004	2000	0	2	544	10,174	10,720
2005	2000	0	104	533	5,840 [3]	6,477 [3]
2006	2000	0	104	597	4,882 [3]	5,583 [3]
2007	**2000**	0	0	416	7,683	8,099
2008 (7.0a)	**2000**	0	5	244	5,719	5,968
2008 (7.0b)	**2000**	0	5	244	7,330	7,579
2009 (7.0b)	**2000**	0	5	238	4,092	4,335
2010 (7.0b)	**2010**	0	0	130	3,700	3,830
2011 (7.0b)	**2010**	0	0	130	3,817	3,947
2011 (7.0c)	**2010**	0	0	130	3,817	3,947

Source: HMMH 2011, Massport.
Notes: Population counts for 2000 through 2009 are based on the 2000 U.S. Census block data and the contours beginning in 2004 from the RealContours™ system
Population counts for 2010 and 2011 are provided for the 2010 U.S. Census block data (as indicated) and the contours are from the RealContours™ system
1 Data for years prior to 2000 is available in *Appendix H, Noise Abatement*. 7.0a, 7.0b, and 7.0c refer to INMv7.0a, INMv7.0b, and INMv7.0c respectively.
2 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.
3 These values reflect the effect of the FAA-approved terrain adjustment in Orient Heights.

Table 6-7 Estimated Population within 65 dB[1] DNL Contour[2]

Year	Census Base	Boston East Boston	Boston South Boston	Boston Total	Chelsea	Revere	Winthrop	Everett	All Communities
2000	**2000**	8,979	269	9,248	0	2,496	6,001	0	**17,745**
2001	**2000**	6,639	61	6,700	0	2,496	5,050	0	**14,246**
2002	**2000**	2,757	0	2,757	0	2,822	2,730	0	**8,309**
2003	**2000**	1,894	0	1,894	0	2,994	2,295	0	**7,183**
2004	**2000**	4,399	0	4,399	0	3,051	1,988	0	**9,438**
2005	**2000**	2,155	34	**2,189**[3]	0	2,622	1,666	0	**6,477**
2006 (INMv6.2a)	**2000**	1,184	34	**1,218**[3]	0	2,622	1,743	0	**5,583**
2007 (INMv7.0a)	**2000**	4,263	0	**4,263**	0	2,450	1,386	0	**8,099**
2008 (INMv7.0b)	**2000**	3,492	0	**3,492**	0	2,434	1,653	0	**7,579**
2009 (INMv7.0b)	**2000**	1,009	0	**1,009**	0	2,512	814	0	**4,335**
2010 (INMv7.0b)	**2010**	689	0	**689**	0	2,413	728	0	**3,830**
2011 (INMv7.0b)	**2010**	331	0	**331**	0	2,574	1,069	0	**3,947**
Change 2010 to 2011		(358)	0	**(358)**	0	161	341	0	**117**
2011 (INMv7.0c)	**2010**	331	0	**331**	0	2,574	1,069	0	**3,947**
Change INM 7.0b to INM 7.0c for 2011		0	0	**0**	0	0	0	0	**0**

Source: HMMH 2011, Massport.
Notes: Population counts for 2005 through 2009 are based on the 2000 U.S. Census block data and the contours are from the RealContours™ system
Population counts for 2010 and 2011 are provided for the 2010 U.S. Census block data (as indicated) and the contours are from the RealContours™ system
Within the DNL 65 dB contour there was no difference in the number of people between the two 2011 INM model runs.
1 65 dB DNL is the federally-defined noise criterion used as a guideline to identify where residential land use is considered incompatible with aircraft noise.
2 Data for years prior to 2000 is available in *Appendix H, Noise Abatement.*
3 These values reflect the effect of the FAA-approved terrain adjustment in Orient Heights.

The increase in operations and the closure of Runway 15R-33L between 2010 and 2011 led to a small 3.1 percent increase in the total number of people living within the DNL 65 dB contour from 3,830 to 3,947. Due to the shift in runway use, East Boston had a decrease with 358 fewer people exposed to noise levels DNL 65 dB or greater compared to 2010. For historical context, noise impacts were greater in 2000 when 8,979 people exposed to levels DNL 65 dB in East Boston and 269 people in South Boston.

The higher use of Runways 4R for departures and 22L for arrivals in 2011 resulted in 161 more people exposed to DNL 65 dB in Revere. The total number exposed in Revere in 2011 (2,754) is slightly higher than the 2,496 exposed in the year 2000. There was also an increase of 341 people in Winthrop exposed to DNL 65 dB and above due to increased use of Runway 9 for departures. Winthrop, similar to Boston, has experienced a dramatic reduction in exposed population dropping from 6,001 in 2000 to 1,069 in 2011. The higher number of people exposed in Revere and Winthrop in 2011 offset the reductions in people exposed in East Boston resulting in the small increase in population.

The total population exposed to noise levels between DNL 70 to 75 dB remained the same as 2010. Compared to 2000, there has been a significant reduction in the people exposed to the higher noise levels also. The number in Boston has dropped from 234 people exposed in 2000 to zero in 2011. Revere has remained at zero compared to 2000 with Winthrop having reductions from 1,317 people exposed in 2000 to 130 in 2011.

Comparing Measured and Modeled Noise Levels

When changes in noise exposure are predicted by the INM, it is important to substantiate these modeled findings with actual noise measurements, such as those taken with Massport's permanent noise monitoring system. Massport's system continuously measures the noise levels at each of 30 microphone locations around the Airport and environs, as shown in Figure 6-16. During normal operation, noise monitors at the microphone locations measure noise exposure levels as well as a variety of metrics associated with individual noise events that exceed preset threshold sound levels. Noise monitoring data are transmitted back to Massport's Noise Office, where daily DNL values and other noise metrics are computed for each location and summarized in various reports.

This *2011 ESPR* compares the measured annual average DNL values from the monitors to INM-computed values of DNL at each of the specific noise monitor sites to check for reasonableness. Many sites produced small differences between measurements and predictions, particularly as adjustments were incorporated into the modeling process to account for the over-water sound propagation and hill effects. However, results at more distant locations have often produced substantial differences of 10 dB or more, especially at measurement sites where DNL values were often less than 60 dB. In 2011, with the Airport's noise measurement equipment and monitoring system and its ability to correlate measured noise events with individual flight tracks, combined with the improvements in the INM database, differences between measured and modeled values have narrowed from the values even more than reported in previous EDRs and ESPRs.[23]

Aircraft altitude is a second factor that contributes to the differences between measured and modeled DNL values (especially at the more-distant noise monitoring sites). Typical noise modeling uses distance from origin to destination to determine the appropriate climb profile for an aircraft; however, many aircraft climb more slowly than the standard profiles would suggest, especially if the pilot must make a turn shortly after takeoff. By modeling the actual climb profile instead of selecting the best fit among a standard set, better measured versus modeled results should be expected. This technique resulted in modeling lower altitudes over many of the farther out monitoring sites, is a better reflection of reality, and further reduced the differences between measured and modeled sound levels at those locations.

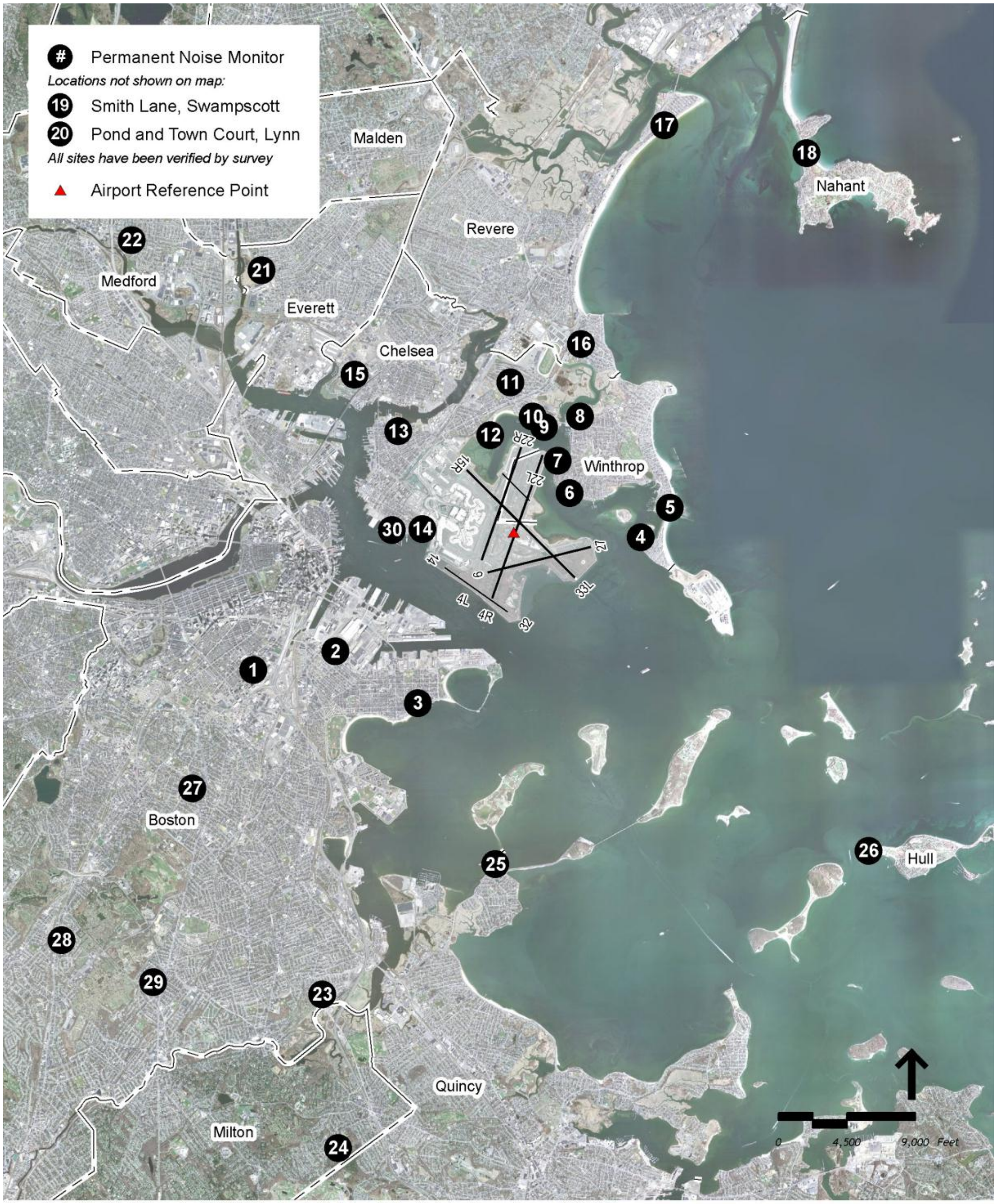
Finally, latitudes and longitudes of each measurement site were verified by survey and their exact coordinates entered into the INM. These improvements in modeling techniques are now fully integrated into the measured-versus-modeled INM comparisons that follow.

Table 6-8 compares the measured 2010 DNL values to the measured 2011 DNL values at each location. Measured sound levels generally dropped between 2010 and 2011. Eleven locations had decreases of more than 2 dB while two had an increase of more than 2 dB; the remaining 17 locations had changes in levels of less than 2 dB. The average measured value for 27 of the sites was 55.0 dB in 2010 and dropped 1.0dB to 54.0 dB in 2011 (Sites 3, 12 and 15 are excluded from the averages due to issues at each site). During 2010, Site 3 had issues due to noise interference from an outside source, which was not an issue in 2011. Site 12 was decommissioned in 2010 and will be relocated. Site 15 had power issues for over six months of 2011. To keep the sites used for the averages consistent, Site 3, 12 and 15 were excluded from the computations. The elimination of these sites from the averages has most likely lowered the average value for each year since these

23 Several factors have resulted in better agreement between measured versus modeled levels. Beginning with the 2009 EDR, flight track data and measurement data have come from the new monitoring system. The more accurate flight track data is used for the modeling inputs and for the measured aircraft event correlation.

sites had measured values greater than DNL 60 dB due to their proximity to the Airport. The average of the absolute difference between the measured values at each site between 2010 and 2011 is 2.1 dB.

Figure 6-16 Noise Monitor Locations



Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

Table 6-8 Measured Versus Measured - Comparison of Measured DNL Values From 2010 to 2011

Location	Site	Distance from Logan Airport (miles)	2010 Measured Aircraft (DNL)	2011 Measured Aircraft (DNL)	Difference 2011 minus 2010
South End – Andrews Street	1	3.7	54.6	51.7	(2.9)
South Boston – B and Bolton	2	2.9	57.7	52.9	(4.8)
South Boston – Day Blvd. near Farragut	3	2.5	64.1	62.3	(1.8)
Winthrop – Bayview and Grandview	4	1.6	70.2	71.6	1.4
Winthrop – Harborview and Faun Bar	5	1.9	62.6	64.0	1.4
Winthrop – Somerset near Johnson	6	0.8	62.4	61.3	(1.1)
Winthrop – Loring Road near Court	7	1.0	65.1	65.5	0.4
Winthrop – Morton and Amelia	8	1.6	59.1	59.8	0.7
East Boston – Bayswater near Annavoy	9	1.3	66.2	66.6	0.4
East Boston – Bayswater near Shawsheen	10	1.3	62.3	62.2	(0.1)
East Boston – Selma and Orient	11	1.8	55.7	55.7	0
East Boston Yacht Club	12	1.2			
East Boston High School	13	1.9	62.2	58.5	(3.7)
East Boston – Jeffries Point Yacht Club	14	1.2	56.2	53.5	(2.7)
Chelsea – Admiral's Hill	15	2.8	61.2	57.1	(4.1)
Revere – Bradstreet and Sales	16	2.4	67.5	68.5	1
Revere – Carey Circle	17	5.3	58.6	59.6	1
Nahant – U.S.C.G. Recreational Facility	18	5.9	43.0	42.4	(0.6)
Swampscott – Smith Lane	19	8.7	42.0	40.5	(1.5)
Lynn – Pond and Towns Court	20	8.4	51.9	54.0	2.1
Everett – Tremont near Prescott	21	4.5	50.6	44.4	(6.2)
Medford – Magoun near Thatcher	22	6.0	50.6	46.6	(4)
Dorchester – Myrtlebank near Hilltop	23	6.3	50.9	52.6	1.7
Milton – Cunningham Park near Fullers	24	8.1	47.9	49.4	1.5
Quincy – Squaw Rock Park	25	4.2	40.4	43.5	3.1
Hull – Hull High School near Channel Street	26	6.0	57.4	56.1	(1.3)
Roxbury – Boston Latin Academy	27	5.3	54.2	50.1	(4.1)
Jamaica Plain – Southbourne Road	28	7.7	45.5	41.4	(4.1)
Mattapan – Lewenburg School	29	7.3	40.5	37.8	(2.7)
East Boston – Piers Park	30	1.5	49.8	47.0	(2.8)
Absolute Average [1]			55.0	54.0	2.1

Source: HMMH

Notes: Changes in ( ) represent a decrease in measured noise level from 2010 to 2011.
Distance from Logan Airport calculated from the Airport Reference Point.
Site 12 was not operational for most of 2010 and 2011. It was operational in 2009.
Site 3 had interference from an outside source in 2010.
Site 15 had a power source issue (out 1/27/11 – 8/3/11).

1 Sites 3, 12 and 15 are not included in the Average values.

Table 6-9 compares the measured 2011 DNL values at each measurement site to the modeled 2011 DNL values. The average measured value for twenty-seven of the sites is 54.0 dB in 2011 and the average modeled value is 57.1 dB in 2011 (Site 3, 12 and 15 are excluded from the averages due to issues at each site). The closure of Runway 15R-33L (Runway 15R departures head out over Boston Harbor) increased use of other runways increasing the average value at the measurement sites. The average of the absolute difference between the measured versus modeled values for 2010 is 1.9 dB and 1.8 dB in 2011.

Using RealContours™, Massport is able to compute the modeled DNL for exactly the same periods for which the noise monitoring system was collecting data at each site. As shown in Table 6-9, 13 of the sites have 2011 modeled levels more than 2 dB different from measured levels, and at 22 sites the modeled levels are higher than the measured levels. At sixteen of these locations where modeled exceeds measured, the measured levels are below DNL 60 dB, and at seven sites the measured levels are below DNL 50 dB. It is not unusual to experience differences between measured and modeled levels at the locations with lower measured DNL values. The monitor identification of aircraft noise events becomes more difficult, and long distance effects can reduce levels that the model cannot duplicate. At Sites 7, 8 and 9 the difference between measured and modeled is greater than in 2010. Site 6 in Winthrop, where the modeled level is 0.5 dB greater than measured levels, experiences side-line noise from start of takeoff, and levels are subject to over-water propagation, which are adjusted using the approved method for Logan Airport.

In 2000, the prior monitoring system did separate out aircraft only measured values and the absolute average difference between measured and modeled was 2.8 dB versus 1.8 dB in 2011. Measured noise levels in general have decreased with the average measured noise level in 2000 equal to DNL 62.5 dB and in 2011 equal to DNL 54.0 dB which is a drop of 8.5 dB over the past 11 years. All of the sites have lower values than 2000 except for Site 20 in Lynn which measured approximately the same 53.6 dB in 2000 and 54.0 in 2011. The measured level is almost equal even though arrivals to Runway 22L have increased from 7 percent in 2000 to 16 percent in 2011. This site also measured a 2.1 dB increase compared to 2010 which is most likely due to the increased use of 22L due to the Runway 15R-33R runway closure. Sites such as the three monitors in South Boston had measured values ranging from 62.6 dB to 66.3 dB in 2000 and measured 51.7 dB to 62.3 dB in 2011.

Table 6-9 Measured Versus Modeled - Comparison of Measured DNL Values to RealContours™-modeled DNL Values, 2011

Location	Site	Distance from Logan Airport (miles)	2011 Measured Aircraft – Only DNL	2011 Modeled RC Results INMv7.0c(DNL)[1]	2010 Difference Modeled minus Measured	2011 Difference Modeled minus Measured
South End – Andrews Street	1	3.7	51.7	51.1	(1.7)	(0.6)
South Boston – B and Bolton	2	2.9	52.9	55.4	0.1	2.5
South Boston – Day Blvd. near Farragut	3	2.5	62.3	61.2	(4.7)	(1.1)
Winthrop – Bayview and Grandview	4	1.6	71.6	73.1	1.9	1.5
Winthrop – Harborview and Faun Bar	5	1.9	64.0	64.3	0.1	0.3
Winthrop – Somerset near Johnson	6	0.8	61.3	61.8	(1.1)	0.5
Winthrop – Loring Road near Court	7	1.0	65.5	69.2	1.8	3.7
Winthrop – Morton and Amelia	8	1.6	59.8	62.0	1.6	2.2
East Boston – Bayswater near Annavoy	9	1.3	66.6	70.6	3.8	4.0
East Boston – Bayswater near Shawsheen	10	1.3	62.2	62.7	(0.4)	0.5
East Boston – Selma and Orient[2]	11[2]	1.8	55.7	54.5	1.6	(1.2)
East Boston Yacht Club	12	1.2		67.2		
East Boston High School	13	1.9	58.5	59.4	(0.4)	0.9
East Boston – Jeffries Point Yacht Club	14	1.2	53.5	55.1	(0.8)	1.6
Chelsea – Admiral's Hill	15	2.8	57.1	57.4	(1.3)	0.3
Revere – Bradstreet and Sales	16	2.4	68.5	68.4	0.2	(0.1)
Revere – Carey Circle	17	5.3	59.6	59.3	0.0	(0.3)
Nahant – U.S.C.G. Recreational Facility	18	5.9	42.4	45.0	1.4	2.6
Swampscott – Smith Lane	19	8.7	40.5	45.6	3.6	5.1
Lynn – Pond and Towns Court	20	8.4	54.0	52.5	(0.1)	(1.5)
Everett – Tremont near Prescott	21	4.5	44.4	49.1	1.5	4.7
Medford – Magoun near Thatcher	22	6.0	46.6	49.0	0.3	2.4
Dorchester – Myrtlebank near Hilltop	23	6.3	52.6	54.1	2.0	1.5
Milton – Cunningham Park near Fullers	24	8.1	49.4	54.0	5.0	4.6
Quincy – Squaw Rock Park	25	4.2	43.5	47.7	5.8	4.2
Hull – Hull High School near Channel Street	26	6.0	56.1	55.7	(1.9)	(0.4)
Roxbury – Boston Latin Academy	27	5.3	50.1	50.2	(1.7)	0.1
Jamaica Plain – Southbourne Road	28	7.7	41.4	46.5	3.2	5.1
Mattapan – Lewenburg School	29	7.3	37.8	44.9	5.8	7.1
East Boston – Piers Park	30	1.5	47.0	52.4	3.5	5.4
Absolute Average [3]			54.0	57.1	1.9	1.8

Source: HMMH

Note: 2010 and 2011 Modeled results were computed for the whole year.
Distance from Logan Airport calculated from the Airport Reference Point.

I NMv7.0c with adjusted database. (Database modifications as described in the *Logan Airport 1994/1995 Generic Environmental Impact Report).*

2 Includes FAA-approved terrain adjustment modifying normal INMv7.0c result for Site 11.

3 Sites 3, 12, and 15 are not included in the average values.

NA Not available.

Supplemental Metrics

To better describe the noise environment, this *2011 ESPR* includes supplemental noise metrics: CNI, dwell and persistence, and times above a noise threshold.

Cumulative Noise Index (CNI)

Massport reports total annual fleet noise at Logan Airport, defined in the Logan Airport Noise Rules by a metric referred to as the CNI. The CNI is a single number representing the sum of the entire set of single-event effective perceived noise levels (EPNL) experienced at Logan Airport over a full year of operation, weighted similarly to DNL so that activity occurring at night is penalized by adding an extra 10 dB to each event. This penalty is equivalent to multiplying the number of nighttime events of each aircraft by a factor of 10.

The Logan Airport Noise Rules define CNI in units of EPNdB and require that the index be computed for the fleet of commercial aircraft operating at Logan Airport throughout the year. In addition, in EDRs and ESPRs, Massport reports partial CNI values of noise at Logan Airport, so that various subsets of the fleet (cargo, night operations, passenger jets, etc.) are identified. Utilizing the expanded data available from the NOMS, all of the available aircraft registration data were used to select the proper noise certification levels from the latest aircraft noise registration database.[24]

The Noise Rules, adopted by Massport following public hearings held in February 1986, established a CNI limit of 156.5 EPNdB. The CNI generally has decreased since 1990, remaining below that cap, and typical changes from one year to the next have been within a few tenths of a dB. The 2011 CNI of 152.1 EPNdB represents a 0.2 dB increase from 2010 but remained well below the cap of 156.5 EPNdB. The partial CNI decreased in 10 categories and increased in 11 categories compared to 2010. The last time the CNI increased was in 2008 which was also a 0.2 dB increase. 2008 had a similar level of operations as 2011 but the total CNI in 2011 is 0.8 dB less than in 2008. This reflects the continued use of quieter aircraft at the Airport.

Partial CNI Calculations

Partial CNI values were obtained by summing the noise from particular segments of Logan Airport's total operations. They are useful for identifying the greatest contributors to overall noise. As shown in Table 6-10, the sectors of the fleet with the highest numbers of partial CNI indicate a greater contribution to total noise. Table 6-10 also indicates that:

- Passenger jets contributed approximately 3.9 dB more noise to the total exposure in 2011 than cargo aircraft.
- Daytime passenger decreased 0.1dB with nighttime passenger decreasing by 0.5 dB compared to 2010.
- Nighttime operations continued to contribute more noise than daytime activity, and nighttime flights by air carriers contributed more noise than nighttime cargo operations.
- Daytime cargo increased 2.1 dB with nighttime cargo increasing by 1.6 dB compared to 2010.
- One Lear 25 (Stage 2 aircraft less than 75,000 pounds) operation occurred during 2011 by a cargo operator. The operator typically operates a Lear 35 (Stage 3 aircraft less than 75,000 pounds).

24 Type-certificate data sheet for noise (TCDSN) database available from the European Aviation Safety Agency; //easa.europa.eu/certification/type-certificates/noise.php.

Table 6-10 Cumulative Noise Index (EPNdB)[1]

	Logan Airport CNI Cap – 156.5 EPNdB					
	2000	**2001**	**2002**	**2003**	**2004**	**2005**
Full CNI (Entire Commercial Jet Fleet)	**154.7**	**154.1**	**153.2**	**152.7**	**153.4**	**153.2**
Total Passenger Jets	153.6	152.9	151.8	151.3	152.2	152.1
Total Cargo Jets	148.2	147.8	147.4	147.1	147.0	146.6
Total Daytime	149.5	149.0	148.5	148.0	148.5	148.2
Total Nighttime	153.1	152.4	151.3	150.9	151.7	151.6
Total Stage 2 Jets	124.7	121.5	114.3	114.1	118.1	NA
Total Stage 3 Jets	154.7	154.1	153.2	152.7	153.4	153.2
Daytime Stage 2	122.6	119.3	111.2	113.7	109.4	NA
Nighttime Stage 2	120.5	117.3	111.4	103.2	117.5	NA
Daytime Stage 3	149.5	149.0	148.5	148.0	148.5	148.2
Nighttime Stage 3	153.1	152.4	151.3	150.9	151.7	151.6
Passenger Jet Stage 2	124.2	116.3	NA	NA	NA	NA
Passenger Jet Stage 3	153.6	152.9	151.8	151.3	152.2	152.1
Cargo Jet Stage 2	114.8	119.9	114.3	114.1	118.1	NA
Cargo Jet Stage 3	148.2	147.8	147.4	147.1	147.0	146.6
Daytime Passenger	149.3	148.7	148.2	147.7	148.2	147.9
Nighttime Passenger	151.6	150.8	149.4	148.8	150.0	150.1
Daytime Cargo	137.5	137.1	137.0	136.2	135.7	135.8
Nighttime Cargo	147.8	147.4	147.0	146.8	146.7	146.2
Daytime Passenger Stage 2	122.3	115.0	NA	NA	NA	NA
Daytime Passenger Stage 3	149.2	148.7	148.2	147.7	148.2	147.9
Nighttime Passenger Stage 2	119.8	110.2	NA	NA	NA	NA
Nighttime Passenger Stage 3	151.6	150.8	149.4	148.8	150.0	150.1
Daytime Cargo Stage 2	111.1	117.3	111.2	113.7	109.4	NA
Daytime Cargo Stage 3	137.5	137.0	137.0	136.1	135.7	135.8
Nighttime Cargo Stage 2	112.3	116.4	111.4	103.2	117.5	NA
Nighttime Cargo Stage 3	147.8	147.4	147.0	146.8	146.7	146.2

Source: HMMH

Table 6-10 Cumulative Noise Index (EPNdB)[1] (Continued)							
	Logan Airport CNI Cap – 156.5 EPNdB						
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**Change (2010-2011)**
Full CNI (Entire Commercial	**152.6**	**152.7**	**152.9**	**152.3**	**151.9**	**152.1**	**0.2**
Total Passenger Jets	151.4	151.5	151.9	151.1	150.9	150.6	(0.3)
Total Cargo Jets	146.5	146.4	146.1	145.9	145.1	146.7	1.6
Total Daytime	147.5	147.2	147.6	147.1	146.8	146.9	0.1
Total Nighttime	151.0	151.2	151.4	150.7	150.3	150.6	0.3
Total Stage 2 Jets	NA	NA	NA	NA	113.6[2]	110.8[2]	(2.8)
Total Stage 3 Jets	152.6	152.7	152.9	152.3	151.9	152.1	0.2
Daytime Stage 2	NA	NA	NA	NA	103.6[2]	NA	NA
Nighttime Stage 2	NA	NA	NA	NA	113.1[2]	110.8	(2.3)
Daytime Stage 3	147.5	147.2	147.6	147.1	146.8	146.9	0.1
Nighttime Stage 3	151.0	151.2	151.4	150.7	150.3	150.6	0.3
Passenger Jet Stage 2	NA	NA	NA	NA	NA	NA	NA
Passenger Jet Stage 3	151.4	151.5	151.9	151.1	150.9	150.6	(0.3)
Cargo Jet Stage 2	NA	NA	NA	NA	113.6[2]	110.8[2]	(2.8)
Cargo Jet Stage 3	146.5	146.4	146.1	145.9	145.1	146.7	1.6
Daytime Passenger	147.2	146.9	147.3	146.8	146.6	146.5	(0.1)
Nighttime Passenger	149.3	149.7	150.0	149.1	149.0	148.5	(0.5)
Daytime Cargo	135.5	135.8	135.8	135.2	134.5	136.6	2.1
Nighttime Cargo	146.1	146.0	145.6	145.5	144.7	146.3	1.6
Daytime Passenger Stage 2	NA	NA	NA	NA	NA	NA	NA
Daytime Passenger Stage 3	147.2	146.9	147.3	146.8	146.6	146.5	(0.1)
Nighttime Passenger Stage 2	NA	NA	NA	NA	NA	NA	NA
Nighttime Passenger Stage 3	149.3	149.7	150.0	149.1	149.0	148.5	(0.5)
Daytime Cargo Stage 2	NA	NA	NA	NA	103.6[2]	NA	NA
Daytime Cargo Stage 3	135.5	135.8	135.8	135.2	134.4	136.6	2.2
Nighttime Cargo Stage 2	NA	NA	NA	NA	113.1[2]	110.8[2]	(2.3)
Nighttime Cargo Stage 3	146.1	146.0	145.6	145.5	144.7	146.3	1.6

Source: HMMH 2011
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 Data for years prior to 2000 is available in *Appendix H, Noise Abatement*.
2 The Stage 2 results are from a Lear 25 aircraft arrival and departure flown by a Cargo Operator during 2011. The operator typically operates a Lear 35 aircraft at Logan Airport.

Table 6-11 provides the number of flight operations, the resulting CNI by airline for 2011 and the partial CNI by operation for 2010 and 2011. The table shows the relative contribution of each airline to total CNI and reflects the contributions of individual aircraft noise levels and the frequency with which they occur. The table is sorted by the Partial CNI by operation for 2011 and shows that the major cargo operators all are at the top of this list since they operate primarily at night. JetBlue Airways, with the largest number of operations, has the second highest CNI per airline at 145.0, but its partial CNI by operation is well below the other major airlines in part due to its use of newer aircraft. FedEx has less than one tenth of the operations that JetBlue Airways has but its total CNI per airline is 146.5, or only 1.5 above JetBlue Airways. The partial CNI by operation for FedEx is the highest of all of the airlines and this is due to the Boeing 727 and DC10 which are the primary aircraft in their fleet and the fact that half of their operations are at night.

Regional carriers generally contribute the least to the partial CNI per operation whereas the international carriers, which operate larger aircraft and generally have more operations at night, are just below the cargo operators in rank. The relative positions for the domestic carriers are due mainly to their fleet characteristics and number of night operations. United Air Lines has fewer operations than Southwest Airlines or JetBlue Airways, however, 19.3 percent of its operations at night as compared to Southwest, which had only 13.2 percent at night. JetBlue Airways also has a lower night percentages (13.6 percent) and operates a newer fleet than either American Airlines or United Air Lines.

Table 6-11 Annual Operations and Partial CNI by Airline and per Operation, 2011

Airlines with more than 100 flights in 2011	2011 Operations[1]	2011 Total Airline CNI (EPNdB)	Partial CNI (EPNdB) per Operation		Airline Category
			2010	2011	
FedEx	5,050	146.5	108.9	109.5	Cargo
United Parcel Service	1,413	137.8	106.5	106.3	Cargo
DHL Airways	492	132.6	105.6	105.7	Cargo
British Airways	2,409	137.1	101.0	103.3	International
Air France	1,013	133.3	103.0	103.3	International
Capital Cargo International	225	126.8	103.1	103.2	Cargo
TACV-Cabo Verde	236	126.0	103.5	102.3	International
Miami Air	179	123.1	101.3	100.6	International
SATA International Airlines	400	126.5	100.4	100.5	International
Lufthansa	1,734	132.9	100.0	100.5	International
Swiss Air	723	127.9	99.3	99.3	International
United Air Lines	15,305	140.7	98.7	98.9	Domestic
Virgin Atlantic	721	127.0	99.5	98.4	International
Virgin America	6,052	135.6	96.6	97.8	Domestic
Continental	9,821	137.7	96.7	97.7	Domestic
American Airlines	21,021	141.0	97.6	97.7	Domestic
Alaska Airlines	1,757	130.0	97.6	97.6	Domestic

Source: HMMH

Table 6-11 Annual Operations and Partial CNI by Airline and per Operation, 2011 (Continued)

Airlines with more than 100 flights in 2011	2011 Operations[1]	2011 Total Airline CNI (EPNdB)	Partial CNI (EPNdB) per Operation 2010	Partial CNI (EPNdB) per Operation 2011	Airline Category
Southwest Airlines	17,387	139.9	96.8	97.5	Domestic
Spirit Airlines	3,054	132.3	96.5	97.4	Domestic
Alitalia	604	124.9	97.1	97.1	International
Frontier Airlines	1,129	127.6	94.9	97.1	Domestic
Aer Lingus	1,126	127.6	97.1	97.1	International
Iberia Air Lines Of Spain	445	123.5	96.9	97.0	International
JetBlue Airways	63,828	145.0	97.2	96.9	Domestic
Delta Air Lines[2]	28,952	141.4	97.3	96.8	Domestic
Astraeus Airlines	100	116.0	NA	96.0	International
US Airways	40,352	141.8	95.2	95.8	Domestic
Allegiant Air	131	116.5	NA	95.4	Domestic
Air Canada	4,163	131.5	96.0	95.3	International
Mesa Airlines	260	119.4	NA	95.3	Regional
Sun Country Airlines	513	122.2	94.6	95.1	Regional
Shuttle America Corp	3,948	130.8	94.2	94.8	Regional
AirTran Airways	12,851	135.8	94.7	94.7	Domestic
Mesaba Airlines	3,117	129.5	93.9	94.6	Regional
Compass Airlines	1,565	125.8	97.3	93.9	Regional
Icelandair	928	123.1	93.9	93.4	International
US Airways Express/Republic	4,365	129.6	95.4	93.2	Regional
Delta Connection/Comair	7,708	131.8	NA	93.0	Regional
Continental Express/Expressjet	2,254	125.2	NA	91.6	Regional
Delta Connection/Atlantic SE	5,088	128.6	90.9	91.6	Domestic
AWAC - US Air Express	6,491	129.5	91.5	91.4	Regional
American Eagle Airlines	8,816	130.2	91.5	90.8	Regional
Horizon Air	150	112.5	NA	90.7	Regional
Trans States Airlines	1,214	121.1	89.7	90.3	Regional
Chautauqua	5,898	127.9	89.9	90.2	Regional
Air Canada Jazz	6,422	128.3	90.5	90.2	Regional
Pinnacle Airlines	1,507	121.2	89.7	89.4	Regional

Source: Massport. 2011

1 Operations for some carriers differ to those in *Chapter 2, Activity Levels* and *Chapter 7, Air Quality/Emissions Reduction* because this table only includes jet aircraft and not turboprops, and because it includes both scheduled and unscheduled air carriers.

2 Delta acquired Northwest Airlines and 2010 is the first year of reported consolidated operations.

NA Airline had no operations at Logan Airport.

Dwell and Persistence Goals

Another supplemental measure of noise impact relates to the length of time noise impacts occur. To provide temporary relief to neighborhoods affected by regular overflights during single or multi-day periods, the PRAS Advisory Committee established two short-term goals for the system in addition to the annual goals:

- Provide relief from excessive dwell. Exceedance is defined as more than seven hours of operations over a given area during any day between the hours of 7:00 AM and midnight.
- Provide relief from excessive persistence. Exceedance is defined as more than 23 hours of operations over an area between 7:00 AM and midnight during a period of three consecutive days.

In contrast to the annual goals that count the number of equivalent operations on a runway, dwell and persistence are measured by the number of hours that a given location or area is subject to jet aircraft overflights. The PRAS Advisory Committee designated eight runway combinations for computing the effects of dwell and persistence on the communities. Table 6-12 shows the dwell and persistence areas by community.

Table 6-12 Representative Neighborhoods Affected by Runway Use

Runway	Representative Affected Neighborhoods
4L and 4R Arrivals	South Boston (Farragut St.), Dorchester, Quincy, Milton, Weymouth, and Braintree
32 and 33L Arrivals	Boston Harbor, Hull, Cohasset, Hingham, Scituate, and Norwell
14 and 15R Departures	Boston Harbor, Hull, Cohasset, Hingham, and Scituate
22L and 22R Departures	South Boston (Farragut Street), Boston Harbor, Hull, Cohasset, Hingham, and Scituate
27 Departures	South Boston (Fan Pier), Roxbury, Jamaica Plain, South End, West Roxbury, Roslindale, Brookline, and Hyde Park
4L and 4R Departures plus 22L and 22R Arrivals	East Boston (Bayswater, Orient Heights), Winthrop (Court Road), Revere, and Nahant
9 Departures plus 27 Arrivals	Winthrop (Point Shirley), and Boston Harbor
33 Departures plus 15 Arrivals	East Boston (Eagle Hill), Chelsea, Everett, Medford, Somerville, Arlington, and Cambridge

Source: Massport

As required by Massport's commitments for the Logan Airside Improvements Planning Project,[25] this *2011 ESPR* reports on noise dwell and persistence levels. Higher levels of dwell or persistence for overwater areas represent a benefit since this produces a corresponding decrease in total hours over populated areas. Figures 6-17 and 6-18 illustrate the annual hours of dwell and persistence by runway end for 2004 through 2011. In 2011, the largest contributor to dwell and persistence remained arrivals to Runway 27 and departures from Runway 9, and persistence and dwell both increased when compared to 2010. Dwell and persistence also increased for both arrivals and departures to Runway 22L and Runway 4R. Areas affected by arrivals to Runway 33L and Runway 32 as well as areas affected by departures from Runway 27 and Runway 33L showed a decrease in dwell and persistence.

25 *Logan Airside Improvements Planning Project Final EIS*, Section 4.2.3 *PRAS Monitoring and Reporting* June 2002.

Figure 6-17 Comparison of Annual Hours of Dwell Exceedance by Runway End, 2004 to 2011

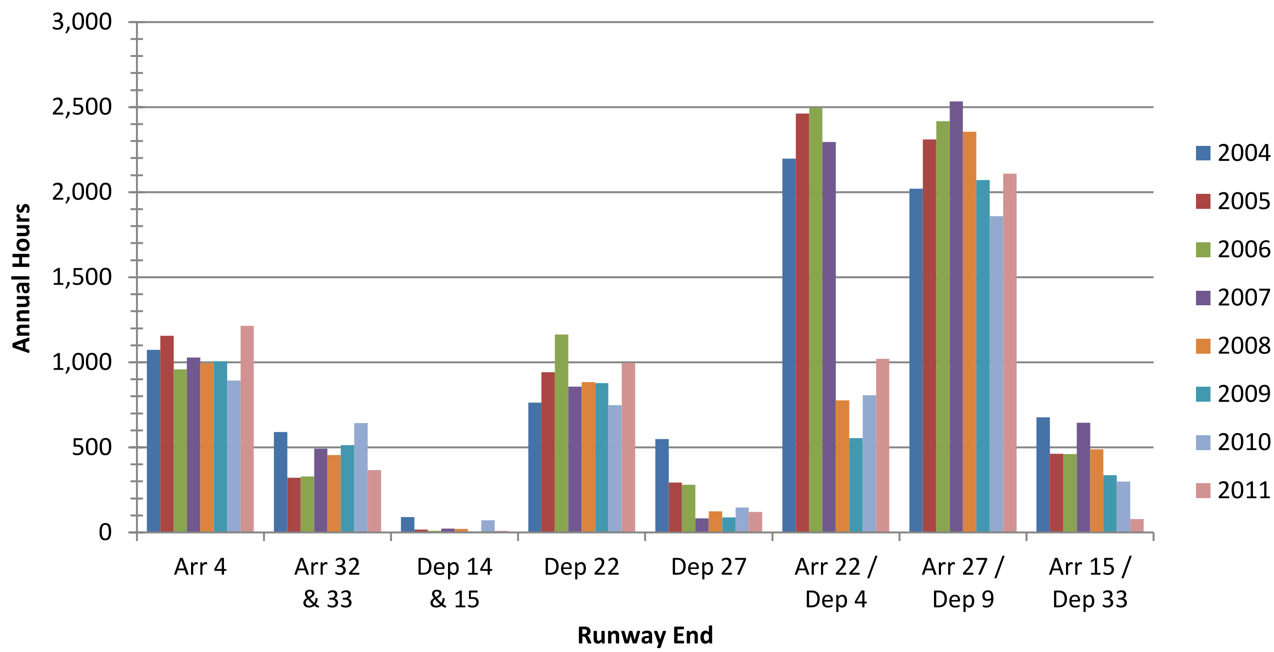
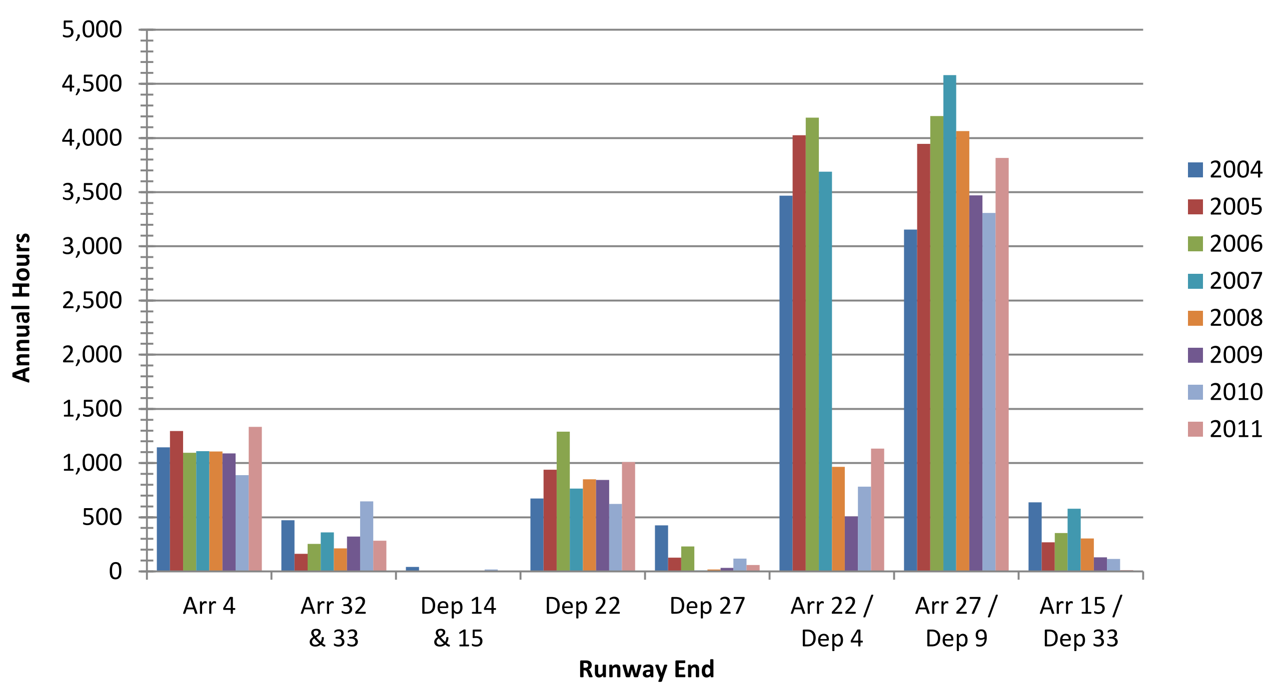


Figure 6-18 Comparison of Annual Hours of Persistence Exceedance by Runway End, 2004 to 2011



Notes: Arr – Arrivals
Dep – Departures

Time Above (TA)

The third supplemental noise metric reported in this *2011 ESPR* is the amount of time that aircraft noise is higher than each of three predefined threshold sound levels. The measure is referred to generally as TA, and the threshold sound levels used in the analysis are 65, 75, and 85 dBA (A-weighted dBs). Like DNL values, these times are computed using the FAA-approved INM as modified for Logan Airport. The calculations are made at each of Massport's permanent noise monitoring locations and are based on an average 24-hour day during the year as well as for the average nine-hour nighttime period from 10:00 PM to 7:00 AM. The threshold sound levels of 65, 75, and 85 dBA reflect different degrees of speech interference depending on factors such as whether people are outdoors, indoors with their windows open, or indoors with windows closed. Findings for 2011 include:

- The TA results at many of the sites correspond to the change in the contour levels. At Site 2, which is affected by Runway 27 departures (utilization for departures increased in 2011), the 24-hour TA65 level decreased from 14.2 minutes in 2010 to 11.1 minutes in 2011, however, the night only TA65 level increased from 0.1 minutes to 1.4 minutes suggesting the increase in departures on Runway 27 was primarily during the night.
- Site 16 (Revere – Bradstreet and Sales), which is affected by arrivals to Runways 22L and 4R departures, experienced an increase in the 24-hour TA65, TA75 and TA85 levels. The TA65 increased from 30.7 minutes in 2010 to 39.2 minutes in 2011 with the TA85 increasing from 1.9 minutes in 2010 to 2.3 minutes in 2011. The night only TA65 level increased 6.3 minutes in 2010 to 8.7 minutes in 2011. The increase in the TA values matches the measured increase from DNL 67.4 dB in 2010 to DNL 68.4 dB in 2011
- At Site 13 (East Boston High School), TA values dropped in 2011 compared to 2010. The TA65 dropped from 29.4 minutes to 15.1 minutes and the TA75 dropped from 6.1 minutes to 2.6 minutes.
- The average 24-hour TA results for 2011 decreased from 2010 for all levels. TA85 decreased on average by 0.1 minute due. The TA75 dropped by 1.6 minutes and the TA65 dropped by 9.4 minutes. Table 6-14 contains the night only TA results and the average results also dropped for 2011. This result is consistent with the decrease use of the noise abatement runway (Runway 15R-33L) due to the runway closure as many sites are affected by noise from Runway 15R-33L.

Table 6-13 and Table 6-14 present a summary of the calculated TA values for 2011.

Table 6-13 Time Above dBA Thresholds in a 24 Hour Period for Average Day[1]

Location	Site	Distance from Logan Airport (miles)	Minutes above Threshold 2010			Minutes above Threshold 2011			2011 Modeled Day-Night Sound Levels[2]
			85dBA	75dBA	65dBA	85dBA	75dBA	65dBA	
Winthrop – Bayview and Grandview	4	1.6	11.5	41.0	91.0	12.1	46.9	105.2	73.1
Winthrop – Harborview and Faun Bar	5	1.9	0.3	10.6	72.4	0.1	12.8	86.8	64.3
Winthrop – Somerset near Johnson	6	0.8	0.0	3.5	79.9	0.0	0.2	11.8	61.8
Winthrop – Loring Road near Court	7	1.0	2.3	22.9	128.5	0.3	7.2	48.9	69.2
Winthrop – Morton and Amelia	8	1.6	0.1	3.0	46.9	0.1	2.6	24.4	62
East Boston – Bayswater near Annavoy	9	1.3	2.0	20.4	67.0	2.1	17.3	48.8	70.6
East Boston – Bayswater near Shawsheen	10	1.3	0.3	5.6	39.8	0.2	4.1	30.6	62.7
East Boston – Selma and Orient	11	1.8	0.0	1.4	20.5	0.0	1.0	9.7	54.5
East Boston Yacht Club	12	1.2	0.8	30.2	153.3	0.1	1.8	49.4	67.2
East Boston High School	13	1.9	0.3	6.1	29.4	0.1	2.6	15.1	59.4
East Boston – Jeffries Point Yacht Club	14	1.2	0.0	0.5	8.8	0.0	0.4	6.8	55.1
East Boston – Piers Park	30	1.5	0.0	0.3	4.2	0.0	0.2	3.1	52.4
Chelsea – Admiral's Hill	15	2.8	0.2	4.1	25.0	0.1	1.6	12.6	57.4
Revere – Bradstreet and Sales	16	2.4	1.9	12.4	30.7	2.3	15.7	39.2	68.4
Revere – Carey Circle	17	5.3	0.0	1.6	21.3	0.0	1.8	28.0	59.3
Nahant – U.S.C.G. Recreational Facility	18	5.9	0.0	0.0	0.7	0.0	0.0	0.3	45.0
Everett – Tremont near Prescott	21	4.5	0.0	0.2	6.6	0.0	0.1	3.0	49.1
Medford – Magoun near Thatcher	22	6.0	0.0	0.2	5.8	0.0	0.1	2.7	49.0
Swampscott – Smith Lane	19	8.7	0.0	0.0	1.7	0.0	0.0	1.0	45.6
Lynn - Pond and Towns Court	20	8.4	0.0	0.0	4.3	0.0	0.0	6.5	52.5
South End – Andrews Street	1	3.7	0.0	0.4	6.7	0.0	0.1	5.3	51.1
South Boston – B and Bolton	2	2.9	0.1	1.9	14.5	0.0	1.0	11.1	55.4
South Boston – Day Blvd. near Farragut	3	2.5	0.1	3.9	39.2	0.2	5.4	58.8	61.2
Roxbury – Boston Latin Academy	27	5.3	0.0	0.3	7.0	0.0	0.1	4.7	50.2
Jamaica Plain - Southbourne Road	28	7.7	0.0	0.0	2.2	0.0	0.0	1.1	46.5
Mattapan – Lewenburg School	29	7.3	0.0	0.0	0.8	0.0	0.0	0.7	44.9
Dorchester – Myrtlebank near Hilltop	23	6.3	0.0	0.0	8.5	0.0	0.0	12.2	54.1
Milton – Cunningham Park near Fullers	24	8.1	0.0	0.0	9.1	0.0	0.0	14.1	54.0
Quincy – Squaw Rock Park	25	4.2	0.0	0.0	0.7	0.0	0.0	0.7	47.7
Hull – Hull High School near Channel Street	26	6.0	0.0	0.2	11.7	0.0	0.1	13.0	55.7
Average Time Above (TA) Value			0.7	5.7	31.3	0.6	4.1	21.9	57.1

Notes: Distance from Logan Airport calculated from the Airport Reference Point.
dBA A-weighted decibel
1 INMv7.0c for all of 2010 and 2011 (12 months) with adjusted database. (Database modifications as described in the *Logan Airport 2004 ESPR)*.
2 Modeled using RealContours™ and RealProfiles™ using INM v7.0c.

Table 6-13 Time Above dBA Thresholds in a Nine Hour Night Period for Average Day[1] (Continued)									
		Distance from Logan Airport	Minutes above Threshold During the Night 2010			Minutes above Threshold During the Night 2011			2011 Modeled Day-Night Sound
Location	Site	(miles)	85dBA	75dBA	65dBA	85dBA	75dBA	65dBA	Levels[2]
Winthrop – Bayview and Grandview	4	1.6	0.6	2.4	5.9	0.9	3.5	8.3	73.1
Winthrop – Harborview and Faun Bar	5	1.9	0.0	0.6	4.4	0.0	1.1	6.9	64.3
Winthrop – Somerset near Johnson	6	0.8	0.0	0.4	10.2	0.0	0.0	1.8	61.8
Winthrop – Loring Road near Court	7	1.0	0.1	1.9	15.5	0.0	1.0	8.3	69.2
Winthrop – Morton and Amelia	8	1.6	0.0	0.3	6.4	0.0	0.3	4.8	62
East Boston – Bayswater near Annavoy	9	1.3	0.4	3.5	12.2	0.4	3.8	9.3	70.6
East Boston – Bayswater near Shawsheen	10	1.3	0.0	0.5	8.8	0.0	0.3	5.3	62.7
East Boston – Selma and Orient	11	1.8	0.0	0.1	3.1	0.0	0.0	0.6	54.5
East Boston Yacht Club	12	1.2	0.1	4.2	22.6	0.0	0.2	6.2	67.2
East Boston High School	13	1.9	0.1	0.8	3.3	0.0	0.5	2.4	59.4
East Boston – Jeffries Point Yacht Club	14	1.2	0.0	0.0	0.9	0.0	0.0	0.7	55.1
East Boston – Piers Park	30	1.5	0.0	0.1	3.2	0.0	0.0	0.2	52.4
Chelsea – Admiral's Hill	15	2.8	0.0	0.5	2.8	0.0	0.3	1.9	57.4
Revere – Bradstreet and Sales	16	2.4	0.5	2.7	6.3	0.6	3.7	8.7	68.4
Revere – Carey Circle	17	5.3	0.0	0.3	4.6	0.0	0.4	6.6	59.3
Nahant – U.S.C.G. Recreational Facility	18	5.9	0.0	0.0	0.0	0.0	0.0	0.0	45.0
Everett – Tremont near Prescott	21	4.5	0.0	0.0	1.2	0.0	0.0	0.4	49.1
Medford – Magoun near Thatcher	22	6.0	0.0	0.0	0.7	0.0	0.0	0.4	49.0
Swampscott – Smith Lane	19	8.7	0.0	0.0	0.1	0.0	0.0	0.1	45.6
Lynn - Pond and Towns Court	20	8.4	0.0	0.3	2.3	0.0	0.0	1.8	52.5
South End – Andrews Street	1	3.7	0.0	0.1	1.2	0.0	0.0	0.7	51.1
South Boston – B and Bolton	2	2.9	0.0	0.0	0.1	0.0	0.1	1.4	55.4
South Boston – Day Blvd. near Farragut	3	2.5	0.0	0.0	0.3	0.0	0.3	5.5	61.2
Roxbury – Boston Latin Academy	27	5.3	0.0	0.0	2.5	0.0	0.0	0.6	50.2
Jamaica Plain - Southbourne Road	28	7.7	0.0	0.0	1.2	0.0	0.0	0.1	46.5
Mattapan – Lewenburg School	29	7.3	0.0	0.0	0.4	0.0	0.0	0.0	44.9
Dorchester – Myrtlebank near Hilltop	23	6.3	0.0	0.0	0.6	0.0	0.0	1.2	54.1
Milton – Cunningham Park near Fullers	24	8.1	0.0	0.0	0.9	0.0	0.0	1.6	54.0
Quincy – Squaw Rock Park	25	4.2	0.0	0.0	1.1	0.0	0.0	0.1	47.7
Hull – Hull High School near Channel Street	26	6.0	0.0	0.0	0.0	0.0	0.0	2.5	55.7
Average Time Above Value			0.1	0.6	4.1	0.1	0.5	2.9	57.1

Source: HMMH
Notes: Distance from Logan Airport calculated from the Airport Reference Point.
dBA A-weighted decibel
1 INMv7.0c for all of 2011 (12 months) with adjusted database. (Database modifications as described in the *2004 ESPR)*.
2 Modeled using RealContours™ and RealProfiles™ using INM v7.0c.

2030 Noise Levels

The 2030 forecast of operations reported in this *2011 ESPR,* while greater than 2011, is lower than the level of operations seen in 2000 (1,355 daily operations in 2000 versus 1,301 daily operations for 2030). The 2030 fleet mix forecast includes a greater level of jet activity than non-jet activity compared to 2011 and 2000. The 2030 operations forecast, along with runway use assumptions developed from the FAA's BLANS No-action Total Airspace and Airport Modeler (TAAM) simulation modeling, were used to develop the 2030 noise contours. Flight tracks and track use were developed from the current RNAV radar data sets and were used for the 2030 modeling. These were used instead of RealContours™ as they would represent a higher predicted level of adherance to the advanced RNAV procedure design in 2030. In the 2011 modeling, there were aircraft flights which did not fly the RNAV procedures due to aircraft equipment and other factors. Using the model tracks developed to represent the RNAV procedures for 2030, a more represenatative forecast of the tracks was used. Only existing runways and procedures currently in place were used for the 2030 modeling. The following section provides the details of the modeling and the DNL results.

2030 Fleet Mix and Operations Assumptions

The long-range forecast developed for Logan Airport includes an increase in both passenger and cargo aircraft operations with a slight decrease in GA operations compared to 2011. The 2030 fleet, while larger, includes a larger percentage of newer aircraft (Boeing 787, 737 Max, Airbus 350, and Airbus Neo variants). These new aircraft types are projected to be more fuel efficient and generate less noise. The 2030 forecast projects 13.7 percent of the arrivals will be at night (up 0.9 perecent from 2011) with 10.9 percent of departures at night (a decrease of 0.2 percent from 2011).

Table 6-14 Modeled Daily Operations (2000, 2011, and 2030)

	Passenger and Cargo Aircraft							
	Stage 2 Jets		Stage 3 Jets		Non-Jet Aircraft		Total	
Year	Day	Night	Day	Night	Day	Night	Day	Night
2000	5.13	0.26	727.09	103.66	409.62	21.58	1,141.84	125.51
2011	0.01	0.00	684.19	109.38	135.18	4.73	819.39	114.11
2030	0.00	0.00	912.88	143.40	160.52	10.12	1,073.40	153.52
	General Aviation							
	Stage 2 Jets		Stage 3 Jets		Non-Jet Aircraft		Total	
Year	Day	Night	Day	Night	Day	Night	Day	Night
2000	7.29	0.64	40.08	3.21	34.57	1.83	81.94	5.68
2011	0.08	0.00	52.51	5.35	18.18	1.29	70.78	6.65
2030	0.00	0.00	53.63	5.15	13.63	1.31	67.26	6.46
	Total Operations							
	Stage 2 Jets		Stage 3 Jets		Non-Jet Aircraft		Total	
Year	Day	Night	Day	Night	Day	Night	Day	Night
2000	12.42	0.90	767.17	106.87	444.19	23.41	1,223.78	131.19
2011	0.09	0.00	736.7	114.73	153.36	6.02	890.17	120.76
2030	0.00	0.00	966.51	148.55	174.15	11.43	1,140.66	159.98

Source: 2011 data - HMMH and Massport's Noise Monitoring System.
2030 Massport Long-Range Forecast

The 2030 forecast assumes all Stage 2 jets and Stage 3 recertificated aircraft would be phased out by 2030. A small number of MD-80 aircraft are included in the forecast, however, the majority of the cargo fleet is made up of MD-11, A300-600 and B757 types. Table 6-14 summarizes the operations breakdowns by commercial and GA aircraft that are derived from this process.

Total operations are expected to increase by nearly 290 operations per day, from 1,011 per day in 2011 to 1,301 in 2030. Nighttime operations by commercial aircraft are projected to increase by 39.4 operations per night. Nighttime operations by GA aircraft are projected to remain similar to 2011.

Looking at historical trends, the 2030 forecast is similar to 2000 in total operations, however, there are several factors that are different. The Stage 2 aircraft present in the 2000 modeling are no longer in the fleet and the 2030 commercial operations are forecasted to have a much larger jet fleet than in 2000. There is also a higher number of operations forecasted to occur at night compared to 2000.

The runway use was determined from the TAAM modeling, which was developed by the FAA for the 2015 BLANS No-Action scenario. This simulation modeling includes a peak month average day of operations for 2015 of approximately 1,300 operations, which is very close to the 1,301 average annual day operations forecasted for 2030 (the peak month average day operations are typically scaled down to meet an annual average day operational level). The TAAM models the top seven runway configurations in use at the Airport. The use of each configuration during 2010 was applied to the TAAM results to generate the 2030 runway use.[26] A historical average of night runway use was developed using data from 2007 through 2009. The historical runway use was used in the 2030 modeling at night due to the fact that the simulation modeling was not optimized for the nighttime noise abatement procedures. The simulation modeling also includes use of the Centerfield Taxiway, Runway 14-32, and RNAV procedures implemented as of the end of 2011.[27]

The 2030 forecast fleet would primarily be comprised of jets which would result in the continued use of the largest capacity runway configurations and an increased use on the other runways. Table 6-15 compares the 2011 jet runway use to the forecast 2030 jet runway use, however, the 2011 use was skewed due to the closure of Runway 15R-33L for RSA improvements. Runway use for 2000 is also shown for context.

The modeled flight tracks for 2030 assume almost full use of the RNAV procedures and include the departure RNAV tracks from Runway 33L.[28]

26 The 2010 runway configuration percents were used as it represents the most recent year without runway closings.
27 The simulation includes the RNAV SIDS and the three new RNAV STARs.
28 Tracks were modified to represent the proposed action tracks shown in the Runway 33L RNAV SID Draft EA (January 14, 2013).

Table 6-15 Summary of Jet Aircraft Runway Use								
Runway	2000 Departures[1]	2011 Departures[1]	2030 Departures[2]	Percent Change (2030 – 2011)	2000 Arrivals[1]	2011 Arrivals[1]	2030 Arrivals[2]	Percent Change (2030-2011)
4L	0%	0%	0%	0%	4%	7%	5%	(2%)
4R	8%	6%	4%	(2%)	40%	37%	29%	(8%)
9	35%	36%	31%	(5%)	0%	0%	0%	0%
14	--	<1%	0%	(<1%)	--	--	--	--
15L	--	--	--	--	--	--	--	--
15R	4%	5%	6%	1%	1%	<1%	1%	<1%
22L	3%	2%	4%	2%	7%	16%	17%	1%
22R	30%	36%	33%	(3%)	0%	0%	0%	0%
27	15%	7%	14%	7%	28%	28%	27%	(1%)
32	--	--	--	--	--	1%	1%	0%
33L	6%	7%	8%	1%	20%	11%	19%	8%
33R	--	--	--	--	--	--	--	--

Source: HMMH
Notes: Percentages in parentheses represent negative change.
1 Actual
2 Projected from the FAA BLANS TAAM Simulations

Use of the north-south runways for jet departures in 2030 would be 86 percent, or 1 percent less than in 2011 and 5 percent less than in 2000. Since the opening of Runway 14-32, the use of the north-south runways is 80 percent; 2011 was above average due to the Runway 15R-33L closure.

Departures for 2030 on Runways 4R , 9, and 22R would be slightly lower than 2011. Departures for 2030 on Runways 15R, 22L, 27 and 33L would be higher than 2011. Arrivals for 2030 on Runways, 4L, 4R, and 27 are predicted to be lower than for 2011 while there is forecast to be an increased use of Runways 22L, and 33L for arrivals in 2030. Similar to the year 2000, there is a higher use of Runways 27 and 33L for departures, the higher use of Runway 27 for departures is driven by the higher use of the Runway 33-27 configuration. In this configuration the majority of arrivals use Runway 33L and the majority of departures use Runway 27. The higher use of departures from Runway 33L is driven by the higher use of the Runway 27-33 configuration. Also for arrivals, the lower use of Runway 4L and 4R is due to the Runway 4-9 configuration which splits the arrivals between Runway 4L and Runway 4R with the majority of departures using Runway 9.

Population counts by contour interval are summarized in Table 6-16.[29] The higher level of operations in 2030 would result in the number of people exposed to noise levels being greater than or equal to DNL 65 dB to increase to 12,211. This is an increase from the 3,947 people exposed to noise levels greater than or equal to DNL 65 dB in 2011. However, this level is significantly less than the number exposed to DNL 65 dB or above in 2000 (the last year the daily operations were over 1,300), which was 17,745. Table 6-16 also shows that in the year 2000, a larger number of people were exposed to DNL 70 dB and above than is forecast in 2030 (352 in 2030 compared to 1,551 in 2000).

It is important to note that the 2030 DNL 65 dB contour remains within areas sound insulated by Massport that surround the Airport.

29 The 2011 and 2030 results are based on the 2010 U.S. Census with the 2000 results based on the 2000 Census data and the 1990 results based on the 1980 Census data.

Table 6-16 Noise-exposed Population by Community

Boston

Year	80+ DNL	75-80 DNL	70-75 DNL	65-70[1] DNL	Total (65+)
1990 (INM[3])	0	0	1,778	28,970	30,748
2000 (INM[3])	0	0	234	9,014[2]	9,248[2]
2011 (RC[4])	0	0	0	331[2]	331[2]
2030 (INM[3])	0	0	0	5,140	5,140

Revere

Year	80+ DNL	75-80 DNL	70-75 DNL	65-70[1] DNL	Total (65+)
1990 (INM[3])	0	0	0	4,274	4,274
2000 (INM[3])	0	0	0	2,496	2,496
2011 (RC[4])	0	0	0	2,547	2,547
2030 (INM[3])	0	0	0	2,975	2,975

Chelsea

Year	80+ DNL	75-80 DNL	70-75 DNL	65-70[1] DNL	Total (65+)
1990 (INM[3])	0	0	0	4,813	4,813
2000 (INM[3])	0	0	0	0	0
2011 (RC[4])	0	0	0	0	0
2030 (INM[3])	0	0	0	0	0

Winthrop

Year	80+ DNL	75-80 DNL	70-75 DNL	65-70[1] DNL	Total (65+)
1990 (INM[3])	0	676	1,211	2,420	4,307
2000 (INM[3])	0	247	1,070	4,684	6,001
2011 (RC[4])	0	0	130	939	1,069
2030 (INM[3])	0	0	352	3,744	4,096

Everett

Year	80+ DNL	75-80 DNL	70-75 DNL	65-70[1] DNL	Total (65+)
1990 (INM[3])	0	0	0	0	0
2000 (INM[3])	0	0	0	0	0
2011 (RC[4])	0	0	0	0	0
2030 (INM[3])	0	0	0	0	0

All Communities

Year	80+ DNL	75-80 DNL	70-75 DNL	65-70[1] DNL	Total (65+)
1990 (INM[3])	0	676	2,989	40,477	44,142
2000 (INM[3])	0	247	1,304	16,194[2]	17,745[2]
2011 (RC[4])	0	0	130	3,817[2]	3,947[2]
2030 (INM[3])	0	0	352	11,859	12,211

Source: HMMH
Notes: The 1990 population estimates are based on the 1980 census data, 2000 population estimates on the 2000 census data and 2011 and 2030 are based on the 2010 U.S. Census data.
1 DNL 65 dB 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.
3 Standard INM
4 RealContours™

It is also important to note that the forecasted fleet for 2030 would have quieter and more efficient engines than flown today, however the modeling uses current versions of aircraft as "substitutes" for future types. Therefore, the 2030 DNL contours presented here are a conservative estimate of the future noise levels. It is expected with the continued advancement in aircraft technology resulting in quieter engines, the actual noise levels in 2030 would be lower.

While noise levels are forecast to increase from 2011 to 2030, they remain well below historical peaks, and the increase is focused on the DNL 65 to 70 dB level and not in the higher noise levels. The number of people in Boston, Winthrop and Revere exposed to sound levels DNL 65 dB are predicted to increase due to higher use of Runways 9, 22L, 22R, 27, 15R and 33L . The number of people within the DNL 70 to 75 dB contour in Winthrop would increase due to increased use of Runway 22L for departures and arrivals.

Figure 6-19 presents the comparison between the 2011 DNL contours and the predicted 2030 DNL contours. The DNL 60 dB contour for both years extends into the Point of Pines neighborhood and the 2030 contour extends farther into Winthrop than the 2011 contour. The 2030 contour extends farther south than the 2011 contour into Quincy and South Boston. To the west, the 2030 contour extends into Chelsea and encompasses the majority of East Boston. The DNL 65 dB contour is larger in all areas around the Airport. The DNL 65 dB contour extends to the north and is only slightly larger than 2011 through Revere and east of Revere Beach. To the east, it extends into Winthrop farther than in 2011 along Court Road and in Point Shirley. To the south, the contour is very similar to the 2011 contour in South Boston over Pleasure Bay. To the west, the contour extends into East Boston almost to the Chelsea River. The contour is also larger over Boston Harbor extending out to Long Island.

In the 1990s, Massport developed a metric termed the Noise Per Seat Index which was designed to encourage the reduction of Stage 2 commercial jet aircraft in use at the airport. The Index level was set and then lowered each year. To reach the new level, airlines would switch to newer Stage 3 aircraft on their routes. The index was last set in 1998 since the Federal Government mandated the phase out of Stage 2 aircraft greater than 75,000 lbs by December 31, 1999. The FAA Reauthorization bill passed in early 2012 also mandates the phase out of Stage 2 aircraft with a takeoff weight less than 75,000 pounds by 2015.

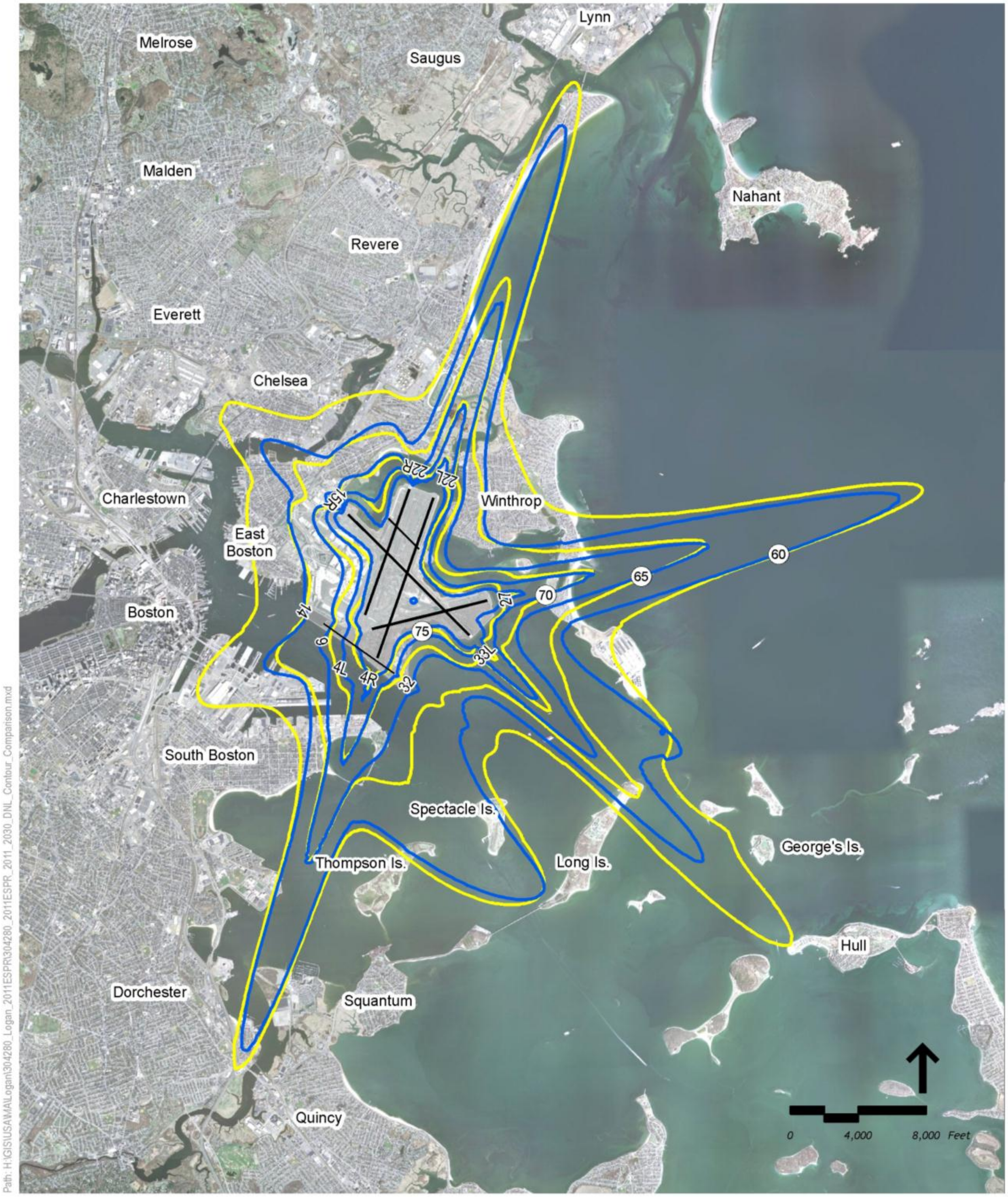
The index provided a decibel noise level per seat (NSPL). This is computed by using the number of operations, the number of seats per aircraft and the certificated noise levels for takeoffs and landings for each aircraft type. For comparison purposes. using this same method Massport computed the NPSL value for 2000, 2011 and 2030. These results are shown in Table 6-17.

Table 6-17 Noise Per Seat Level (NSPL)

Year	Jet Operations	Average Number of Seats per Aircraft	NSPL (dB EPNL)
2000	306,026	161.7	73.4
2011	283,320	133.1	72.0
2030	385,540	150.3	70.8

Source: HMMH

The NSPL analysis shows that in 2030, even with a higher level of commercial jet operations and higher seat levels per aircraft, the forecasted NSPL would be lower than in 2011. As shown in Table 6-17, the average number of sets decreased to 133.1 in 2011 primarily due to the use of RJs and smaller narrow-body aircraft on routes compared to 2000. This number increases by 2030 with the reduction of the small RJs and use of larger aircraft on routes. The NSPL continues to decline from 73.4 dB to 70.8 dB by 2030. The 2030 value is an estimate based on the lowest certificated values available today for the forecasted aircraft. It is expected that the aircraft operating in 2030 will actually have lower certificated values and that this noise level will be less than the 70.8 dB calculated.



Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

2011 DNL Contour (INM 7.0c)

2030 DNL Contour (INM 7.0c)

Comparison of the 60-75 dB DNL Contours for 2011 and 2030 with INM 7.0c

Figure 6-19

Historical Context and Trends

Noise levels at Logan Airport have decreased since 1990 due to changes at the Airport, efforts by Massport, and FAA, and improvements in aircraft technologies. Figure 6-20 presents the DNL 65 dB noise contours from every decade starting with 1980. The contours for 1980, 1990, 2000, and 2010 are from actual data and the predicted contours for 2030 were prepared for this *2011 ESPR*, respectively.

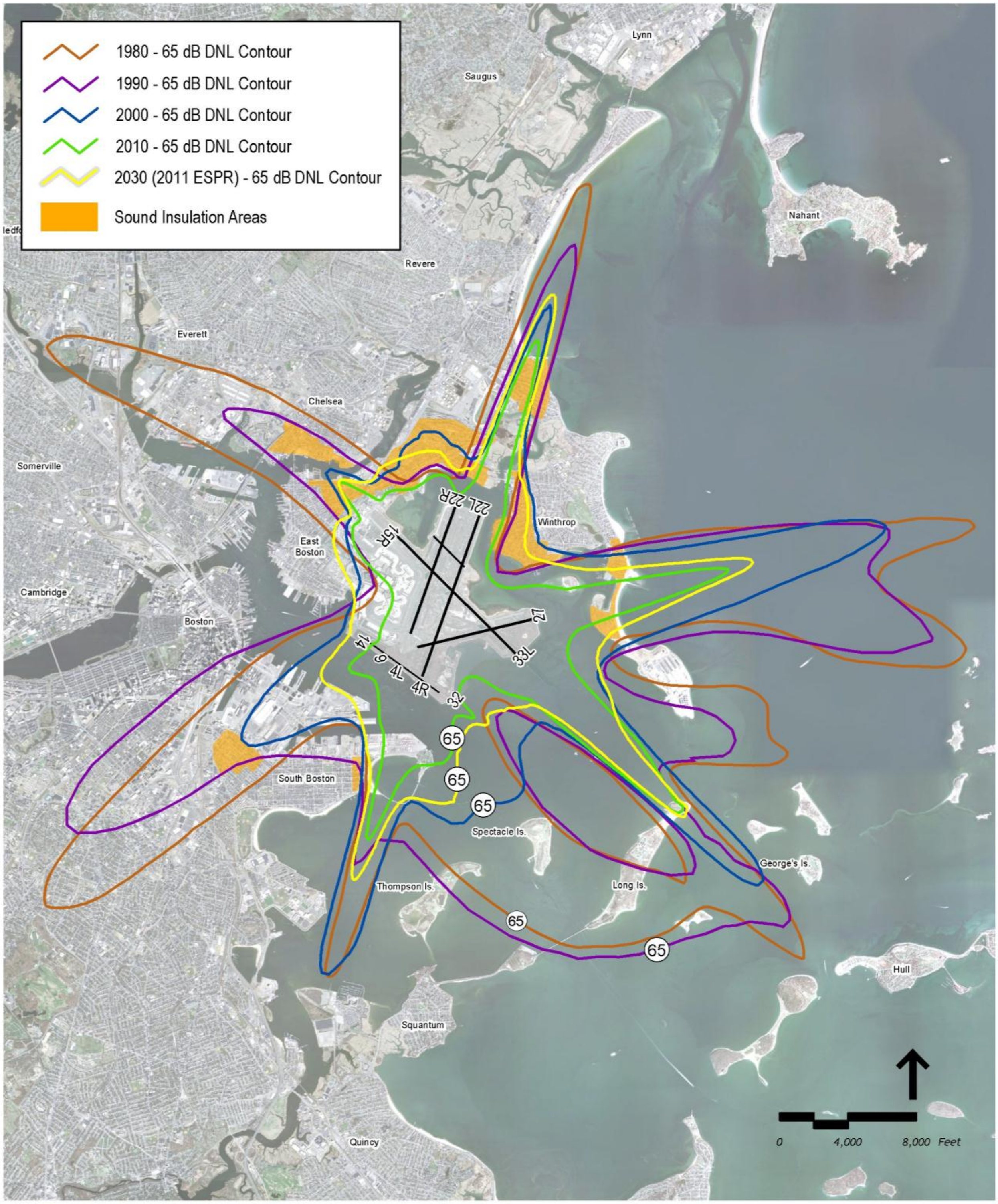
As shown in Table 6-18, the 1990 contour reflected an aircraft fleet where over 50 percent of the jets in the fleet were Stage 2 types and over 40 percent of the overall fleet was non-jet aircraft. The contour also shows the prior Runway 27 departure procedure (the current FAA procedure was implemented in 1996).

The 2000 contour contains a high level of recertificated aircraft and a much smaller Stage 2 fleet since all Stage 2 aircraft greater than 75,000 pounds were phased out by December 31, 1999. The contour also shows the change to the Runway 27 procedure and a higher use than today. The noise levels in East Boston were also higher due to the increase of the DNL 65 dB due to modeling of hill effects in Orient Heights (this adjustment is still made, however, it does not affect the DNL 65 dB contour).

Table 6-18 Modeled Average Daily Operations by Commercial and General Aviation Aircraft[1]

		1990	2000	2010	2030[1]
Commercial Aircraft					
Stage 2 Jets[2]	Day	312.4	5.13	0.01	0.00
	Night	19.99	0.26	0.01	0.00
	Total	**332.39**	**5.39**	**0.02**	**0.00**
Stage 3 Jets (All)	Day	288.89	727.09	674.25	912.88
	Night	57.25	103.66	107.92	143.40
	Total	**346.14**	**830.75**	**782.17**	**1,056.27**
Non-Jet Aircraft	Day	444.41	409.62	138.53	160.52
	Night	11.72	21.58	5.21	10.12
	Total	**456.13**	**431.2**	**143.74**	**170.65**
Total Commercial	Day	1,045.70	1,141.84	812.78	1,073.40
Operations	Night	88.96	125.51	113.13	153.52
	Total	**1,134.66**	**1,267.35**	**925.91**	**1,226.92**
GA Aircraft					
Total GA	Day	NA[3]	81.94	36.26	67.26
Operations	Night	NA[3]	5.68	3.97	6.46
	Total	**NA[3]**	**87.62**	**40.22**	**73.72**
Total	Day	1,045.70	1,223.78	849.03	1,140.66
	Night	88.96	131.19	117.1	159.98
	Total[1]	**1,134.66**	**1,354.97**	**966.13**	**1,300.64**

Source: HMMH
1 Predicted
2 Stage 2 aircraft are exempt from meeting newer federal Stage 3 noise limits when their certificated MGTOW is less than or equal to 75,000 pounds.
3 Totals prior to 1998 do not include GA operations.



Source: *Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010*
Note: The DNL 65 dB contour for 1980 and 1990 just northwest of Spectacle Island and over Long Island represents an area of noise lower than DNL 65 dB.

Comparison of Historical and Forecast 65 dB DNL Contours - 1980, 1990, 2000, 2010, and 2030

Figure 6-20

The 2010 contour included the addition of new Runway 14-32 and a reduced level of operations due to the economic recession as seen in Table 6-18.

The 2030 contour which is based on the latest forecast developed for Logan Airport includes a consistent level of non-jet operations (airlines such as Cape Air) and the continued reduction of small RJs. Even with the higher level of operations, it is important to note that the predicted 2030 contour is smaller than the 2000 contour in many areas. The exception to this is over areas of East Boston and over Revere where it is slightly larger than 2000; however the DNL 65 dB contour in 2030 extends into the areas where Massport has completed its residential sound insulation program. The 2030 contour also reflects the use of the RNAV procedures which were being implemented in 2010 and does not benefit from likely aircraft improvements.

Noise Abatement

Noise levels at Logan Airport have decreased in recent years due to a decrease in operations and quieter aircraft. Massport's noise abatement program continues to play a critical role in helping to limit and monitor noise impacts. Massport's emphasis on noise abatement has focused on the benefits of better analysis tools and improved modeling techniques to identify the causes of noise problems.

In 2008, the installation of a new Noise and Operations Management System (NOMS) was completed and after successful testing, the system was operationally accepted by Massport in 2009. Unlike the previous system, the new system is incorporated directly into Massport's computer network. Other important benefits of the new system include vastly improved analysis and mapping capabilities, better quality flight tracking data, use of multilateration radar (a separate and unique source of operational data), and direct correlation of noise events with radar flight paths and complaints (a feature that the prior system did not have). This latter capability is expected to further improve the ability of the system to differentiate between aircraft and community noise sources. All measured data and complaint information in this report were generated through the new NOMS.

Other continuing elements of Massport's noise mitigation program include:

- The Massport Noise Abatement Office, which was initiated in 1977. The Noise Office also maintains the noise section of the Massport website.[30] The site also provides information on Massport's sound insulation program, the Airport's noise monitoring system, various abatement measures, and other information of interest to the public.
- Preferred runway use designed to optimize over-water operations (especially during nighttime hours).
- RNAV flight tracks designed to avoid highly populated areas.
- An overwater visual approach used at night to keep aircraft offshore as much as possible.
- One of the most extensive residential and school sound insulation programs in the nation. To date, Massport has installed sound insulation in 5,374 residences, including 11,333 dwelling units, and 36 schools in East Boston, Roxbury, Dorchester, Winthrop, Revere, Chelsea, and South Boston.
- To initiate the process with each new sound insulation grant, Massport's RSIP representatives mail applications to eligible homeowners and often follow up with phone calls to encourage participation. Historically, the percentage of eligible homeowners who respond and whose dwellings are ultimately treated varies significantly by community from a high of nearly 90 percent in Revere to a low of about 50 percent in South Boston. Eighty to 85 percent of homeowners in East Boston and Winthrop typically

30 www.massport.com/environment/environmental_reporting/Noise%20Abatement/overview.aspx

participate. Approximately 8 percent of applicants also choose the Room-of-Preference option that allows the owner to identify a room (usually a bedroom or living room) for extra acoustical treatment.

- Massport has utilized a reach-back program where homes that are still within the eligible contour areas but have not participated in the RSIP were offered another chance to participate.
- The Massport RSIP program is almost complete and if the DNL contour expands into untreated areas Massport could apply to the FAA for funds to sound insulate these areas.
- Development of annual noise contours (Figure 6-14 presents the DNL 65 dB contours for 2010 and 2011).
- Continued support of a website that features an internet flight tracking system known as Airport Monitor (www.massport.com/environment/environmental_reporting/Noise%20Abatement/AirportMonitor.aspx). The site provides the general public with the opportunity to track individual flights to and from Logan Airport on a delayed basis. Tracking of noise complaints which can be entered online or by phone.
- Summary reports of operations by airline, runway, aircraft type, and other parameters that help the Noise Office track potential changes in the noise environment. Tables 6-11 and 6-14 are examples of these reports.

Commercial air carrier and cargo operators are deploying the newest engine technology at Logan Airport. Table 6-19 summarizes each airline operator and the percentage of its fleet that were originally manufactured as Stage 3 or Stage 4 aircraft. In 2011, the majority of the commercial air carrier and cargo operations are in aircraft which were originally manufactured as Stage 3 with a small percentage originally manufactured as Stage 4. Only three airlines of the 45 airlines listed were using aircraft originally manufactured as Stage 2 but have been recertificated to comply with Stage 3 requirements. Of the major cargo operators, UPS remained at 100 percent Stage 3 and Stage 4 operations, FedEx increased its share from 82 to 92 percent and DHL remained at 100 percent as it has phased out its fleet of older Boeing 727 aircraft.

Most of the charter operators remained similar to 2010 or increased their percentage of originally manufactured Stage 3 or Stage 4 aircraft operations. Only one major U.S. airline, Delta Air Lines, had a fleet which is not composed of 100 percent originally manufactured Stage 3 or Stage 4 aircraft operating at Logan Airport. Prior to the merger with Northwest Airlines, Delta Air Lines was using a fleet at 100 percent of originally manufactured Stage 3 or Stage 4 aircraft. In 2010, Northwest Airlines aircraft combined with Delta Air Lines' fleet, which caused the percentage to drop to 93 percent and they have increased to 97 percent in 2011. Only Capitol Cargo International had a fleet operating below 50 percent of originally manufactured Stage 3 or Stage 4 aircraft operations in 2011 but had fewer operations (225 operations).

Table 6-19 Percentage of Airline Operations in Original Stage 3 or 4 Aircraft[1] (2001 to 2011)

Airlines with more than 100 flights	Number of Flights 2011	Percentage of Original Stage 3 and 4 Operations[2] 2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	100% Stage 3 or 4[3]
JetBlue Airways	63828	NA	NA	NA	100%	100%	100%	100%	100%	100%	100%	100%	✓
US Airways	40352	96%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Delta Air Lines[7]	28952	67%	75%	90%	100%	100%/87%	100%	100%	100%	100%	93%	97%	
American Airlines	21021	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
American Eagle Airlines	8816	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
United Air Lines	15305	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	✓
AirTran Airways	12851	40%	93%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Southwest Airlines	17387	NA	NA	NA	NA	NA	NA	NA	NA	100%	100%	100%	✓
Continental	9821	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Delta Connection/Comair	7708	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Air Canada Jazz	6422	NA	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
AWAC - US Air Express	6491	NA	NA	NA	NA	NA	NA	NA	NA	100%	100%	100%	✓
US Airways Express/Republic	4365	NA	NA	NA	100%	100%	100%	100%	100%	100%	100%	100%	✓
Air Canada	6422	91%	90%	97%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Shuttle America Corp	3948	NA	NA	NA	NA	0%	0%	100%[6]	100%[6]	100%	100%	100%	✓
Virgin America	6052	NA	NA	NA	NA	NA	NA	NA	NA	100%	100%	100%	✓
FedEx	5050	66%	74%	76%	70%	72%	70%	71%	79%	83%	82%	92%	
Spirit Airlines	3054	NA	NA	NA	NA	NA	NA	NA	100%	100%	100%	100%	✓
Chautauqua	5898	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
British Airways	2409	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Alaska Airlines	1757	NA	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Lufthansa	1734	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Delta Connection/Atlantic SE	5088	NA	100%	100%	NA	NA	NA	NA	NA	NA	100%	100%	✓
United Parcel Service	1413	92%	97%	90%	94%	94%	98%	100%	100%	100%	100%	100%	✓
Pinnacle Airlines	1507	NA	NA	NA	NA	NA	100%	100%	100%	100%	100%	100%	✓
Aer Lingus	1126	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Mesaba Airlines	3117	NA	NA	NA	NA	NA	NA	NA	NA	NA	100%	100%	✓
Compass Airlines	1565	NA	NA	NA	NA	NA	NA	NA	100%	100%	100%	100%	✓
Air France	1013	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Icelandair	928	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Swiss Air	723	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Virgin Atlantic	6052	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Alitalia	604	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Frontier Airlines	445	100%	100%	100%	NA	NA	NA	NA	NA	NA	100%	100%	✓
DHL Airways	492	15%	6%	3%	0%	20%	1%[6]	1%	88%	95%	100%	100%	✓
Iberia Air Lines Of Spain	445	NA	NA	NA	NA	NA	100%	100%	100%	100%	100%	100%	✓
Mesa Airlines	260	NA	NA	100%	NA	0%	100%	100%	100%	100%	100%	100%	✓
Capital Cargo International[4]	225	NA	0%	0%	0%	0%	0%	7%	0%	0%	3%	0%	
SATA International Airlines	400	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	✓
Sun Country Airlines	513	100%	63%	100%	NA	NA	NA	NA	NA	100%	100%	100%	✓
TACV-Cabo Verde	236	NA	NA	100%	100%	NA	NA	NA	NA	100%	100%	100%	✓
Trans States Airlines	67	NA	NA	100%	100%	NA	NA	NA	NA	NA	100%	100%	✓
Bombardier Business Jet Solutions	69	NA	NA	NA	NA	NA	NA	NA	NA	100%	100%	100%	✓
Aeromexico	322	NA	NA	100%	100%	NA	NA	NA	NA	NA	100%	100%	✓
Miami Air	179	NA	29%	29%	78%	98%	91%	100%	100%	100%	100%	100%	✓

Source: Massport, 2011

1 Data was not reported prior to 2001.

2 Operations for some carriers differ with those in *Chapter 2, Activity Levels,* and *Chapter 7, Air Quality/Emissions Reduction* because the table only includes jet aircraft, not turboprops, and it includes scheduled and unscheduled air carriers.

3 Original Stage 3 or 4 means originally manufactured as a certificated Stage 3 or 4 aircraft under FAR Part 36.

4 No aircraft used at the Airport were New Stage 3 aircraft.

5 In 2006, DHL airways took over Airborne which had no New Stage 3 aircraft.

6 In 2008, Shuttle America Corp. began operating for Delta Connections.

7 Delta acquired Northwest Airlines and 2010 is the first year of reported consolidated operations. Numbers for 2009 and prior are provided for Delta Air Lines only. Separate data for Northwest Airlines for 2009 and prior are provided in the *2009 EDR.*

Noise Complaint Line

In 2011, Massport received a total of 3,280 noise complaints from 54 communities, a decrease of 12.8 percent from 2010, when the Noise Abatement Office received 3,761 complaints. In 2000, the level of noise complaints was much higher with 6,631 complaints. Table 6-20 is a summary of noise complaints from the Massport Noise Abatement Office. *Appendix H, Noise Abatement* has a full listing of the complaints by community. Four communities had more than 100 complaints from an individual caller, the most being 891 complaints from an individual in Winthrop. The other three individual callers who contacted the complaint line were from Lynn (468), Medford (275), and Weymouth (221). Among communities with more than 100 annual complaints, the greatest increases were Lynn (up from 339 to 469), Milton (up from 84 to 177), Weymouth (up from 193 to 228) and Winthrop (up from 207 to 1,147). Seven communities with more than 100 annual complaints in 2010 had a decrease in noise complaints for 2011: Cambridge (down from 323 in 2010 to 154 in 2011), Chelsea (down from 129 to 27), East Boston (down from 699 to 116), Jamaica Plain (down from 158 to 63), Medford (down from 444 to 297), Nahant (down from 204 to 74), and Somerville (down from 385 to 98).

Table 6-20 Noise Complaint Line Summary

	2010		2011		Change		2010		2011		Change
Town	Calls	Callers	Calls	Callers	(2010 to 2011)	Town	Calls	Callers	Calls	Callers	(2010 to 2011)
Jamaica Plain	158	15	63	6	(95)	Cambridge	323	38	154	10	(169)
Lynn	339	3	469	2	130	Chelsea	129	17	27	9	(102)
Milton	84	13	177	27	93	East Boston	699	52	116	34	(583)
Roslindale	73	5	3	2	(70)	Marshfield	13	1	21	6	8
Somerville	385	74	98	45	(287)	Medford	444	53	297	13	(147)
South Boston	59	26	53	24	(6)	Nahant	204	48	74	26	(130)
Weymouth	193	4	228	7	35	Winthrop	207	70	1,147	92	940

Source: Massport 2011

Boston Logan Airport Noise Study (BLANS)

The FAA's Record of Decision (ROD) approving construction of the new unidirectional Runway 14-32 required that the FAA, Massport, and the Community Advisory Committee (CAC) jointly undertake a study to determine whether changes to existing noise abatement flight track corridors might further reduce noise impacts. In addition, the Massachusetts Environmental Policy Act (MEPA) Certificate for the *Boston-Logan Airside Improvements Planning Environmental Impact Report (EIR)* directed Massport to work with the FAA and local communities on a review of the Logan Airport Preferential Runway Advisory System (PRAS).

This study is being conducted in multiple phases. Phase 1, which was known as The Boston Overflight Noise Study (BONS), was initiated in the winter of 2004 and was completed in fall of 2007. During Phase 1, 55 airspace and operational alternatives to reduce noise related to Logan Airport overflights were identified and screened for safety, operational, and noise benefits. Of the 55 alternatives, 13 measures were identified as potentially implementable in the near term. This phase was completed in 2007 and a National Environmental Policy Act (NEPA) Categorical Exclusion was issued by FAA in October 2007 for several flight path changes mostly along the northeast and southeast shores from the Airport.[31]

31 FAA Documented Categorical Exclusion Record of Decision, October 16, 2007.

The conventional and radar vectored[32] changes which could be implemented without airspace changes were implemented in February of 2008. RNAV and other changes began taking place in 2009 when FAA completed design of these procedures. RNAV procedures were published by FAA on October 22, 2009 and were implemented in 2010.

Eight new RNAV procedures were implemented by FAA in 2010 and 2011 for Runways 4R, 9, 15R, 22R and 22L. Under these procedures, aircraft immediately depart the Airport similar to existing procedures but then aircraft follow a precise path over Boston Harbor, then aircraft cross the shoreline and return back over land at a higher altitude than previous procedures.

- Starting on 2/1/2010 all six RNAV procedures were in use from Runway 9
- Starting on 5/3/2010 all six RNAV procedures were in use from Runway 4R
- Starting on 11/18/2010 all six RNAV procedures were in use from Runway 15R, 22R and 22L
- Starting on 3/10/2011 all eight RNAV procedures were is use from Runways 4R, 9, 15R, 22R and 22L
- Pending RNAV procedures from Runway 33L

On December 14, 2011, three new RNAV Standard Terminal Arrival Routes were also implemented by FAA. These concentrate arrivals on routes leading into the Logan Airport's airspace and improve efficiency of arrivals. These have little effect on the noise environment close to the Airport and the DNL contours. The Runway 33L departure is the last RNAV to be implemented. FAA completed an EA in January 2013, and the comment period for the EA was extended to March 15, 2013 (from February 15, 2013), with a 6-month reevaluation of the RNAV. All other major Logan Airport runways that are capable of accommodating RNAVs have been implemented by the FAA and are in operation today.

Phase 2 of BLANS, which began in late 2007, included consideration of 53 proposed arrival, departure and ground noise measures. After the first level of screening completed in 2009, thirty-two measures advanced to the next level of screening. Nine of these measures address ground noise issues, six are approach measures, and eleven address departure measures. The remaining measures address local air traffic issues such as helicopters and altitudes for Visual Flight Rules (VFR) flights. The Level 2 screening was completed in 2011 and of the 32 measures, 10 were passed on to Level 3, 5 were determined as completed and 17 were eliminated. The Level 3 analysis, which consists of noise modeling for each individual measure along with a change analysis against the future baseline was completed in 2012. The Level 3 Screening Report was published by the FAA in December 2012. Two of the flight measures were modified resulting in a total of 12 measures evaluated (2 measures are related to ground movements and 10 are related to flight procedures). Of these measures, eight were recommended for implementation by the CAC (the two ground movements and six flight procedures) and four flight procedures were rejected. The FAA and Massport reviewed the CAC recommendations and determined that the two ground measures would meet the criteria for implementation, however, the FAA determined that none of the flight procedures would meet the criteria for noise abatement under BLANS.

32 Radar vector is the heading issued to aircraft to provide guidance by radar.

The approved two measures, with their status, are described below:[33]

- **Preferred Location for Runups away from Communities**. Massport has already tested this measure and identified a new location at the end of Runway 32 to be used when operationally feasible.
- **Holding Area for Delayed Departures**. Massport is prepared to commit to working with the FAA to seek approval and funding (subject to FAA operations/safety approval, environmental review, Massport capital budget process, availability of FAA funds) for construction of a hold pad to allow for short term staging of aircraft at or near the midpoint of the airfield.

Runway 22R Analysis

In the fall of 2011, Massport, in response to community inquiry, conducted an analysis reviewing departures from Runway 22R at Logan Airport. The RNAV departure procedures were implemented by FAA late in 2010 as a result of the BLANS project and the analysis compared departures on Runway 22R from December 2009 through October 2010 (pre-RNAV) and December 2010 through October 2011 (Post-RNAV). The analysis showed that the new procedures were causing departures to fly a more gradual turn after departing the airport to reach the first RNAV fix location. This was placing aircraft closer to the South Boston community when compared to the pre-RNAV departures. Massport shared this information with the community and the FAA. The results of the analysis are presented in *Appendix H, Noise Abatement*.

Reduced Engine Taxiing

Single or reduced engine taxiing has the potential to reduce noise at Logan Airport. When used, the largest benefit is achieved by reducing the use of the engines on the side of the aircraft closest to the community; however, this is not always practicable due to airline procedures, taxiway routings, and safety considerations. Massport has reached out to the airlines and encouraged the use of this procedure whenever practicable. In 2009, Massachusetts Institute of Technology (MIT) in cooperation with Massport and FAA conducted a survey of pilots at Logan Airport and found that the procedure was widely used on arrivals but not frequently used on departures.[34] Key reasons cited for not using the procedure were safety-related or practical reasons such as a short taxi time. The survey indicated that for the procedure to be considered for arrivals, the taxi-in time would have to exceed 10 minutes and for departures, exceed 20 minutes. The average taxi-out times for Logan Airport for 2011 exceeded 20 minutes only during the 6:00 PM to 7:00 PM period and for arrivals the average taxi-in time never exceeded 10 minutes. The total average departure taxi out time at Logan Airport for 2011 is 18.2 minutes and the average taxi-in time is 7.0 minutes.[35]

Mandatory single engine taxiing was also one of the proposed measures in the BLANS but was rejected due to safety concerns, and it is currently being implemented as a voluntary measure. Another MIT study was completed in January 2011, which presented the field tests of a control strategy to minimize airport congestion at Logan Airport. The study determined a suggested rate to meter aircraft pushbacks from the gate, in order to prevent airport congestion and reduce the time that flights spend with engines on while taxiing to the runway. The 2011 study is included as *Appendix L, Demonstration of Reduced Airport Congestion through Pushback Rate Control.*

Massport's noise abatement goals are achieved through the implementation of multiple elements. Table 6-21 lists these goals and the associated plan elements, and reports on progress toward achieving these goals.

33 Boston Logan Airport Noise Study Level Three Screening Analysis, FAA, December 2012, Page E-3.
34 The full report was published in the *2009 EDR* in *Appendix L*.
35 FAA Aviation Performance Metrics: Avg. Taxi Time Analysis – Internet report –accessed 9/4/2012.

Table 6-21 Noise Abatement Management Plan

Noise Abatement Goal	Plan Elements	2011 Progress Report
Limit total aircraft noise	Limit on Cumulative Noise Index (CNI)	The CNI value for 2011 was 152.1 EPNdB, well below the cap of 156.5 EPNdB.
	Stage 3 percentage Requirement in Noise Rules	In 2011, Stage 3 operations represented 99 percent of Logan Airport's total commercial jet traffic. The few Stage 2 operations that occurred during the year were all older small corporate jets flown by charters or small cargo operators and because these aircraft were less than 75,000 pounds gross takeoff weight, they were in full compliance with FAR Part 91, but still prohibited from operating at Logan Airport during the hours of 11:00 PM to 7:00 AM.
Mitigate noise impacts	Residential Sound Insulation Program (RSIP)	114 dwelling units were sound insulated in 2011, bringing the total of treated dwelling units to 11,333 since the start of the program in 1986. See *Appendix H, Noise Abatement* for additional details.
	School Sound Insulation Program	36 eligible schools have been sound insulated since this program began.
	Noise Abatement Arrival and Departure Procedures	Flight track monitoring and data analysis were used to verify adherence to noise abatement flight procedures. See *Appendix H, Noise Abatement* for copies of the 2011 Monitoring Report.
	Preferential Runway Advisory System (PRAS) Runway End Use Goals	The PRAS computer system was last used early in 2004 but due to system changes is not in use. However, FAA and Massport continue to work toward the current goals. The PRAS goals are expected to be reevaluated as part of the BLANS.
	Runway Restrictions	Noise-based use restrictions 24 hours per day on departures from Runway 4L and arrivals on Runway 22R were continued.
	Reduced-Engine Taxiing	Voluntary use of reduced-engine taxiing is encouraged when appropriate and safe.
Improve Noise Monitoring System	Replace Existing Noise Monitors, Install Multilateration Antennas for Flight Track Monitoring, and Install New Robust Software	The Airscene noise monitoring system is completely installed and in use at Logan. The noise monitors provide 1/3 octave band data at all sites to aide with aircraft identification. Noise events, flight events, and complaints are all linked. Multilateration provides improved radar coverage near the ground to help in identification of aircraft and runway assignment.
Minimize nighttime noise	Nighttime Stage 2 Aircraft Prohibition	Prohibition on Stage 2 aircraft operations at Logan Airport between 11:00 PM and 7:00 AM was continued.
	Nighttime Runway Restrictions	Prohibitions on use of Runway 4L for departures and Runway 22R for arrivals between 11:00 PM and 6:00 AM were continued.
	Maximization of Late-Night Over-Water Operation	Efforts to maximize late-night over-water operations were continued. Use of Runway 15R for departures and Runway 33L for arrivals continued.
	Nighttime Engine Run-up and APU Restrictions	Restriction on nighttime engine run-ups and use of auxiliary power units (APUs) was continued.
Address/respond to noise issues and complaints	Noise Complaint Line	Massport continued operation of Noise Complaint Line, (617) 561-3333. In 2011, Massport's Noise Abatement Office responded to 3,280 calls from callers living in 54 communities. The Noise Abatement Office issued the 2011 Noise Report (see *Appendix H, Noise Abatement)*.
	Special Studies	Massport continued to provide technical assistance and analysis using noise monitoring system to support FAA and others in monitoring jet departure tracks from Runway 27.
		The BLANS is evaluating several flight and ground procedure modifications that may reduce noise to affected communities near Logan Airport. Phase 1 is complete and Phase 2 was completed in 2012.

Source: Massport

7

Air Quality/ Emissions Reduction

Introduction

This chapter describes the air quality conditions at Logan Airport in 2011 and compares them to air quality conditions in 2010 and anticipated future conditions in 2030. Massachusetts Port Authority's (Massport) updated forecast is for the long-range planning horizon, 2030. This *2011 Environmental Status and Planning Report (ESPR)* provides an opportunity to revisit previous forecasts completed in 2004 and update them based on current and predicted conditions. As such, the 2030 emission inventory is based on the likely future passenger activity levels, aircraft operations, and fleet mix. There will be opportunities to revisit the 2030 forecast based on the most current data available at the next ESPR cycle as necessary. For further information on the development of the 2030 long-range forecast, refer to *Chapter 2, Activity Levels.*

The emissions inventory provided in this chapter includes Airport-related volatile organic compounds (VOCs), oxides of nitrogen (NO_x), carbon monoxide (CO), and particulate matter (PM).[1] An emissions inventory of greenhouse gases (GHGs) for 2011 and 2030 is also included.

This chapter also presents an update of air quality monitoring data for nitrogen dioxide (NO_2) collected by Massport in the vicinity of Logan Airport during 2011. Status reports are provided on Massport's Air Quality Initiative (AQI) (a 15-year voluntary program with the goal of maintaining NO_x emissions at, or below, 1999 levels); the Massport Air Monitoring Study (a program that collected air quality data in the communities around Logan Airport before and after the new Centerfield Taxiway was constructed); and other Massport air quality and emissions reduction initiatives.

Massport implements many measures to reduce air pollutant and GHG emissions through use of alternative fuels and renewable energy sources, energy efficiency, sustainable facility designs, recycling, single engine taxi procedures, and improvements to airfield operations.

1 PM less than or equal to 10 microns (PM_{10}) and PM less than or equal to 2.5 microns ($PM_{2.5}$) are subsets of PM.

Key Findings

In 2011, the changes in estimated emissions inventory results were driven principally by the increase (4.6 percent) in the number of aircraft operations at Logan Airport compared to 2010, primarily in the jet aircraft and general aviation categories. Slight changes in ground-based aircraft taxi times, stationary source fuel usage, on-airport vehicle miles traveled (VMT), and vehicle speeds also affected the 2011 emissions inventory results.

Air quality conditions in 2011 were as follows:

- Total VOC emissions were 1,109 kilograms per day (kg/day), or 9 percent higher than 2010 levels, but still following a long-range (i.e., a period of over 20 years) downward trend decreasing by 38 percent since 2000 and almost 76 percent since 1990. This one-year increase is primarily due to the increase in aircraft landing and takeoff operations (LTOs) when compared to 2010 (176,322 LTOs in 2010 and 184,494 LTOs in 2011).
- Total emissions of NO_x were 4,077 kg/day, or 2 percent higher than 2010 levels. In 2011, total NO_x emissions at Logan Airport were approximately 29 percent lower than 2000 levels. Also, total NO_x emissions in 2011 were 707 tons per year (tpy) lower than Massport's 1999 AQI benchmark. This represents an overall decrease of 30 percent in NO_x emissions since 1999.
- Total emissions of CO were 6,919 kg/day, or 3 percent lower than 2010 levels and 53 percent lower than 2000 levels; following the same long-range downward trend as VOCs and NO_x.
- Total emissions of $PM_{10}/PM_{2.5}$ associated with Logan Airport increased in 2011 by approximately 5 percent to 67 kg/day compared to 2010 levels, but still following a long-range downward trend decreasing by 19 percent since 2005 (2005 is the first year that $PM_{10}/PM_{2.5}$ emissions were reported). This one-year increase is mostly attributable to the corresponding increase in stationary source use, particularly snow melters in conjunction with the unusually heavy snowfall in early 2011.
- Since 1999, there has been a continuing trend of decreasing NO_2 concentrations at both the Massport and Massachusetts Department of Environmental Protection (MassDEP) monitoring sites located in the vicinity of Logan Airport. In addition, the annual NO_2 concentrations at all monitoring locations in 2011 continued to be well within the National Ambient Air Quality Standards (NAAQS) for NO_2. As discussed in this chapter, the NO_2 monitoring program was discontinued in 2012.
- Massport's Air Quality Monitoring Study is now complete, having collected data on a variety of ambient air pollutants over a two-year period as a means of assessing any air quality changes attributable to the operation of the Centerfield Taxiway which was completed in 2009. The findings from this Study will be submitted to MassDEP in 2013, and reported in the next Logan Airport Environmental Data Report (EDR).
- This reporting year, 2011, marks the fifth consecutive year in which Massport has voluntarily prepared a GHG emissions inventory for the EDR/ESPR. The 2011 GHG emission inventory was prepared following methodological guidance by the Transportation Research Board's (TRB) Airport Cooperative Research Program (ACRP).[2] The 2011 inventory assigns GHG emissions based on ownership or control (whether it is controlled by Massport, the airlines or other airport tenants, or the general public). Total Logan Airport GHG emissions in 2011 were 5 percent higher than 2010 levels primarily due to the increase in aircraft operations and passenger vehicles accessing the Airport. Massport-related emissions represent only

2 Transportation Research Board, Airport Cooperative Research Program, ACRP Report 11, Project 02-06, *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*. See http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf for the full report.

12 percent of total GHG emissions at the Airport, tenant-based emissions represent approximately 68 percent, electrical consumption represents 14 percent; and passenger vehicle emissions represent 6 percent. This inventory is one of the three GHG emissions inventories Massport prepares annually; however, the other two only comprise stationary sources of GHGs and are filed with MassDEP and the U.S. Environmental Protection Agency (EPA) respectively.

For the assessment of 2030 air quality conditions, the number of aircraft operations is forecasted to increase by 29 percent compared to 2011 levels. The findings for the 2030 air quality emissions inventory include:

- While still below the historic peaks (there were 487,996 operations in 2000), the number of annual aircraft operations in 2030 is predicted to be approximately 475,000 while the number of operations in 2011 was approximately 370,000. However, the average aircraft taxi time is expected to be approximately 20 percent lower in 2030 based the Boston Logan Airport Noise Study (BLANS) No-action Total Airspace and Airport Modeler (TAAM) model.[3] This model simulates the use of the Airport for each of the main runway configurations based on the BLANS Future No-action scenario, the existing airfield layout, and existing NextGen improvements.[4] Use of this model is consistent with the 2030 noise analysis presented in *Chapter 6, Noise Abatement,* and the taxi times results are within the range of historical averages.[5]
- Since the current version of the Federal Aviation Administration's (FAA) Emissions and Dispersion Modeling System (EDMS) used for this *2011 ESPR* air quality emissions inventory does not reflect the anticipated significant design and operational improvements in aircraft engine technologies, alternative fuels, and aircraft operational measures, the estimated emission totals for 2030 are expected to be measurably less for all pollutants than the values predicted in this chapter. Technology changes are likely to lead to lower fuel use, improved combustion efficiencies and lower emissions.
- Total emissions of NO_x in 2030 are predicted to be 11 percent lower than in 2000 but 24 percent higher than in 2011. This increase is almost entirely a result of the changing aircraft fleet (i.e., greater use of quieter Stage 3, higher NO_x-emitting aircraft) and the forecasted increase in operations at the Airport. However, compared to the AQI, NO_x emissions in 2030 are still shown to be 13 percent lower than 1999 levels – the benchmark for these emissions. The number of aircraft operations in 1999 was 494,816, about 4 percent higher than is predicted in 2030.
- Total emissions of VOCs in 2030 are predicted to be 36 percent lower than in 2000; however, it is 2 percent higher compared to 2011. This small increase is mostly attributable to the forecasted increase in aircraft operations and anticipated increase in the number of vehicle trips of passengers, employees and other airport users.
- Total emissions of CO in 2030 are predicted to be 52 percent lower than in 2000 and 11 percent lower compared to 2011. This overall reduction is due to anticipated decreased aircraft taxi times and likely tighter emission controls for motor vehicles and off road-vehicles such as ground service equipment (GSE).
- Total emissions of $PM_{10}/PM_{2.5}$ in 2030 are predicted to be 22 percent lower than 2005 levels (2005 is the first year that $PM_{10}/PM_{2.5}$ emissions were reported), and 3 percent lower than 2011. This decrease since 2011 is mostly due to the lower emissions from GSE over this timeframe.

3 For more information on the BLANS and the TAAM model, please refer to *Chapter 6, Noise Abatement.*
4 The taxi times forecasted for 2030 are almost five minutes less than the times reported for 2011. This is due to several factors such as; the use of runway configurations (i.e. a higher use of a configuration with a lower taxi time), the simulation is run under optimal operating conditions, the simulation does not include delays in the National Airspace System or delays due to various weather conditions that may be experienced throughout the year.
5 The FAA reports that the four year (2007 – 2010) average taxi time under optimal conditions is 19.05 minutes and the total four year average taxi time is 25.81 minutes. The forecasted 2030 taxi time falls within this range.

- Total emissions of GHG in 2030 are predicted to be 11 percent higher than 2011 levels due, in part, to the predicted 29 percent increase in aircraft operations associated with a 38 percent forecast increase in passenger traffic, and an anticipated 3 percent increase in terminal space area and utilization. The GHG calculation includes consideration of greater efficiency in aircraft movements and improvements in combustion efficiency of motor vehicles and GSE.

Regulatory Framework

The federal Clean Air Act (CAA), the NAAQS, and similar state laws govern air quality conditions in Massachusetts. The NAAQS and the Massachusetts State Implementation Plan (SIP), promulgated to demonstrate compliance with the CAA (and its 1990 amendments), regulate air quality in the Boston metropolitan area and Massachusetts, and are discussed in the following section.

National Ambient Air Quality Standards

The EPA established 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: CO, lead (Pb), NO_2, ozone (O_3), PM_{10}, $PM_{2.5}$, and sulfur dioxide (SO_2). The NAAQS primary standards (designed to protect human health) and secondary standards (designed to protect human welfare) are summarized on Table 7-1.

Based on air monitoring data and in accordance with the CAA, all areas within Massachusetts are designated as *attainment*, *nonattainment*, *maintenance*, or *unclassifiable* with respect to the NAAQS.[6] An area with air quality better than the NAAQS is designated as attainment; an area with air quality worse than the NAAQS is designated as nonattainment; and an area that is in transition from nonattainment to attainment is designated as attainment/maintenance. An area may also be designated as unclassifiable when there is a temporary lack of data to form a basis for determining attainment status. Nonattainment areas can be further classified as extreme, severe, serious, moderate, and marginal by the degree of non-compliance with the NAAQS. The current attainment/nonattainment designations for the Boston metropolitan area are summarized in Table 7-2.

6 Environmental Protection Agency, *The Green Book Nonattainment Areas for Criteria Pollutants* (www.epa.gov/air/oaqps/greenbk/).

Table 7-1 National Ambient Air Quality Standards

Pollutant	Averaging Time	Standard ppm	Standard $\mu g/m^3$	Notes:
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 $\mu g/m^3$ 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	—	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.
	24 hour	0.14	365	Not to be exceeded more than once a year. (The 24 hour standard was revoked as of June 2, 2010).
	Annual	0.03	80	Not to exceed this level. (The Annual standard was revoked as of June 2, 2010.)

Source: EPA, 2012(www.epa.gov/air/criteria.html).
1 The 1997 NAAQS for ozone.
2 The 2008 NAAQS for ozone.
ppm Parts per million
$\mu g/m^3$ Micrograms per cubic meter

The Boston area is currently designated as attainment/maintenance for CO, indicating that it is in transition back to attainment for this pollutant. Historically, the entire Boston metropolitan area has been designated as attainment for all other criteria pollutants except O_3, for which it was designated as "moderate" nonattainment based on the 1997 eight-hour ozone standard (see Table 7-1). The O_3 nonattainment area consisted of 10 counties in Massachusetts (Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester). Logan Airport is located in Suffolk County.

In May 2012, the EPA published a Clean Air Determination for the *Boston-Lawrence-Worcester* 1997 Eight-Hour Ozone Nonattainment Area, signifying that based on air monitoring data collected between 2007 through 2010, the area has now attained the 1997 eight-hour ozone standard.[7] In April 2012, EPA began implementing the 2008 eight-hour ozone standard and has determined, based on year 2008 through 2011 monitoring data, that the area is considered attainment/unclassifiable for the 2008 eight-hour ozone standard.[8]

Table 7-2 Attainment/Nonattainment Designations for the Boston Metropolitan Area

Pollutant	Designation
Carbon monoxide (CO)	Attainment/Maintenance[1]
Nitrogen Dioxides (NO_2)	Attainment
Ozone (Eight-hour, 1997 Standard)	Attainment[1]
Ozone (Eight-hour, 2008 Standard)	Attainment/Unclassifiable[2]
Particulate matter (PM_{10})	Attainment
Particulate matter ($PM_{2.5}$)	Attainment
Sulfur Dioxide (SO_2)	Attainment
Lead (Pb)	Attainment

Source: EPA, 2012 (www.epa.gov/air/oaqps/greenbk/).
1 The Boston area was previously designated nonattainment for this pollutant but has since attained compliance with the NAAQS. Maintenance plan requirements have yet to be established.
2 Attainment/Unclassifiable means that the initial data shows attainment but additional data is needed to verify longer term conditions.

State Implementation Plan (SIP)

A SIP is a state's regulatory plan for bringing nonattainment areas within that state into compliance with the NAAQS. As indicated previously, the entire Boston metropolitan area has until recently been designated as "moderate" nonattainment for the 1997 eight-hour O_3 standard, but has since received a Clean Air Determination from EPA classifying the area as "attainment." As long as the area continues to attain this standard, MassDEP is not required to comply with any outstanding SIP requirements. However, Maintenance Plan requirements stipulated under Section 110 of the federal CAA could eventually apply for the 1997 standard, but any associated rulemaking has yet to be promulgated. Additionally, as stated above, the area has been designated attainment/unclassifiable for the 2008 eight-hour O_3 standard, and accordingly SIP preparation relative to this standard is not required for the Boston area. The most current SIP submittals for the Boston area are summarized in Table 7-3.

7 Approval and Promulgation of Air Quality Implementation Plans; Massachusetts and New Hampshire; Determination of Attainment of the One-Hour and 1997 Eight-Hour Ozone Standards for Eastern Massachusetts. (77 FR 31496)
8 Air Quality Designations for the 2008 Ozone National Ambient Air Quality Standards; Implementation of the 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation Conformity Purposes; Final Rules (77 FR 30088).

Table 7-3 State Implementation Plan for Ozone			
Standard	**Title**	**Status**	**Comments**
One-Hour	One-hour Ozone Attainment Demonstration for the Massachusetts Portion of the Boston-Lawrence-Worcester, Massachusetts-New Hampshire Ozone Nonattainment Area.	Published December 6, 2002, as final rule.	EPA approved this SIP revision and established an attainment date of November 15, 2007, for the entire multi-state nonattainment area. EPA has further determined that there are no additional obligations under the one-hour standard for this area.
Eight-Hour	Final Massachusetts State Implementation Plan To Demonstrate Attainment of the National Ambient Air Quality Standard for Ozone	Submitted to EPA, January 31, 2008, for approval.	This standard calls for the attainment of the 1997 eight-hour NAAQS for ozone by 2010 and focuses on the control of NO_x and VOCs as precursors to ozone. As of April 2012, EPA has determined that the Boston area is compliant with the 2008 standard, thus no SIP is required for eight-hour ozone.[1, 2]

Source: MassDEP (www.mass.gov/dep/air/priorities/sip.htm).
1 In 2007, the EPA promulgated a new eight-hour NAAQS for ozone. Informally called the “2008 standard” to differentiate it from the former “1997 standard”, this new standard is more strict (i.e., lower) than the former standard.
2 The original SIP established the Logan Airport Parking Freeze and the limit of 17,319 commercial and 3,373 employee spaces at the Airport in 2007, which was changed to 18,019 commercial and 2,673 employee spaces in 2011.

Logan Airport Air Quality Permits for Stationary Sources of Emissions

Massport was granted a Title V Air Quality Operating Permit for Logan Airport in September 2004. This permit covers all of the Massport-operated stationary sources including the Central Heating and Cooling Plant, snow melters, fuel dispensers, boilers, emergency electrical generators, and fuel storage tanks.

Methodology

For the purposes of the ESPR, the analysis of air emissions associated with Logan Airport operations includes the following source categories, each of which has its own assessment methodology, database, and assumptions as described.

- **Aircraft Emissions** — The FAA’s EDMS is the EPA-preferred and the FAA-required model for calculating aircraft emissions. Because the FAA continually improves the performance, precision and adaptability of the EDMS, the program is subject to regular updates and revisions. For this analysis, the most recent version, EDMS v5.1.3, was used to compute the 2011 (and 2030) Logan Airport emissions inventory.

  As with recent EDRs and ESPRs, the actual aircraft fleet mix at Logan Airport in 2011 was used as a model input to analyze annual conditions. In a few instances where the aircraft/engine type or combinations operating at Logan Airport were not available in the EDMS database, consistent with FAA guidance, substitutions were made based on the closest match of aircraft type and engine performance characteristic. Table I-4 in *Appendix I, Air Quality/Emissions Reduction* contains the data that were used, including aircraft type, engine, LTOs, and aircraft taxi/delay times. For the analysis, the aircraft are grouped into four categories: air carriers, cargo, commuter, and general aviation (GA) aircraft.

  Each LTO consists of taxiing, queuing, takeoff, climb out, approach, and landing operations. From 2010 to 2011, total LTOs increased by approximately 5 percent (176,322 to 184,494) overall with air carrier LTOs increasing by approximately 4 percent (111,032 to 115,116), commuter LTOs decreasing by approximately 5 percent (54,812 to 52,316), air cargo LTOs decreasing by approximately 7 percent (3,137 to 2,932), and GA increasing by approximately 92 percent (7,341 to 14,130).[9]

9 GA operations are recovering from the large declines experienced over the past two years and are returning to average levels at the Airport. These GA operations still represent only a small percentage (7.7 percent) of total operations at Logan Airport.

Aircraft taxi/delay times are based on data obtained from the FAA Aviation System Performance Metrics (ASPM) database for 2011.[10] According to this database, the average aircraft taxi/delay times at Logan Airport increased from 25.0 minutes to 25.2 minutes from 2010 to 2011, which is less than a 1 percent change. Minimizing aircraft taxi/delay times is beneficial for air quality since this reduces the time airplane engines are operating while on the ground.

- **Ground Service Equipment/Auxiliary Power Units** — Estimates of GSE emissions were based on EDMS emission factors and continue to reflect emission reductions attributable to Massport's Alternative Fuel Vehicle (AFV) Program and the conversion of Massport and/or tenant GSE and fleet vehicles to compressed natural gas (CNG) or electricity. Model input data are based on a new on-site GSE time-in-mode survey conducted in May 2012 at the Airport at part of the ESPR, combined with the most recent information regarding GSE fuel use (e.g., gasoline, diesel, CNG, liquid petroleum gas (LPG), and electric) from the Logan Airport Vehicle Aerodrome Permit Application documentation.[11]

- **Motor Vehicles** — Motor vehicle emission factors were obtained from the most recent version of EPA's MOBILE model (MOBILE6.2.03) combined with MassDEP-recommended motor vehicle fleet mix data, operating conditions, and other Massachusetts-specific input parameters. MOBILE is preferred by MassDEP and used to develop motor vehicle emissions budgets for the SIP. The MOBILE input/output files are included in *Appendix I, Air Quality/Emissions Reduction*. In addition, *Chapter 5, Ground Access to and from Logan Airport* of this *ESPR* provides a discussion of the VMT data used for this analysis. Starting with this *2011 ESPR*, VMT and vehicle speed data were predicted by the traffic simulation model, VISSIM.[12]

- **Other Sources** — Emissions associated with fuel storage and handling, the Central Heating and Cooling Plant, snow melters, generators, and fire training at Logan Airport were based on annual fuel throughput records for 2011, combined with appropriate EPA emission factors (e.g., compilation of Air Pollution Emission Factors AP-42 or emission factors obtained from NO_x Reasonably Available Control Technology [RACT] compliance testing). When compared to 2010, No. 2 fuel oil, No. 6 fuel oil, natural gas usage from boilers and diesel fuel from snow melter usage increased approximately 20 percent, 25 percent, 4 percent, and 87 percent, respectively. (The increased snow melter use is attributable to the unusually heavy snowfall in early 2011).

- **Particulate Matter** — Estimates of PM emissions associated with Logan Airport were first reported in the *2005 EDR* in response to the then recent availability of an FAA-updated method (e.g., *First Order Approximation*) for computing aircraft $PM_{10}/PM_{2.5}$ emission factors. $PM_{10}/PM_{2.5}$ emissions are now routinely reported in the EDRs/ESPRs including this *2011 ESPR*.

- **Greenhouse Gases** — GHG emissions were calculated in much the same way criteria pollutants were calculated - through the use of input data such as activity levels or material throughput rates (i.e., fuel usage, VMT, electrical consumption) that are applied to appropriate emission factors (i.e., in units of GHG emissions per gallon of fuel). Input data were either based on Massport records, or data and information derived from the EDMS v5.1.3. Emission factors were obtained from the U.S. Energy Information Administration (EIA), the International Panel on Climate Change (IPCC), and the EPA.

  Consistent with prior years, the 2011 GHG emissions inventory includes aircraft operations within the ground-based taxi-idle/delay mode and up to the top of the 3,000–foot LTO cycle.[13] Consistent with prior EDRs, GHG emissions associated with GSE/auxiliary power unit (APU), motor vehicles, a variety of stationary sources, and electricity usage were also included. Of note, Massport has direct ownership or

10 FAA Aviation System Performance Metrics (ASPM) database for 2011 (aspm.faa.gov/).
11 All vehicles and equipment (including GSE) that operate on the airfield must obtain a Logan Airport Vehicle Aerodrome Permit. The application form for this permit was modified in 2007 to request the fuel-type information (e.g., gasoline, diesel, CNG, LPG, and electric).
12 PTV America. (2011). Verkehr In Städen Simulationsmodell- VISSIM version 5.40 [computer software]. Portland, OR.
13 Following the guidance issued by the Airport Cooperative Research Program, ACRP Report 11, Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories.

control over a small percentage (approximately 12 percent) of these GHG emissions and their sources (i.e., limited to Massport fleet vehicles, on-airport roadways, stationary sources, and electrical consumption within Massport buildings). As with most commercial service airports, the vast majority of the emission sources at Logan Airport are owned or controlled by the airlines, other airport tenants, and the general public (motor vehicles). Massport undertakes a variety of program to reduce non-Massport emissions (by Airport tenants) through its support of HOV initiatives, including subsidizing free Silver Line Service through June 1, 2013, and supporting use of alternative fuels by airport taxis, the CNG station, and providing electric plug-ins for GSE, 400 Hz Power and pre-conditioned air at airplane gates.

Emissions Inventory in 2011

This section provides a summary of the 2011 Logan Airport emissions inventory for VOCs, CO, NO_x, and PM_{10}/$PM_{2.5}$. Emissions of O_3 are not directly computed as it is a secondary pollutant formed by the interactions of NO_x and VOCs throughout the region. Emissions of SO_2 and Pb are also not computed, as Logan Airport emission sources are not large generators of these two pollutants.

As stated above, the aircraft emissions inventory was prepared based on the actual number of aircraft operations (i.e., LTOs), fleet mix, and operational times-in-mode (TIM) at the Airport in 2011. Similarly, emissions associated with GSE, motor vehicles, fuel storage and transfer facilities, and a variety of stationary sources (i.e., boilers, snow melters, live-fire training, emergency generators, etc.) associated with Logan Airport were also computed based on actual conditions.

As in preceding ESPRs and EDRs, the results of the 2011 emissions inventory are compared with the results for 2010 and other previous years extending back to 1990. For ease of comparison in this ESPR, the summary figures now contain the previous results for 1990 and 2000 and then annually for 2005 to 2011.[14] However, to show the most recent data and to be consistent with other sections of the ESPR, the summary tables contain the results for 2000 through 2011. In this way, the changes in Logan Airport air quality conditions can be evaluated in both the short- and long-range time frame and on a common basis. For the AQI, estimates of 2015 NO_x emissions are also provided as a way of monitoring the progress of this voluntary emission management program. Finally, the results for the intervening years (i.e., 1995, 1996, 1997, etc.) are shown in previous EDRs and contained in *Appendix I, Air Quality/Emissions Reduction* of this ESPR.

Volatile Organic Compounds

In 2011, total VOC emissions at Logan Airport were 446 tpy (1,109 kg/day); an estimated increase of approximately 9 percent from 2010 levels. This calculated change is largely due to the increase in VOC emissions from aircraft engines associated with the 5 percent increase in aircraft operations and a 3 percent increase in VMT. However despite these increases, Figure 7-1 depicts an overall, long-range downward trend in VOC emissions at Logan Airport; since 1990, there has been a decrease of 76 percent. Figure 7-2 shows the 2011 percent breakdown of these emissions by source category. Table 7-4 shows the computed VOC emissions in kg/day for each emission source from 2000 to 2011. Other key findings include the following:

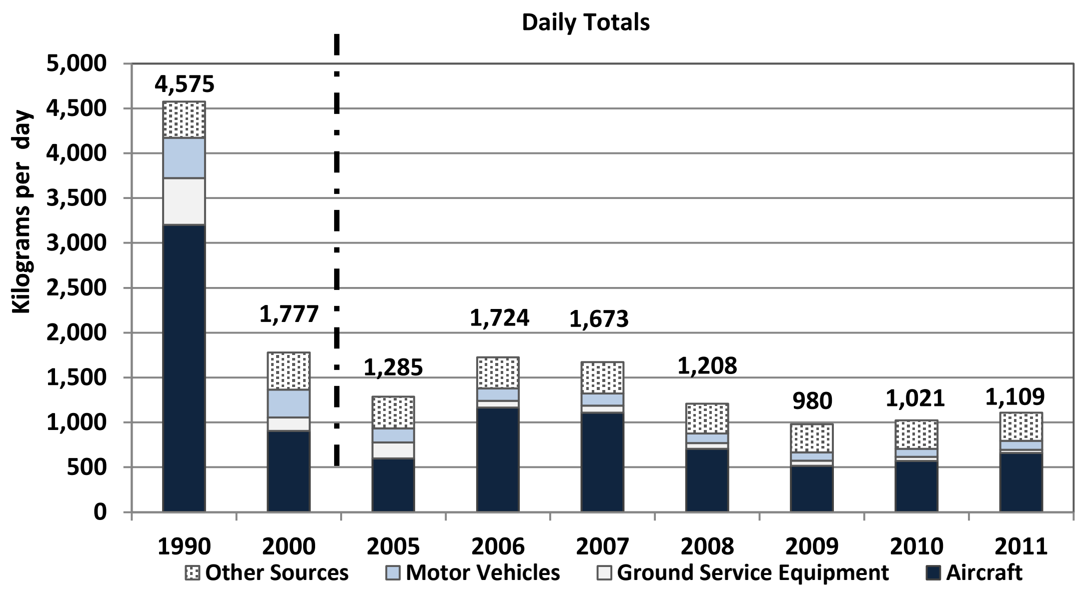
- Total aircraft-related VOC emissions were approximately 16 percent higher in 2011, when compared to 2010. This increase was largely due to the increase in aircraft LTOs, specifically, GA aircraft over this one-year period.

14 The results for the intervening years (i.e., 1995, 1996, 1997, etc.) are shown in previous EDRs and contained in *Appendix I, Air Quality/Emissions Reduction.*

- GSE-related VOC emissions were approximately 33 percent lower in 2011 than in 2010. This decrease was largely due to the changes in the GSE operating times based on the new GSE time-in-mode survey conducted at Logan Airport in May 2012.
- Total VOC emissions from motor vehicles in 2011 increased by 15 percent from 2010 levels. The increase in motor vehicle emissions is mostly attributable to higher emission factors of the 2011 motor vehicle fleet – an outcome of the lower speeds predicted by the VISSIM and an increase in VMT from 2010 to 2011.
- VOC emissions from stationary and other sources (e.g., fuel storage/handling, Central Heating and Cooling Plant, snow melter usage and firefighter training) remained virtually unchanged from 2010 to 2011. This is because Logan Airport ceased the use of VOC-containing deicing chemicals in 2010, which helped to offset the increase in stationary sources usage.

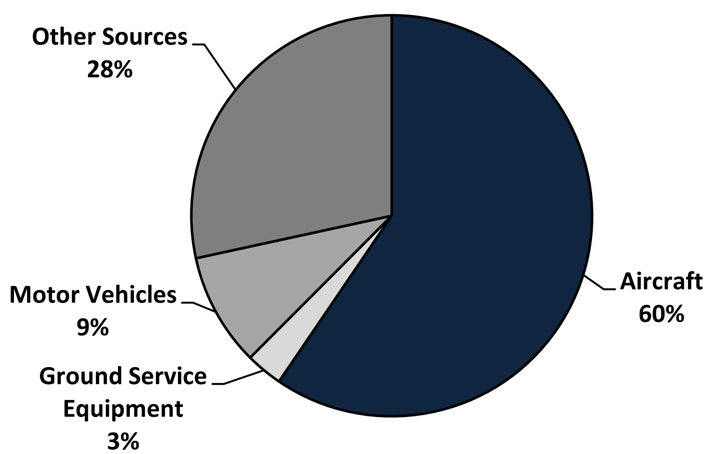
As Figure 7-2 shows, aircraft continue to represent the largest source (60 percent) of VOC emissions associated with Logan Airport, followed by stationary sources (28 percent), motor vehicles (9 percent), and GSE (3 percent). In summary, the 2011 results contained in Table 7-4 show a 9 percent increase of total emissions of VOCs when compared to 2010. However, the overall, long-range trend still shows a substantial decrease (38 percent) in these emissions since 2000.

Figure 7-1 Emissions of VOCs at Logan Airport



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

Figure 7-2 Sources of VOC Emissions, 2011



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

Table 7-4 Estimated VOC Emissions (in kg/day) at Logan Airport[1]

Aircraft/GSE Model:	EDMS v4.03		EDMS v4.11		EDMS v4.21	EDMS v4.5		EDMS v5.0.1		EDMS v5.0.2		EDMS v5.1		EDMS v5.1.2		EDMS v5.1.3	
Motor Vehicle Model:	MOBILE 6.0			MOB 6.2.01	MOBILE 6.2.03												
Year:	2000	2001	2002	2003	2004	2005	2006	2006	2007	2007	2008	2008	2009	2009	2010	2010	2011
Aircraft Sources																	
Air carriers	514	374	248	208	292	271	227	511	435	381	324	286	237	235	292	292	305
Commuter aircraft	140	113	75	95	127	140	125	371	479	409	253	176	131	133	129	125	110
Cargo aircraft	207	149	127	94	110	41	19	46	129	112	107	70	71	71	70	70	69
General aviation	42	43	52	61	127	147	147	236	226	206	201	171	78	78	81	81	176
Total aircraft sources	903	679	502	458	656	599	518	1,164[2]	1,269	1,108	885	703	517	517	572	568	660
Ground Service Equipment[3]	153	143	247	227	187	178	167	77	78	78	66	66	56	56	49	49	33
Motor Vehicles																	
Ted Williams Tunnel through-traffic	12	10	9	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]
Parking/curbside[4]	89	77	51	45	38	37	33	33	31	31	25	25	22	22	20	20	20
On-airport vehicles	206	170	152	135	129	118	106	106	104	104	82	82	71	71	68	68	81
Total motor vehicle sources	307	257	212	180	167	155	139	139	135	135	107	107	93	93	88	88	101
Other Sources																	
Fuel storage/handling[5]	412	372	329	297	341	340	336	336	338	338	320	320	307	307	311	311	311
Miscellaneous sources[6]	2	2	2	3	9	13	8	8	14	14	13	12	7	7	5	5	4
Total other sources	414	374	331	300	350	353	344	344	352	352	333	332	314	314	316	316	315
Total Airport Sources	1,777	1,453	1,292	1,165	1,360	1,285	1,168	1,724	1,834	1,673	1,391	1,208	980	980	1,025	1,021	1,109

Source: Massport

Notes: Years 2006 to 2010 were computed with previous years EDMS version to provide for a common basis of comparison.

kg/day = kilograms per day. 1 kg/day is equivalent to approximately 0.40234 tons per year (tpy).

1 See *Appendix I, Air Quality/Emissions Reduction* for 1993 to 1999 emission inventory results.

2 The 2006 increase in aircraft VOC emissions is largely attributable to the addition of aircraft main engine startup emissions.

3 GSE emissions include aircraft APUs as well as vehicles and equipment converted to alternative fuels.

4 Due to the new roadway configuration and opening of the Ted Williams Tunnel there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.

5 Parking/curbside is based on VMT analysis.

6 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Table 7-5 Estimated NO_X Emissions (in kg/day) at Logan Airport, 2000 – 2011[1]

Aircraft/GSE Model:	EDMS v4.03		EDMS v4.11		EDMS v4.21	EDMS v4.5		EDMS v5.0.1		EDMS v5.0.2		EDMS v5.1		EDMS v5.1.2		EDMS v5.1.3	
Motor Vehicle Model:	**MOBILE 6.0**			**MOB 6.2.01**	**MOBILE 6.2.03**												
Year:	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**		**2007**		**2008**		**2009**		**2010**		**2011**
Aircraft Sources																	
Air carriers	4,202	3,707	2,721	2,479	2,949	2,880	2,849	3,044	3,120	3,121	3,031	3,031	2,944	2,952	3,031	3,037	3,128
Commuter aircraft	125	233	208	185	245	225	195	256	353	354	319	319	309	234	203	204	199
Cargo aircraft	284	267	246	213	215	211	192	125	248	248	233	233	215	204	197	197	196
General aviation	49	34	38	45	49	50	49	60	56	56	43	43	27	23	29	26	43
Total aircraft sources	4,660	4,241	3,213	2,922	3,458	3,366	3,285	3,485	3,777	3,779	3,626	3,626	3,495	3,413	3,460	3,464	3,566
Ground Service Equipment[2]	333	305	322	291	333	312	280	300	299	299	257	257	219	219	198	198	173
Motor Vehicles																	
Ted Williams Tunnel through-traffic	26	22	20	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]
Parking/curbside[4]	52	46	32	28	21	22	19	19	18	18	15	15	13	13	12	12	11
On-airport vehicles	425	369	341	302	267	269	238	238	233	233	182	182	153	153	144	144	148
Total motor vehicle sources	503	437	393	330	288	291	257	257	251	251	197	197	166	166	156	156	159
Other Sources																	
Fuel storage/handling[5]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[6]	211	185	175	151	211	218	109	109	128	128	124	124	181	181	166	166	179
Total other sources	211	185	175	151	211	218	109	109	128	128	124	124	181	181	166	166	179
Total Airport Sources	5,707	5,168	4,103	3,694	4,290	4,187	3,931	4,151	4,455	4,457	4,204	4,204	4,061	3,979	3,980	3,984	4,077

Source: Massport

Notes: Years 2006 to 2010 were computed with previous years EDMS version to provide for a common basis of comparison.

kg/day - kilograms per day. 1 kg/day is approximately equivalent to 0.40234 tons per year (tpy).

1 See *Appendix I, Air Quality/Emissions Reduction* for 1993 to 1999 emission inventory results.

2 GSE emissions include APUs as well as vehicles and equipment converted to alternative fuels.

3 Due to the new roadway configuration and opening of the Ted Williams Tunnel there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.

4 Parking/curbside data is based on VMT analysis.

5 Fuel storage/handling facilities are not a source of NO_x emissions.

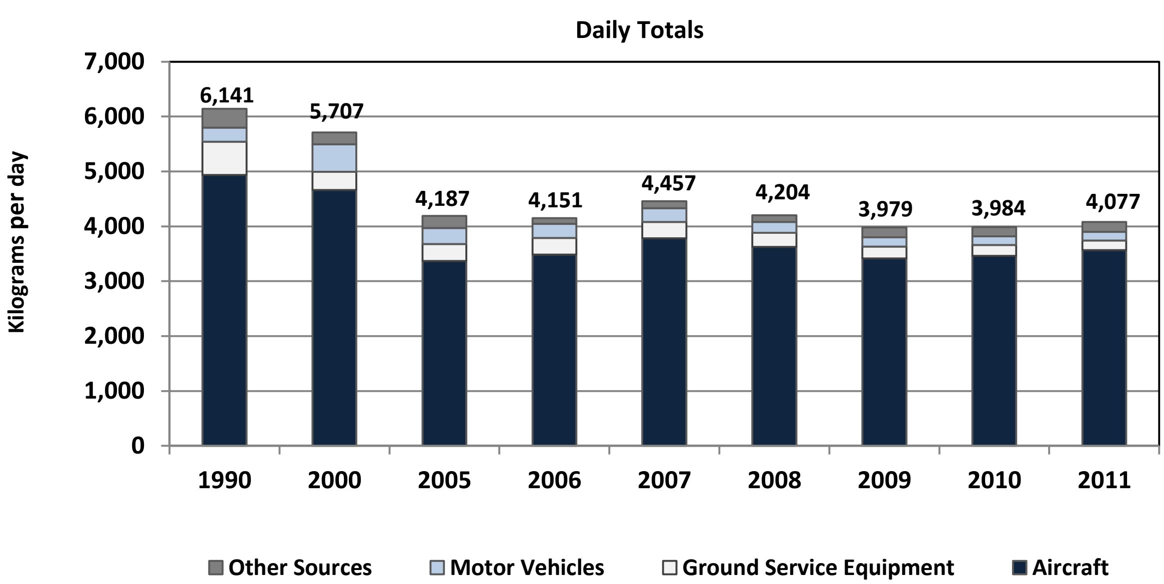
6 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Oxides of Nitrogen

In 2011, total NO_x emissions from all Airport-related sources were estimated to be 1,640 tpy (4,077 kg/day), which is a small increase of 2 percent from 2010 levels; however, this observation is within the context of an overall decrease of 30 percent from 1999 levels, the benchmark of the AQI which is discussed later in this chapter. Figure 7-3 depicts these short- and long-range trends in NO_x emissions and Table 7-5 shows the share for each emission source in 2000 through 2011. Other findings related to NO_x emissions include the following:

- When compared to 2010 levels, total aircraft-related NO_X emissions were 3 percent higher in 2011. This increase is largely due to the 5 percent increase in aircraft operations at Logan Airport, particularly in air carriers and GA operations while commuter and cargo aircraft emissions decreased due to 5 percent fewer operations by those categories of aircraft in 2011. Despite the NO_X emissions increase in 2011, the overall, long-range trend still shows a significant decrease (29 percent) in these emissions since 2000 and beyond.
- GSE emissions of NO_x decreased by 13 percent in 2011 compared to 2010, due mostly to the changes in GSE operating times reflected in the recent GSE time-in-mode survey.
- NO_x emissions from motor vehicles increased by approximately 2 percent from 2010 levels. This small increase is attributable mostly to higher emission factors of the 2011 motor vehicle fleet and an increase in VMT.
- Stationary sources show an increase of approximately 8 percent in NO_x emissions in 2011 compared to 2010, largely due to the higher usage of the snow melters attributable to the unusually high snowfall in early 2011. Additionally, the usage of No. 2 fuel oil, No. 6 fuel oil, and Tekflame at the fire training facility (FTF) also increased over this time period.

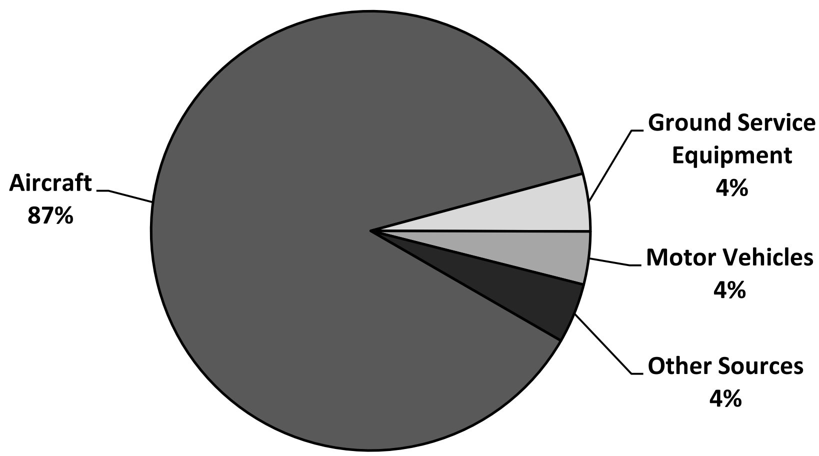
Figure 7-3 Emissions of NO_X at Logan Airport



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

As shown in Figure 7-4, in 2011, aircraft continued to represent the largest source (87 percent) of NO_x at Logan Airport, followed by GSE (4 percent), motor vehicles (4 percent), and stationary sources (4 percent**).** In summary, the 2011 results contained in Table 7-5 show a 2 percent increase of total emissions of NOx when compared to 2010. However, the overall, long-range trend still shows a significant decrease (29 percent) in these emissions since 2000 and beyond.

Figure 7-4 Sources of NO_X Emissions, 2011



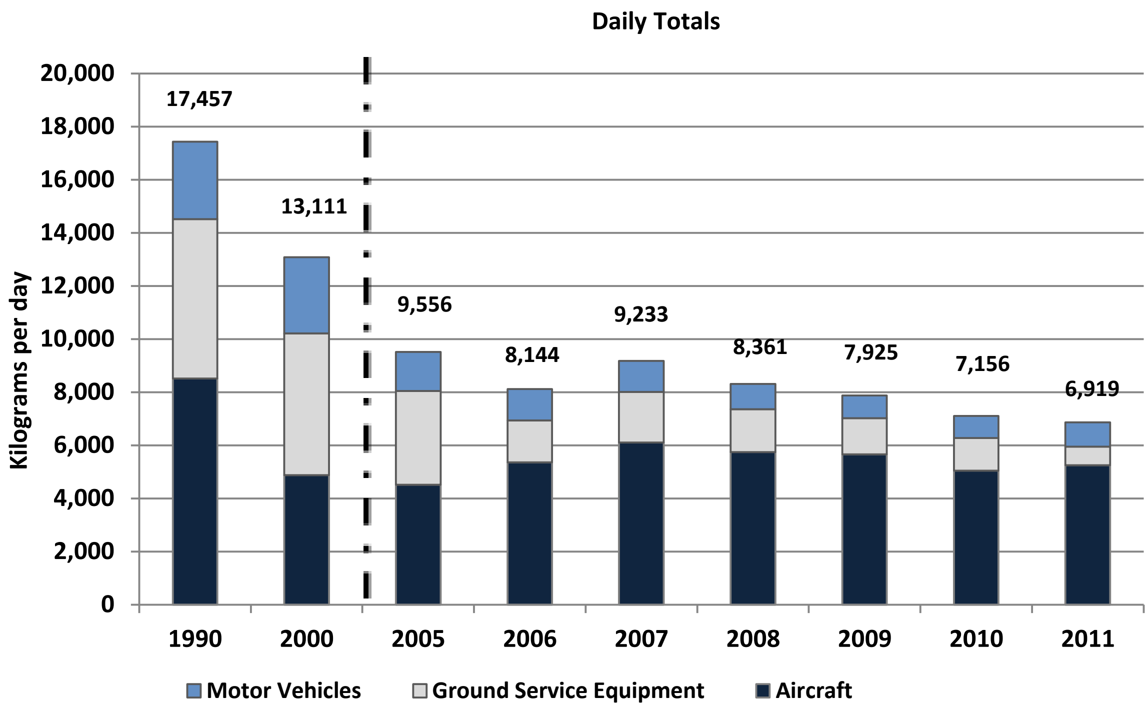
Note: Other sources include stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.). Values may not add to 100 percent due to rounding.

Carbon Monoxide

Total CO emissions at Logan Airport in 2011 were 2,784 tpy (6,919 kg/day), or approximately 3 percent lower than 2010 levels. Figure 7-5 also depicts this long-range downward trend (i.e., a 60 percent overall reduction from 1990 to 2011) in CO emissions associated with airport activities. Table 7-6 also shows the breakdown of these emissions, by source category, for the years 2000 to 2011. The findings of the analysis reveal the following:

- Aircraft-related CO emissions increased in 2011 by approximately 4 percent compared to 2010 levels due mostly to the overall increase in aircraft operations at Logan Airport, particularly in air carriers and GA operations, as discussed above.
- GSE CO emissions decreased by approximately 43 percent in 2011 compared to 2010. This is mostly due to changes in the GSE operating times based on the 2012 GSE time-in-mode survey.
- CO emissions from motor vehicles increased in 2011 by approximately 10 percent from 2010 levels. This increase is attributable mostly to the higher emission factors of the 2011 motor vehicle fleet that reflect the lower speeds (i.e., emission factors are higher at lower vehicle speeds) predicted by the VISSIM and an increase in VMT.
- CO emissions from stationary sources increased approximately 11 percent in 2011 compared to 2010, largely due to the higher usage of snow melters associated with the unusually high snowfall in early 2011.

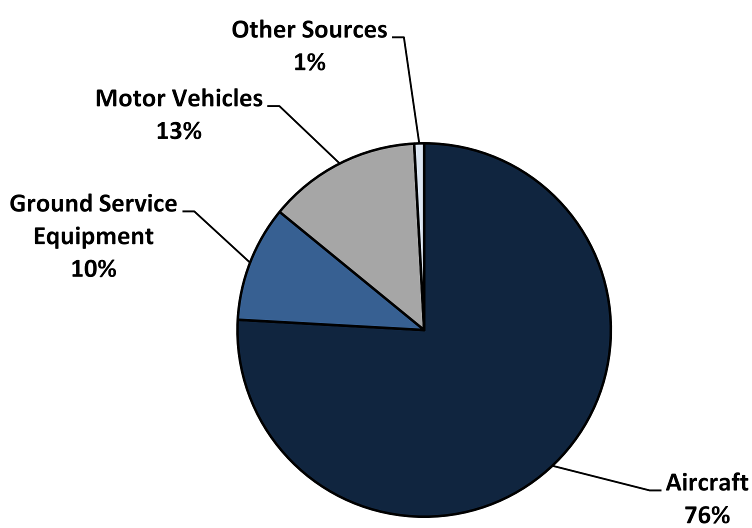
Figure 7-5 Emissions of CO at Logan Airport



Note: Other stationary sources not shown.

As shown in Figure 7-6, aircraft emissions continued to represent the largest source (76 percent) of CO at Logan Airport in 2011, followed by motor vehicles (13 percent), GSE (10 percent), and stationary sources (1 percent).

Figure 7-6 Sources of CO Emissions, 2011



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

The 2011 results contained in Table 7-6 show a 3 percent decrease of total emissions of CO when compared to 2010 and an overall, long-range downward trend of a 53 percent decrease in these emissions since 2000.

Particulate Matter (PM)

Table 7-7 shows that total estimated $PM_{10}/PM_{2.5}$ emissions at Logan Airport in 2011 were 27 tpy (67 kg/day), or approximately 5 percent higher than 2010 levels. However, there is still a measurable downward trend in these emissions, 19 percent lower since 2005 when they were first computed and reported in the *2005 EDR*. Other key findings of the analysis include the following:

- Aircraft-related $PM_{10}/PM_{2.5}$ emissions increased approximately 5 percent in 2011 compared to 2010 levels. This increase is due mostly to the overall increase in aircraft operations at Logan Airport, particularly in air carriers and GA operations.
- GSE $PM_{10}/PM_{2.5}$ emissions remained the same in 2011when compared to 2010 levels. This is mostly due to changes in the GSE operating times based on the recent GSE time-in-mode survey, which showed an increase in operating times of two of highest $PM_{10}/PM_{2.5}$ emitters (i.e., the diesel powered aircraft and baggage tugs and tractors).
- $PM_{10}/PM_{2.5}$ emissions from motor vehicles remained approximately the same in 2011 when compared to 2010 levels. This is attributable mostly to slightly lower emission factors (i.e., particulate matter emission factors are unaffected by the lower vehicle speeds in 2011) of the motor vehicle fleet offsetting the increased VMT over this time period.
- Stationary source emissions of $PM_{10}/PM_{2.5}$ increased by approximately 1 ton (1.5 percent of the overall total) compared with 2010, which is mostly attributable to the higher usage of the snow melters during the early winter of 2011.

Table 7-6 Estimated CO Emissions (in kg/day) at Logan Airport, 2000-2011[1]

Aircraft/GSE Model:	EDMS v4.03		EDMS v4.11		EDMS v4.21	EDMS v4.5		EDMS v5.0.1		EDMS v5.0.2		EDMS v5.1		EDMS v5.1.2		EDMS v5.1.3	
Motor Vehicle Model:	MOBILE 6.0			MOB 6.2.01	MOBILE 6.2.03												
Year:	2000	2001	2002	2003	2004	2005	2006		2007		2008		2009		2010		2011
Aircraft Sources																	
Air carriers	2,994	2,475	2,156	2,128	2,985	2,895	2,828	3,167	2,973	2,973	2,710	2,710	2,460	2,448	2,531	2,531	2,592
Commuter aircraft	1,188	1,072	783	846	1,010	1,010	950	1,587	2,484	2,484	2,436	2,436	2,364	2,795	2,629	2,086	2,042
Cargo aircraft	400	323	285	209	229	174	138	158	241	241	255	255	256	266	248	259	246
General aviation	295	407	256	276	416	437	398	442	401	403	345	345	145	150	177	173	370
Total aircraft sources	4,877	4,277	3,480	3,459	4,640	4,516	4,314	5,354	6,099	6,101	5,746	5,746	5,225	5,659	5,585	5,049	5,250
Ground Service Equipment[2]	5,335	5,193	5,170	4,758	3,586	3,531	3,409	1,586	1,904	1,904	1,609	1,609	1,364	1,364	1,222	1,222	694
Motor Vehicles																	
Ted Williams Tunnel through-traffic	133	121	112	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]
Parking/curbside[4]	495	440	295	253	180	179	144	144	139	139	117	117	107	107	106	106	110
On-airport vehicles	2,245	2,001	1,872	1,685	1,412	1,290	1,036	1,036	1,038	1,038	834	834	740	740	726	726	806
Total motor vehicle sources	2,873	2,562	2,279	1,938	1,592	1,469	1,180	1,180	1,177	1,177	951	951	847	847	832	832	916
Other Sources																	
Fuel storage/handling[5]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[6]	27	24	23	22	33	40	24	24	51	51	55	55	55	55	53	53	59
Total other sources	27	24	23	22	33	40	24	24	51	51	55	55	55	55	53	53	59
Total Airport Sources	13,112	12,056	10,952	10,177	9,851	9,556	8,927	8,144	9,231	9,233	8,361	8,361	7,491	7,925	7,692	7,156	6,919

Source: Massport

Notes: Years 2006 to 2010 were computed with previous years EDMS version to provide for a common basis of comparison.
kg/day = kilograms per day. 1 kg/day is approximately equivalent to 0.40234 tons per year (tpy).

1 See *Appendix I, Air Quality/Emissions Reduction* for 1993 to 1999 emission inventory results.
2 GSE emissions include APUs as well as vehicles and equipment converted to alternative fuels.
3 Due to the new roadway configuration and opening of the Ted Williams Tunnel there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.
4 Parking/curbside information is based on VMT analysis.
5 Fuel storage/handling facilities are not a source of CO emissions.
6 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Table 7-7 Estimated $PM_{10}/PM_{2.5}$ Emissions (in kg/day) at Logan Airport, 2005-2011[1]

Aircraft/GSE Model:	**EDMS v4.5**		**EDMS v5.0.1**		**EDMS v5.0.2**		**EDMS v5.1**		**EDMS v5.1.2**		**EDMS v5.1.3**	
Motor Vehicle Model:	**MOBILE 6.2.03**											
Year:	**2005[2]**	**2006**		**2007**		**2008**		**2009**		**2010**		**2011**
Aircraft Sources												
Air carriers	25	25	38	35	67	63	42	43	36	34	34	35
Commuter aircraft	1	1	2	6	14	11	6	5	5	4	4	3
Cargo aircraft	2	3	2	3	6	5	4	4	3	3	3	3
General aviation	2	2	2	2	5	5	4	2	2	2	2	4
Total aircraft sources	30	31	44	46	92	84	56	54	46	43	43	45
Ground Service Equipment[3]	11	9	9	10	10	8	15	14	14	13	13	13
Motor Vehicles												
Ted Williams Tunnel through-traffic	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]	0[4]
Parking/curbside[5]	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
On-airport vehicles	8	8	8	9	9	7	7	6	6	6	6	6
Total motor vehicle sources	9	9	9	9	9	7	7	6	6	6	6	6
Other Sources												
Fuel storage/handling[6]	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[7]	34	16	16	17	17	3	3	5	5	2	2	3
Total other sources	34	16	16	17	17	3	3	5	5	2	2	3
Total Airport Sources	84	65	78	82	128	102	81	79	71	64	64	67

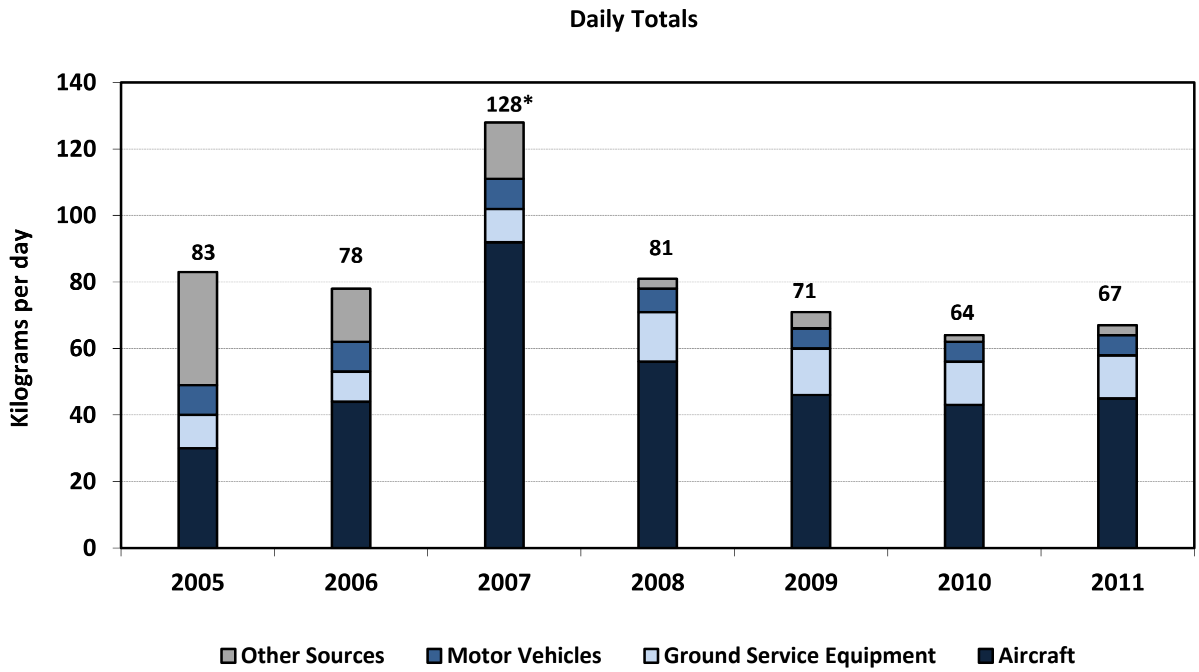
Source: Massport

Notes: Years 2006 to 2010 were computed with previous years EDMS version to provide for a common basis of comparison.
kg/day = kilograms per day. 1 kg/day is approximately equivalent to 0.40234 tons per year (tpy); PM - particulate matter

1 It is assumed that all PM are less than 2.5 microns in diameter ($PM_{2.5}$).
2 2005 is the first year that $PM_{10}/PM_{2.5}$ emissions were included in the Logan Airport ESPR/EDR emission inventories.
3 GSE emissions include APUs as well as vehicles and equipment converted to alternative fuels.
4 Due to the new roadway configuration and opening of the Ted Williams Tunnel there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.
5 Parking/curbside is based on VTM analysis.
6 Fuel storage and handling facilities are not sources of PM emissions.
7 Includes the Central Heating and Cooling Plant, emergency electricity generation, fire training, snow melters, and other stationary sources.

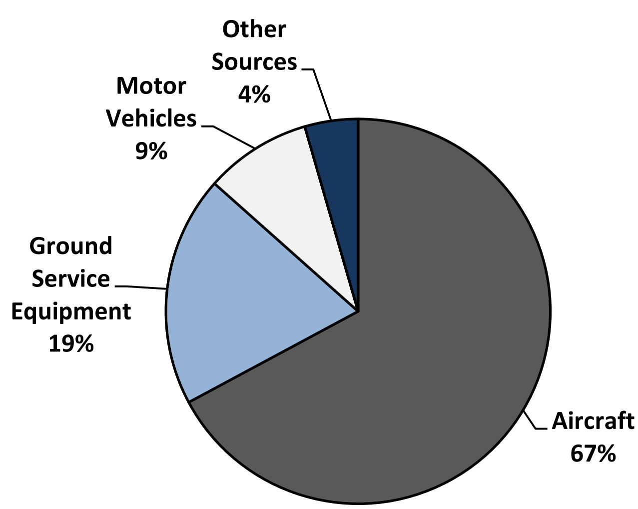
As shown in Figures 7-7 and 7-8, aircraft represent the largest source of $PM_{10}/PM_{2.5}$ (67 percent) followed by GSE (19 percent), motor vehicles (9 percent), and stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.) (4 percent). The 2011 results contained in Table 7-7 show a 5 percent increase of total emissions of VOCs when compared to 2010. However, the overall, long-range trend still shows a significant decrease (19 percent lower since 2005) in these emissions at Logan Airport.

Figure 7-7 Emissions of $PM_{10}/PM_{2.5}$ at Logan Airport, 2005-2011



Notes: Other sources include stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.).
In 2007, 46 kg /day of PM emissions were attributable to changes in the EDMS model.

Figure 7-8 Sources of $PM_{10}/PM_{2.5}$ Emissions, 2011



Note: Other sources include stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.). Values may not add to 100 percent due to rounding.

Projected Emissions Inventory for 2030

In 2012, Massport developed a long-range forecast for Logan Airport for 2030. Details are provided in *Chapter 2, Activity Levels*. The forecast number of aircraft operations for 2030 (474,734 operations) is nearly 30 percent greater than 2011 (368,987 operations), however, it is less than the level of operations in 2000 (487,996 operations). These forecasts, along with future Airport activity assumptions pertaining to airfield operating conditions, aircraft fleet mix, GSE and APU usage, and fuel throughput volumes were used to calculate the 2030 emissions inventory. A primary finding of the 2030 air quality analysis shows that although there are projected increases in emissions for most air quality parameters due to increased flights, the increases are still well below historical highs. In addition, the 2030 emission inventory represents a conservative analysis, and actual 2030 emissions are anticipated to be lower than the predicted values.

2030 Fleet Mix, Vehicle Miles Traveled (VMT), and Operations Assumptions

There are several limitations on the predictive ability of air quality models relating to years as distant as 2030. For example, the model used to conduct the aircraft and GSE analyses (i.e., EDMS) is often updated by FAA but does not anticipate future-year technological changes. The EDRs and ESPRs update assumptions and technological advances as they are available. The modeling used to calculate the 2030 emission inventory makes the following assumptions:

- As with the 2011 emissions inventory, the most recent version, EDMS v5.1.3, was used to compute the 2030 Logan Airport emissions inventory. While current aircraft and motor vehicle engine technologies are likely to change, become more efficient, and possibly use alternative fuels not used currently, these changes cannot feasibly be accounted for, and thus are not included in the model. Similarly, the modeled aircraft reflect current technologies and cannot adequately characterize the low-emissions profiles of certain developing engine technologies. Thus the predicted emissions represent a conservative (likely over estimate) of future conditions.
- LTOs from 2011 to 2030 are forecasted to increase by approximately 29 percent (184,494 to 237,367), with overall air carrier LTOs increasing by approximately 36 percent (115,116 to 156,361), commuter LTOs increasing by approximately 22 percent (52,316 to 63,734), air cargo LTOs increasing by approximately 30 percent (2,932 to 3,818), and GA decreasing by approximately 5 percent (14,130 to 13,454). Table I-4 in *Appendix I, Air Quality/Emissions Reduction* contains the input data that were used, including aircraft types, engines, LTOs, and assumed aircraft taxi/delay times.
- The estimation of GSE emissions was based on data from the 2012 on-site GSE time-in-mode survey. The 2030 emissions inventory uses current 2012 Alternative Fuel Vehicle statistics, as obtained from the Logan Airport Vehicle Aerodrome Permit Application process, to estimate GSE emissions in 2030, which reflects an over-estimate of emissions, since the percentage of alternative-fuel GSE is expected to be higher in 2030.
- Massport developed the 2030 taxi times from the BLANS TAAM simulation model which simulates the use of the Airport for each of the main runway configurations with a level of operations consistent with the 2030 forecast, the existing airfield layout, and existing NextGen improvements. The average taxi time forecasted for 2030 is approximately five minutes less than the times reported for 2011. This is due to several factors such as; the use of runway configurations (i.e., a higher use of a configuration with a lower taxi time), the simulation is run under optimal operating conditions, the simulation does not include delays in the National Airspace System or delays due to various weather conditions that may be experienced throughout the year. The simulation results are within historical averages. The FAA reports that the four year (2007 - 2010) average taxi time under optimal conditions is 19.05 minutes and the total four year average taxi time is 25.81 minutes. The forecasted 2030 taxi time falls within this range.

- As with 2011, motor vehicle emission factors for 2030 were obtained from the most recent version of EPA's MOBILE model (MOBILE6.2.03). The MOBILE input/output files are included in *Appendix I, Air Quality/Emissions Reduction*. The model assumes continued emissions improvements in motor vehicles. However, as engine technologies continue to evolve and become more fuel efficient with reduced emissions, future modeling is expected to show even smaller increases in emissions in 2030 than can be predicted today. *Chapter 5, Ground Access to and from Logan Airport,* of this *ESPR* provides a discussion of the VMT data used for this analysis. As with 2011, the VMT and vehicle speed data for 2030 were predicted by the traffic simulation model, VISSIM.
- Emissions associated with fuel storage and handling, the Central Heating and Cooling Plant, snow melters, generators, and fire training at Logan Airport are based largely on fuel throughput, and it is difficult to predict what the fuel usage will be in 2030. Emissions from boilers and generators were estimated by using the average fuel throughput for the last five years and increasing that by the anticipated increase in terminal building area, or 3 percent. Emissions from snow melters and fire training are anticipated to be relatively constant through 2030. The same emission factors used in 2011 were also assumed for 2030.

2030 Emissions Inventory Results

Due to the conservative nature of the modeling assumptions, the results of the 2030 emissions inventory, which are shown in Table 7-8, should be considered reasonable, but may be conservatively high, since the calculations are based on currently known information. As more accurate emissions data become available in the future, these results will be updated with future ESPRs.

Changes in emissions are a function of number of aircraft operations, fleet mix, taxi times, GSE emission factors, motor vehicle volumes and emission factors, stationary source fuel usage, and others. In some cases, these data result in opposite effects such as taxi times which influence aircraft VOC and CO, while NO_X is mostly influenced by the increase in the number of operations, and $PM_{10}/PM_{2.5}$ is influenced by GSE serving the aircraft fleet.

As shown, even with a nearly 30 percent forecasted increase in operations, total emissions of VOCs in 2030 are expected to be only 2 percent higher than in 2011 and 36 percent lower than in 2000. The small overall increase in VOC emissions is mainly attributed to the projected increase in fuel storage and handling, particularly jet fuel and gasoline, associated with the forecasted increase in operations and the number of motor vehicles accessing the Airport. Any increased use of lower emitting fuels would offset this small increase.

Total emissions of NO_X in 2030 are expected to be 24 percent higher than in 2011 but 11 percent lower than in 2000. The influence of quieter Stage 3 aircraft (which emit more NO_X and less VOCs than Stage 2 aircraft because of their higher combustion temperatures) and the forecast increase in aircraft operations at the Airport are reflected in these long-term results. Importantly, the current projections for 2030 do not incorporate technical innovations that are likely to be in effect at that time, including the introduction of Stage 4 engines, which will be cleaner and quieter. Therefore, with more operations and higher-emitting engines in the current database, the predicted NO_X emissions from aircraft are likely to be conservatively high.

Total emissions of CO in 2030 are expected to be 10 percent lower than in 2011 and 52 percent lower than in 2000. As with VOCs, CO emissions from aircraft would be largely a result of taxi/delay aircraft operations, thus, taxi times have a large influence on the CO aircraft emission estimates. Also, motor vehicle and GSE are expected to continue to become cleaner over time resulting in lower CO emissions.

Total emissions of $PM_{10}/PM_{2.5}$ in 2030 are expected to be 22 percent lower than 2005 levels and 3 percent lower than in 2011. This overall reduction since 2005 is primarily attributable to the nearly 100 percent decrease in the use of No. 6 fuel oil in favor of lower $PM_{10}/PM_{2.5}$-emitting natural gas and No. 6 fuel oil. However, the small decrease in emissions since 2011 is mostly due to the lower emissions from GSE in the future due to tighter emission controls for GSE.

Table 7-8 Emission Estimates for 2030 (in kg/day) at Logan Airport

	Projected Emissions			
Source Categories	**VOCs**	**NO_x**	**CO**	**$PM_{10}/PM_{2.5}$**
Aircraft Sources[1]				
Air carriers	382	4,262	2,752	38
Commuter aircraft	111	240	1,885	2
Cargo aircraft	20	226	134	2
General aviation	131	39	283	3
Total aircraft sources	644	4,767	5,054	45
Ground Service Equipment[2]	16	82	320	10
Motor Vehicles				
Parking/curbside	16	4	112	<1
On-airport vehicles	52	36	710	5
Total motor vehicle sources	68	40	822	6
Other Sources[3]				
Fuel storage/handling	399	0	0	0
Miscellaneous sources	4	179	56	4
Total other sources	403	179	56	4
Total Airport Sources	1,131	5,068	6,252	65

Source: Massport
Note: kg/day is approximately equivalent to 0.40234 tons per year (tpy).
1 Calculations for 2030 are based on taxi times based on the TAAM.
2 Includes vehicles and equipment converted to alternative fuels based on the 2011 fleet mix.
3 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources.

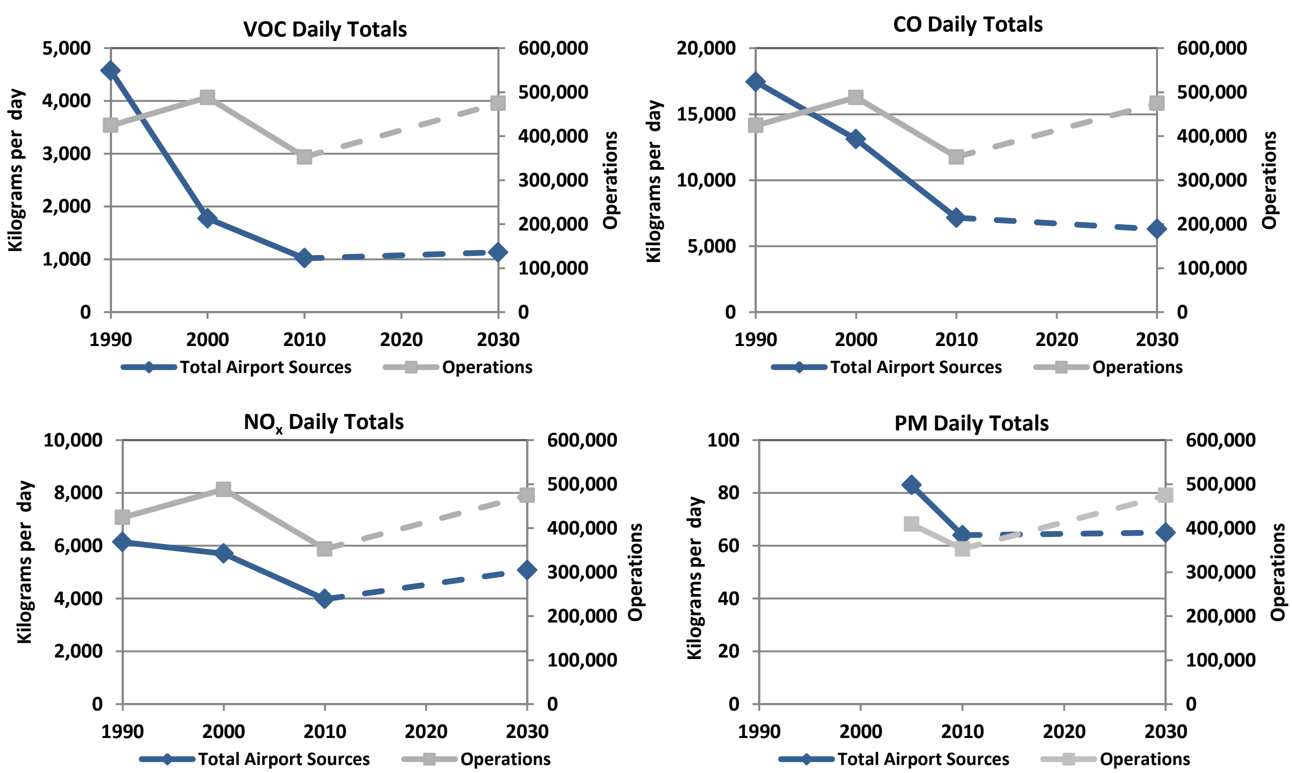
Again, the estimated emission totals for 2030 are expected to be measurably less for all pollutants than the values reported in this *2011 ESPR*. The current version of EDMS, which was used to calculate the 2030 emission inventory, does not reflect the significant design and operational improvements in aircraft engine technologies, alternative fuels, and aircraft operational measures, which will lead to lower fuel use, improved combustion efficiencies, and lower emissions.

Historical Context and Trends

This section provides a summary of the Logan Airport long-range emissions levels for VOCs, CO, NO_x, and PM_{10}/$PM_{2.5}$ from 1990 to the future year 2030. As shown, long-range emissions levels at Logan Airport have decreased since 1990 due to improvements in aircraft and motor vehicle engine combustion technologies and improvements to the Airport such as the Logan Airside Improvements Project. The emission trends for VOCs, NO_x, CO, and PM from 1990 to 2030 are shown in Figure 7-9 and operational levels at the Airport are also shown for comparative purposes.

Overall, there has been a long-range trend of decreasing emissions since 1990. However, from 2010 to 2030, the emissions of VOCs, NO_x, and PM are predicted to increase slightly. However, for no parameters are 2030 emissions predicted to be above historical highs (i.e., 1990) levels. This forecasted increase in emissions is mostly due to a corresponding increase in aircraft operations (352,643 in 2010 and 474,734 in 2030), fuel storage and handling, and stationary source fuel usage (e.g., boilers) predicted for the Airport over this same timeframe. By contrast, CO emissions continue to decrease through 2030 due to tighter emission controls for motor vehicles and GSE.

Figure 7-9 Long-Range Emissions Trends of VOCs, NO_x, CO, and PM at Logan Airport, 1990-2030[1]



Note: The dashed lines represent projected values.
1 PM emissions were not estimated until 2005.

Measured NO_2 Concentrations

This section presents the results of Massport's ambient (i.e., outdoor) air quality monitoring program for NO_2, a pollutant associated with aircraft activity and other fuel combustion sources. Between 1982 and early 2012, Massport collected NO_2 concentration data at numerous locations both on the Airport and in neighboring residential communities. The purpose of this monitoring program was to track long-term trends in NO_2 levels and to compare the results to the NAAQS for this pollutant. Massport determined that the Logan NO_2 Monitoring Program had achieved its objectives with the significant and stable decrease in NO_2 emissions since 1999. Massport discontinued the program in early 2012.

This monitoring program used passive diffusion tube technology for a period of one week each month for 12 months of the year at each of the monitoring stations (Figure 7-10). The samples of NO_2, along with Quality Assurance/Quality Control (QA/QC) samples, were then analyzed in a laboratory.

Table 7-9 presents the 2011 NO_2 monitoring data and Figure 7-10 depicts the locations of the 27 sites currently in the Massport NO_2 monitoring network. For comparative purposes, historical data from 1999 are also shown in Table 7-9. The table also includes NO_2 data collected under a separate effort by MassDEP using continuous monitors at four Boston-area locations (Figure 7-10).

As shown on Table 7-9, the 2011 NO_2 levels were generally higher than in 2010. This is consistent with the cyclical trend of the average levels over the past several years[15]. However, there remains a long-term trend of decreasing NO_2 concentrations at both the Massport and MassDEP monitoring sites since 1999. Other observations of the 2011 data show that:

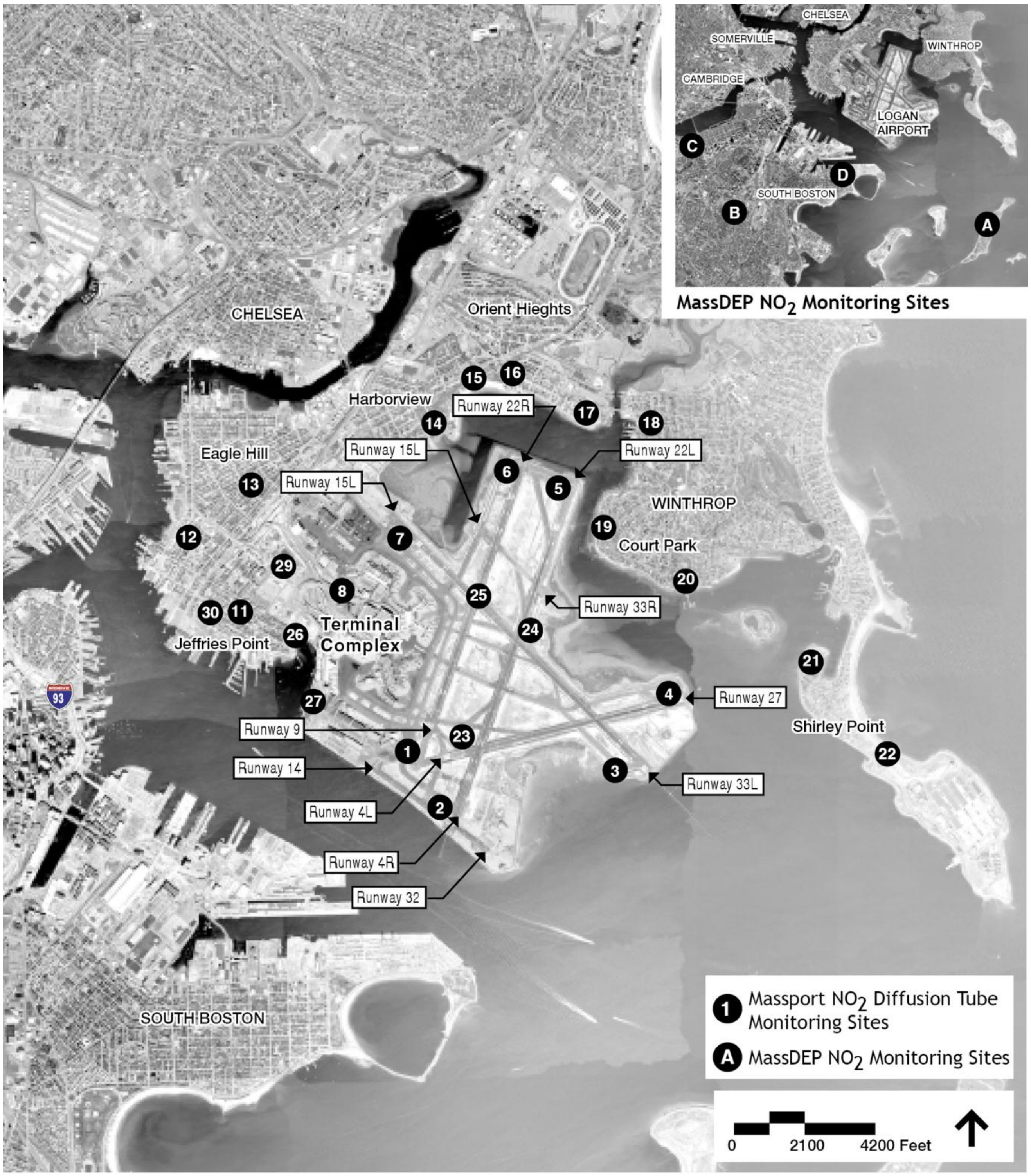
- Annual NO_2 concentrations at all Massport and MassDEP monitoring locations were below the annual NO_2 NAAQS of 100 micrograms per cubic meter ($\mu g/m^3$) in 2011.
- The Massport-collected data compare relatively closely with data collected by the MassDEP. The average of all Massport monitoring sites was 29.8 $\mu g/m^3$ compared to 32.3 $\mu g/m^3$ for the four MassDEP Boston-area monitors.
- The highest NO_2 concentrations in 2011 from the Massport program occurred in areas characterized by high levels of motor vehicle traffic (i.e., Main Terminal Area [Site 8] and Maverick Square [Site 12]).

15 Spatial and temporal changes in measured NO_2 levels from year to year are typical and should not be used to define short-term results. Rather, NO_2 levels are better assessed by looking at the trends over several years.

Table 7-9 Massport and MassDEP Annual NO_2 Concentration Monitoring Results ($\mu g/m^3$)														
	Site	Year												
Monitoring Site	No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Massport Monitoring Sites														
Runway 9	**1**	61.0	58.2	41.6	45.8	33.9	30.1	35.0	31.9	17.3	31.3	32.2	32.3	38.7
Runway 4R	**2**	55.6	44.6	41.4	36.9	32.5	30.9	30.7	29.0	17.2	20.2	19.2	21.9	25.7
Runway 33L	**3**	47.7	42.6	39.4	33.3	30.8	25.4	24.5	26.3	24.2	21.6	16.9	25.0	29.8
Runway 27	**4**	42.9	37.8	35.8	30.3	25.5	24.1	22.7	22.3	16.9	18.3	17.6	19.4	23.3
Runaway 22L	**5**	47.5	39.8	38.2	33.8	27.8	23.7	22.1	24.9	17.1	21.3	20.1	21.9	29.0
Runway 22R	**6**	60.6	59.2	51.6	45.0	32.3	29.7	32.9	25.1	24.8	29.7	27.8	33.1	30.6
Runway 15R	**7**	47.0	43.4	44.3	42.6	40.8	28.7	27.7	28.7	20.5	24.2	23.9	26.7	29.7
Main Terminal Area	**8**	70.8	87.0	80.7	69.3	44.3	44.7	46.2	43.5	29.5	41.7	37.7	43.9	49.0
Webster St., Jeffries Point	**11**	52.4	45.5	43.4	39.1	32.5	28.3	31.3	31.3	22.7	25.2	23.9	27.0	30.1
Maverick Square, E. Boston	**12**	81.2	72.2	68.5	61.3	47.9	46.5	41.4	45.6	36.0	41.3	38.2	42.5	43.5
Bremen St., E. Boston	**13**	59.1	52.6	52.0	46.2	39.1	35.7	37.6	37.1	27.8	30.1	28.6	31.9	35.3
Shore St. E. Boston	**14**	45.7	38.5	38.8	35.0	27.2	24.0	24.9	22.4	18.1	19.7	18.3	20.7	26.7
Orient Heights Yacht Club	**15**	45.1	46.9	47.7	43.1	29.4	25.2	25.5	25.1	19.6	21.1	18.3	22.5	26.7
Bayswater St. E. Boston	**16**	45.2	45.5	48.3	41.2	28.4	22.8	30.4	23.1	18.4	20.2	17.8	21.0	25.9
Annavoy St. E. Boston	**17**	40.8	39.2	44.4	33.7	24.7	21.4	23.3	21.0	18.2	19.6	17.3	20.9	25.8
Pleasant St. Winthrop	**18**	42.0	39.3	37.8	32.3	27.9	22.6	23.4	21.4	17.8	20.2	17.7	20.1	24.4
Court Road, Winthrop	**19**	40.0	36.1	33.8	27.4	24.0	19.2	22.3	21.0	16.3	17.1	16.7	18.4	22.7
Cottage Park Yacht Club	**20**	37.1	50.9	45.9	36.7	22.5	19.1	27.7	21.4	16.3	18.4	17.8	17.8	22.5
Winthrop, Point Shirley	**21**	33.1	37.7	38.6	24.4	22.7	17.4	17.2	20.2	15.7	15.6	14.9	17.5	21.6
Deer Island	**22**	36.3	31.9	33.8	33.1	21.3	17.8	16.9	17.8	13.0	17.0	14.7	16.7	20.7
Runway 4R–9	**23**	42.2	66.0	42.3	33.4	28.6	24.1	27.1	26.3	19.2	22.4	21.2	21.6	26.5
Runway 33L–4R	**24**	44.3	41.7	41.8	33.5	28.1	24.3	22.3	25.7	20.9	25.2	20.0	23.6	26.2
Runway 22R–33L	**25**	62.4	50.3	49.4	42.2	33.8	31.7	29.4	34.5	22.9	25.1	25.3	29.5	34.9
Jeffries Point Park/Marginal St.	**26**	68.6	49.8	45.0	42.0	35.2	30.5	32.5	31.7	24.4	27.0	25.6	28.6	33.1
Harborwalk	**27**	54.3	48.5	47.4	43.5	35.6	35.5	29.3	34.2	24.2	26.1	24.5	28.3	34.9
Logan Athletic Fields	**29**	NA	69.1	67.6	54.9	41.9	40.2	37.5	37.0	24.6	28.8	26.8	30.8	37.8
Brophy Park, Jeffries Point	**30**	NA	48.0	45.2	41.0	36.5	31.2	32.9	31.3	24.8	26.6	24.6	26.8	30.8
Average of all Monitoring Sites		**50.5**	**50.5**	**47.5**	**40.0**	**31.7**	**28.0**	**28.7**	**28.7**	**21.0**	**24.3**	**22.5**	**25.6**	**29.8**
MassDEP Monitoring Sites[1]														
Long Island Rd (MassDEP)	**A**	20.7	24.4	22.6	22.6	16.9	12.6	13.2	13.2	13.2	13.2	11.3	13.6	13.4
Harrison Ave. (MassDEP)	**B**	NA	45.1	47.0	45.1	43.2	37.4	35.8	35.8	37.7	37.7	33.9	32.1	33.1
Kenmore Square (MassDEP)	**C**	56.4	54.5	56.8	47.0	47.0	51.7	43.3	43.3	39.6	41.5	37.7	36.0	38.4
East First Street (MassDEP)	**D**	39.5	37.6	43.2	39.5	39.5	36.8	33.9	39.6	37.7	30.2	28.3	24.0	25.4

Source: Massport
Notes: The NAAQS is 100 $\mu g/m^3$. The site identification labels in Figure 7-10 are keyed to the site labels in this table.
$\mu g/m^3$ micrograms/cubic meter.
NA Not available.
1 NO_2 monitoring sites operated by the MassDEP.

Figure 7-10 Massport NO_2 Monitoring Sites



Greenhouse Gas (GHG) Assessment

There is now widespread consensus that GHGs contribute to climate change (also known as global warming), although there is still some uncertainty regarding the global magnitude of this impact and the associated short- and long-term remedies. In April 2009, the EPA issued a proposed finding that GHGs contribute to air pollution that may endanger public health or welfare. This action has laid the initial groundwork for the regulation of GHG emissions nation-wide under the CAA, although currently there are no specific U.S. laws or regulations that call for the regulation of GHGs associated with airports. The climate change bills proposed in Congress have thus far focused on entities that emit significant amounts of GHGs and those that have direct control over these emissions (i.e., power plants, fuel producers, cement manufacturing, etc.). Current estimates of aviation-related GHG emission contributions to man-made totals range from 2 to 4 percent world-wide and approximately 3 percent nationwide.[16,17]

In May 2010, the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) revised the *Massachusetts Environmental Policy Act (MEPA) Greenhouse Gas Emissions Policy and Protocol*.[18] Under the revised policy, certain projects undergoing review under MEPA (not specifically this *2011 ESPR*) are required to:

- Quantify the GHG emissions generated by proposed projects
- Identify measures to avoid, minimize, or mitigate such emissions[19]

Although Massport-related emissions represent only 12 percent of total GHG emissions at the Airport, Massport has voluntarily set goals and developed plans to reduce and offset GHGs associated with Logan Airport to further minimize the "carbon footprint" of Massport facilities. These initiatives include (but are not limited to) the implementation of carbon-based energy saving programs, purchase of renewable energy credits, and other capital investments that will conserve fossil fuel and energy in both the short- and long-term. In conjunction with the Massachusetts Global Warming Solutions Act, Massport has participated in working groups primarily focused on reducing transportation and building energy demand by increasing energy efficiency, providing incentives to increase passengers per vehicle, and expanding upon opportunities for alternative (low-emitting) fuel use within the transportation sector.

Since October 2009, Massport has also been part of the Commonwealth's Climate Adaptation Advisory Committee. Within this committee, the Key Infrastructure team looked at potential issues at airports related to service disruption, access issues, flooding, and other storm-related impacts. The final Climate Change Adaptation Report was issued in September 2011.

With respect to the GHG emissions inventory conducted for 2011, the following information is noteworthy:

- Even though the *2011 ESPR* is not subject to the MEPA GHG policy since it does not propose any discrete projects, Massport has voluntarily prepared an inventory of GHG emissions directly and indirectly associated with the Airport starting with the *2007 EDR*. The results from the 2007 and 2008 GHG inventories are not presented in this chapter because these inventories were calculated before the ACRP-based methodology was available. GHG inventories from 2009 through 2011 are based on the ACRP methodology.

16 Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, New York City, NY. 2007.
17 U.S. Governmental Accountability Office (GAO), Aviation and the Environment, NextGen and Research and Development Are Keys to Reducing Emissions and Their Impact on Health and Climate, May 6, 2008.
18 Revised *MEPA Greenhouse Gas Emissions Policy and Protocol*, Massachusetts Executive Office of Energy and Environmental Affairs, effective May 5, 2010.
19 These GHG are comprised primarily of carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), and three groups of fluorinated gases (i.e., sulfur hexafluoride [SF_6], hydrofluorocarbons [HFCs], and perfluorocarbons [PFCs]). GHG emission sources associated with airports are generally limited to CO_2, CH_4, and N_2O.

- For this assessment, the 2011 and 2030 GHG emissions inventories include aircraft operations within the ground-based taxi-idle/delay mode, up to the top of the 3,000–foot LTO cycle). GHG emissions associated with GSE/APU, motor vehicles, a variety of stationary sources, and electricity usage were also included.
- Massport has direct ownership or control over a small percentage of these GHG emission sources (i.e., limited to Massport fleet vehicles, stationary sources, and electrical consumption within Massport buildings). The vast majority of the emission sources are owned or controlled by the airlines, other airport tenants (such as rental car companies), and the general public (such as passenger motor vehicles).
- Massport also prepares two other GHG emissions inventories for Logan Airport:
    - A 2011 GHG emissions inventory for the MassDEP GHG Emissions Reporting Program for those sources meeting the criteria for Category 1 and Scope 1 (i.e., only those sources under the direct ownership and control of Massport)[20]
    - EPA Greenhouse Gas Summary Report[21]

This analysis followed the EOEEA guidelines and uses widely-accepted emission factors that are considered appropriate for airports, including International Organization for Standardization (ISO) New England electricity-based values. The analysis of GHG emissions below presented is also consistent with the ACRP guidance with the exception that only a portion of aircraft cruise mode emissions (below 3,000-foot LTO cycle) were included.

For the *2011 ESPR*, GHG emissions are categorized by ownership and control including: (1) emissions related to Massport activities were assigned to the Massport category; (2) emissions related to airport tenants were assigned to the tenant category; and (3) emissions related to the public, such as private automobiles, were assigned to the public category. These three categories (identified in Table 7-10) are also characterized by the degree of control that the airport operator (Massport) has over GHG emissions.

- Category 1 – GHG emissions from sources that are owned and controlled by the reporting entity (e.g., Massport). Category 1 typically represents sources which are owned by the entity - or sources which are not owned by the entity, but over which the entity can exert control. At Logan Airport, these sources include airport-owned and controlled stationary sources (e.g., boilers, generators, etc.), fleet vehicles, and purchased electricity. On-airport ground transportation and off-airport employee vehicle trips are included as Category 1 emissions as they are partly controlled by the airport.
- Category 2 – This category comprises sources owned and controlled by airlines and airport tenants, and include aircraft (on-ground, within the LTO up to 3,000 feet, GSE/APU, electrical consumption, and employee vehicles.

Category 3 – This category generally comprises GHG emissions associated with passenger ground access vehicles. These include public automobiles, taxis, limousines, buses, shuttle vans, etc. operating on the off-airport roadway network.

Consistent with the ACRP guidance, once the ownership categories are determined, the operational boundaries are also set, reflecting the Scope of the emission source (refer to Table 7-10) and include:

20 Boston Logan International Airport, Massachusetts Department of Environmental Protection GHG Emissions Reporting Program, April 17, 2012.
21 U.S. EPA Greenhouse Gas Summary Report for Boston Logan International Airport, June 14, 2012.

- Scope 1 / Direct – GHG emissions from sources that are owned and controlled by the reporting entity (e.g., Massport) such as stationary sources and airport-owned fleet motor vehicles.
- Scope 2 / Indirect – GHG emissions associated with the generation of electricity consumed, but generated off-site at public utilities.
- Scope 3 / Indirect and Optional – GHG emissions that are associated with the activities of the reporting entity (e.g., Massport), but are associated with sources that are owned and controlled by others. These include aircraft-related emissions, emissions from airport tenant's activities, as well as ground transportation to and from the Airport.

Table 7-10 Ownership Categorization and Emissions Category/Scope

Owning/Controlling Entity Categories	Source	Category/Scope
Massport Owned and/or Controlled	Massport Fleet Vehicle	Category 1/Scope 1
	On-airport Ground Transportation	Category 1/Scope 1
	Off-airport Employee Vehicle Trips	Category 1/Scope 3
	On-airport Parking Lots	Category 1/Scope 1
	Stationary Sources (includes generators, boilers, etc.)	Category 1/Scope 1
	Fire Training	Category 1/Scope 1
	Electrical Consumption	Category 1/Scope 2
Tenant Owned and/or Controlled (includes airlines, government, concessionaires, aircraft operators, fixed-based operators, etc.)	Aircraft (on-ground, within the LTO up to 3,000 feet)	Category 2/Scope 3
	Auxiliary Power Units	Category 2/Scope 3
	Ground Support Equipment	Category 2/Scope 3
	Off-airport Employee Vehicle Trips	Category 2/Scope 3
	Electrical Consumption	Category 2/Scope 2
Public Owned and Controlled	Off-airport Vehicle Trips (Includes private automobiles, taxis, limousines, buses, shuttle vans, etc., operating on the off-airport roadway network)	Category 3/Scope 3

Source: Massport
Note: Follows Airport Cooperative Research Program (ACRP) guidance.
LTO Landing and Takeoff

The GHG emissions inventory included in this *2011 ESPR* is consistent with the data provided in MassDEP and EPA GHG inventories. However, the *2011 ESPR* GHG emissions inventory is more comprehensive as it covers all three scopes of GHG emissions at Logan Airport including those from tenants and the public, which is consistent with ACRP guidance.[22] Additionally, the EPA GHG Reporting Program covers only stationary sources (Category 1 and Scope 1).

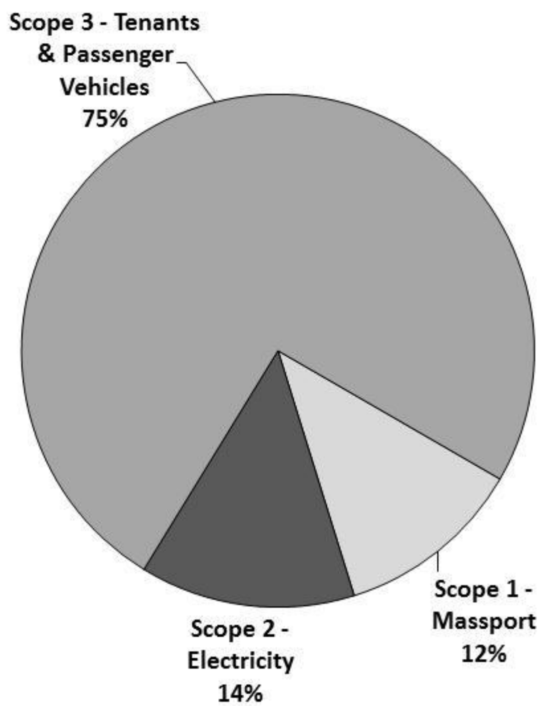
Table 7-11 presents the 2011 GHG emissions inventory reported in CO_2 equivalent values.[23] Massport-related emissions represent only 12 percent of total GHG emissions at the Airport. Tenant-based emissions represent 68 percent, electrical consumption from Massport, common areas, and tenants represents 14 percent, and passenger vehicle emissions represent 6 percent of total GHG emissions. Aircraft represents the largest source of emissions followed by motor vehicles and electricity generation. When segregated by Scopes, as shown in Figure 7-11, tenants and passenger vehicles (Scope 3) represent the largest source of GHG emissions at 74 percent, followed by electrical consumption (Scope 2) at 14 percent, and Massport (Scope 1) at 12 percent.

22 However, aircraft cruise mode emissions above the 3,000-foot LTO cycle were not included.
23 CO_2 equivalent values are based upon the Global Warming Potential values of 1 for CO_2, 25 for CH_4, and 298 for N_2O (based on a 100 year period) as presented in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, *2007.*

Table 7-11 Estimated Greenhouse Gas Emissions Inventory (in MMT of CO_2eq) at Logan Airport, 2011[1]						
Source	**Category**	**Scope**	**CO_2**	**N_2O**	**CH_4**	**Totals**
Massport Emissions						
Ground Support Vehicles[2]	1	1	0.01	<0.01	<0.01	0.01
Massport Shuttle Bus	1	1	<0.01	<0.01	<0.01	<0.01
Massport Express Bus	1	1	<0.01	<0.01	<0.01	<0.01
On-Airport Roadways[3]	1	1	0.02	<0.01	<0.01	0.02
Off-Airport Roadways (Employees)[4]	1	3	<0.01	<0.01	<0.01	<0.01
Parking Lots	1	1	<0.01	<0.01	<0.01	<0.01
Stationary Sources[5]	1	1	0.03	<0.01	<0.01	0.03
Total Massport Emissions (12.0%)			**0.07**	**<0.01**	**<0.01**	**0.07**
Tenant Emissions						
Aircraft – Ground[6]	2	3	0.19	<0.01	<0.01	0.19
Aircraft – Ground to 3000 feet[7]	2	3	0.17	<0.01	<0.01	0.17
Aircraft Engine Startup	2	3	<0.01	<0.01	<0.01	<0.01
Ground Support Equipment	2	3	0.01	<0.01	<0.01	0.01
Auxiliary Power Units	2	3	0.01	<0.01	<0.01	0.01
Off-Airport Roadways (Employees)[4]	2	3	0.02	<0.01	<0.01	0.02
Total Tenant Emissions (67.8%)			**0.39**	**<0.01**	**<0.01**	**0.40**
Purchased Electricity Emissions[8]						
Massport	1	2	0.01	<0.01	<0.01	0.01
Tenant	2	2	0.03	<0.01	<0.01	0.03
Common Area	3	2	0.05	<0.01	<0.01	0.05
Total Purchased Electricity Emissions (14.0%)			**0.08**	**<0.01**	**<0.01**	**0.08**
Passenger Vehicle Emissions						
Off-Airport Roadways[4]	3	3	0.04	<0.01	<0.01	0.04
Total Passenger Vehicle Emissions (6.2%)			**0.04**	**<0.01**	**<0.01**	**0.04**
Total Logan Airport Emissions[9]			**0.58**	**<0.01**	**<0.01**	**0.58**
Percent of Statewide Totals[10]			<1.0%	<1.0%	<1.0%	<1.0%

Source: Massport
1 MMT - million metric tons of CO_2 equivalents (1 MMT = 1.1M Short Tons). CO_2 equivalents (CO_2eq) are bases for reporting the three primary GHGs (e.g., CO_2, N_2O, and CH_4) in common units. Quantities are reported as "rounded" and truncated values for ease of addition.
2 Ground Support Vehicles include the Logan Airport fleet. Emissions were calculated based on fuel usage.
3 On-airport roadways based on on-site vehicle miles traveled (VMT) and includes all vehicles.
4 Off-site roadways based on off-site Airport-related VMT and an average round trip distance of 60.5 miles (2010 Passenger Ground Access Survey).
5 Other sources include Central Heating and Cooling Plant, emergency generators, snow melters, and live fire training facility.
6 Aircraft – Ground emissions include taxi-in, taxi-out and ground-based delay emissions.
7 Aircraft – Ground to 3,000 feet include takeoff, climbout, and approach emissions up to a height of 3,000 feet (as specified by the ACRP guidance).
8 Emissions from electrical consumption occurs off-airport at power generating plants.
9 Total Emissions = Airport + Tenant + Public.
10 Percentage based on relative amount of total emissions to statewide total from World Resources Institute (cait.wri.org).

Figure 7-11 Sources of GHG Emissions, 2011



Note: Scope 1 emissions are from sources that are owned or controlled by Massport, Scope 2 emissions are from electrical consumption, which are generated off-Airport at power generating plants, and Scope 3 emissions are from airport tenants and ground transportation to and from the Airport.

In summary, total 2011 GHG emissions were slightly higher (5 percent) than 2010 levels due partly to a 5 percent increase in aircraft operations and passenger automobile traffic. Massport plans to annually update and report on the GHG Emissions Inventory for Logan Airport through the EDR/ESPR.

As with the 2011 analysis, the 2030 GHG emission inventory is also based on guidance developed by TRB's ACRP to compute GHG emissions.[24] Thus, the 2030 inventory also assigns emissions based on ownership or control (e.g., Massport, airlines and other airport tenants, and the general public). The vast majority of emission sources at Logan Airport are controlled by the airlines, airport tenants, (through emissions from aircraft and GSE) and the general public (through emissions from motor vehicles). The 2030 Massport-related emissions are expected to represent only 11 percent of total GHG emissions at the Airport. Tenant-based emissions represent 72 percent, electrical consumption from Massport, common areas, and tenants represents 13 percent, and passenger vehicle emissions represent 4 percent of total GHG emissions. Table 7-12 presents the predicted 2030 GHG emissions inventory reported in CO_2 equivalent values.

This expected increase in operations is partially offset by greater motor vehicle and GSE fuel efficiencies (associated with advancements in equipment technology on a nation-wide basis and regulatory requirements). Additionally, actions are underway within the U.S. and by other nations to reduce aviation's contribution through such measures as new aircraft technologies to reduce emissions and improve fuel efficiency, renewable alternative fuels with lower carbon footprints, more efficient air traffic management, market-based measures and environmental regulations including an aircraft CO_2 standard.

24 Transportation Research Board, Airport Cooperative Research Program, ACRP Report 11, Project 02-06, *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*. See http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf for the full report.

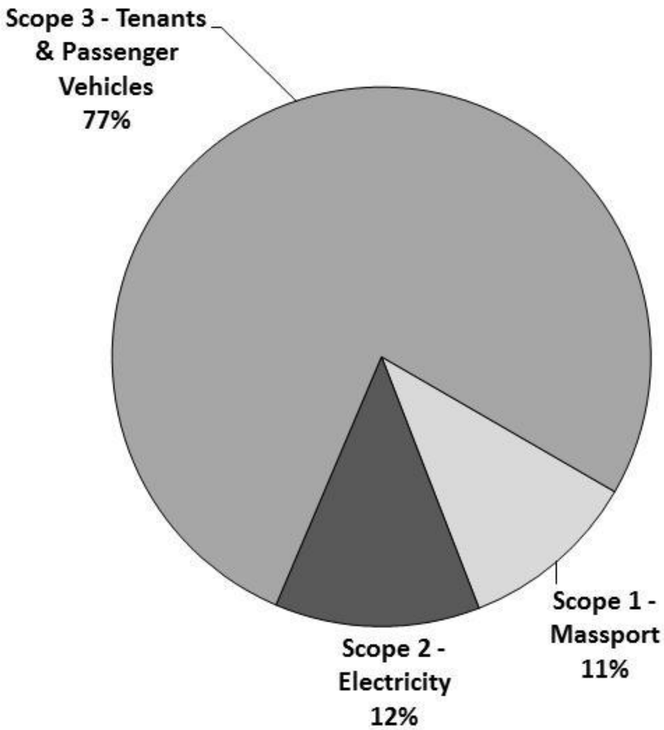
As shown in Figure 7-12, in 2030 tenants and passenger vehicles (Scope 3) represent the largest source of GHG emissions at 76 percent, followed by electrical consumption (Scope 2) at 13 percent, and Massport (Scope 1) at 11 percent.

Table 7-12 Estimated Greenhouse Gas Emissions Inventory (in MMT of CO_2eq) at Logan Airport, 2030[1]

Source	Category	Scope	CO_2	N_2O	CH_4	Totals
Massport Emissions						
Ground Support Vehicles[2]	1	1	0.01	<0.01	<0.01	0.01
Massport Shuttle Bus	1	1	<0.01	<0.01	<0.01	<0.01
Massport Express Bus	1	1	<0.01	<0.01	<0.01	<0.01
On-Airport Roadways[3]	1	1	0.02	<0.01	<0.01	0.02
Off-Airport Roadways (Employees)[4]	1	3	<0.01	<0.01	<0.01	<0.01
Parking Lots	1	1	<0.01	<0.01	<0.01	<0.01
Stationary Sources[5]	1	1	0.03	<0.01	<0.01	0.03
Total Massport Emissions (10.5%)			**0.07**	**<0.01**	**<0.01**	**0.07**
Tenant Emissions						
Aircraft – Ground[6]	2	3	0.20	<0.01	<0.01	0.20
Aircraft - Ground to 3000 feet[7]	2	3	0.23	<0.01	<0.01	0.23
Aircraft Engine Startup	2	3	<0.01	<0.01	<0.01	<0.01
Ground Support Equipment	2	3	0.01	<0.01	<0.01	0.01
Auxiliary Power Units	2	3	0.01	<0.01	<0.01	0.01
Off-Airport Roadways (Employees)[4]	2	3	0.01	<0.01	<0.01	0.01
Total Tenant Emissions (72.5%)			**0.47**	**<0.01**	**<0.01**	**0.47**
Purchased Electricity[8] Emissions						
Massport	1	2	0.01	<0.01	<0.01	0.01
Tenant	2	2	0.03	<0.01	<0.01	0.03
Common Area	3	2	0.05	<0.01	<0.01	0.05
Total Purchased Electricity Emissions (13.0%)			**0.08**	**<0.01**	**<0.01**	**0.08**
Passenger Vehicle Emissions						
Off-Airport Roadways[4]	3	3	0.03	<0.01	<0.01	0.03
Total Passenger Vehicle Emissions (4.0%)			**0.03**	**<0.01**	**<0.01**	**0.03**
Total Logan Airport Emissions			**0.65**	**<0.01**	**<0.01**	**0.65**

Source: Massport
1 MMT - million metric tons of CO_2 equivalents (1 MMT = 1.1M Short Tons). CO_2 equivalents (CO_2eq) are bases for reporting the three primary GHGs (e.g., CO_2, N_2O, and CH_4) in common units. Quantities are reported as “rounded” and truncated values for ease of addition.
2 Ground Support Vehicles include the Logan Airport fleet. Emissions were calculated based on fuel usage.
3 On-airport roadways based on on-site vehicle miles traveled (VMT) and includes all vehicles.
4 Off-site roadways based on off-site Airport-related VMT and an average round trip distance of 60.5 miles (2010 Passenger Ground Access Survey).
5 Other sources include Central Heating and Cooling Plant, emergency generators, snow melters, and live fire training facility.
6 Aircraft – Ground emissions include taxi-in, taxi-out and ground-based delay emissions.
7 Aircraft – Ground to 3,000 feet include takeoff, climbout, and approach emissions up to a height of 3,000 feet (as specified by the ACRP guidance).
8 Emissions from electrical consumption occurs off-airport at power generating plants.
9 Total Emissions = Airport + Tenant + Public.

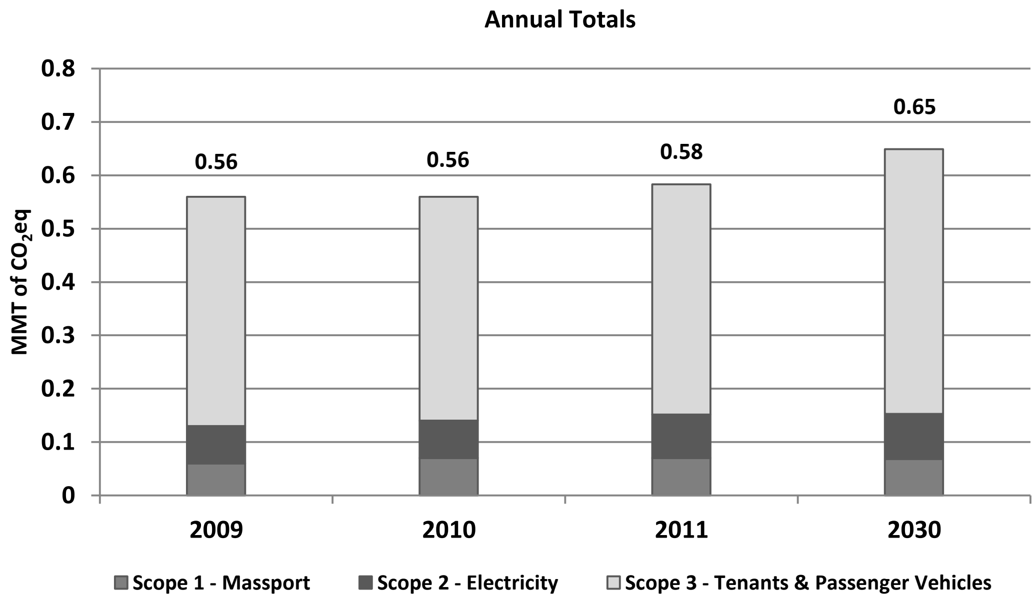
Figure 7-12 Sources of GHG Emissions, 2030



Note: Scope 1 emissions are from sources that are owned or controlled by Massport, Scope 2 emissions are from electrical consumption, which are generated off-Airport at power generating plants, and Scope 3 emissions are from airport tenants and ground transportation to and from the airport.

As shown in Figure 7-13, total GHG emissions in 2030 are estimated to be 11 percent higher than 2011 levels because of the forecasted 29 percent increase in aircraft operations and 38 percent increase in traffic, which result in increased fuel usage and VMT. The increase in total GHG emissions is due to the increase in Scope 3 emissions (tenants and passenger vehicles). Scope 1 (Massport) is predicted to remain constant through 2030 due to tighter emission controls for motor vehicles. Scope 2 (electricity) is predicted to increase slightly by 3 percent due to the Terminal B project (increased terminal area for the Terminal C-E connector).

Figure 7-13 Emissions of GHG at Logan Airport



Air Quality Emissions Reduction

As part of implementing the ongoing Logan Airport Air Quality Management Plan, Massport has established a number of goals and objectives to address air emissions from Airport operations, including the minimization of Airport-related emissions through the AQI and the reduction of GSE and Massport fleet emissions with AFV. This section presents an update on the AQI and the AFV Program at Logan Airport.

Air Quality Initiative

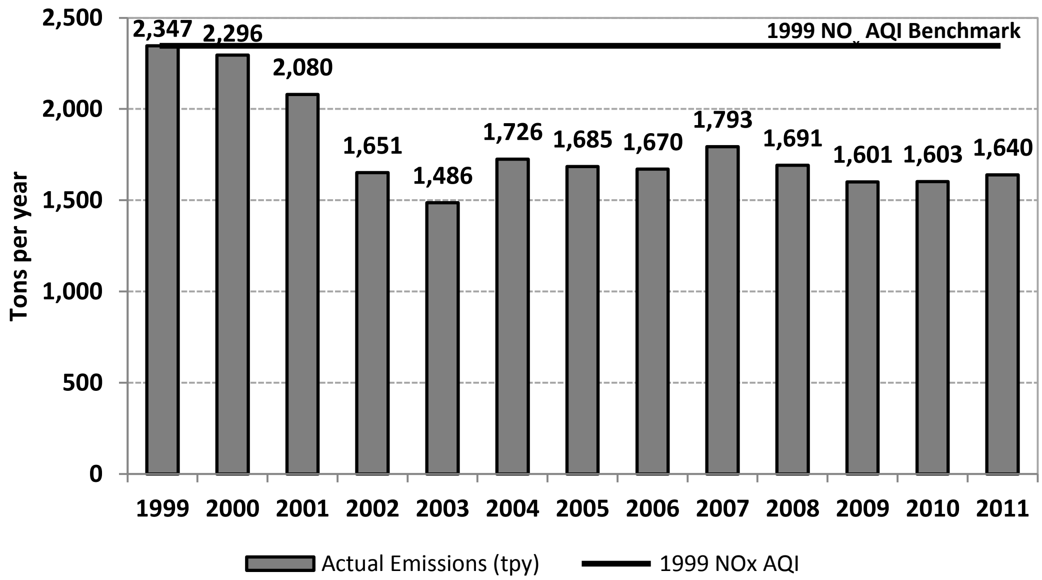
Massport developed the AQI as a 15-year voluntary program with the overall goal to maintain NO_x emissions associated with Logan Airport at, or below, 1999 levels. The AQI has four primary commitments, shown below, along with Massport's progress in meeting the AQI commitments.

- **Expand on the initiatives already in-place at Logan Airport.** See Table 7-13 for the initiatives in place at the time the AQI was developed.
- **As necessary to maintain NO_x emissions at or below 1999 levels, retire emissions credits, giving priority to mobile sources.** Massport updates the Logan Airport inventory of NO_x emissions annually to reflect new information and changing conditions associated with the Airport's operations. Table 7-13 presents the updated emissions inventory and shows that, in 2011, it was not necessary to purchase and retire mobile source emission credits to maintain NO_x emissions at or below 1999 levels.
- **Report the status and progress of the AQI in the ESPR or EDR.** Massport reports on the status of the AQI in the Logan Airport EDRs and ESPRs and has done so since 2001 (Table 7-13).
- **Continue to work at international and national levels to decrease air emissions from aviation sources.** Massport maintains memberships and active participation in a number of organizations involved in addressing aviation-related environmental issues, including air quality. These include serving on technical review committees of the Airports Council International (ACI) and American Association of Airport Executives (AAAE).

As shown in Table 7-13, NO_x emissions at Logan Airport in 2011 were 707 tpy lower than the 1999 AQI benchmark. This represents a 30 percent decrease since 1999. Between 1999 and 2011, the greatest reductions of NO_x emissions were associated with aircraft, GSE, and on-Airport motor vehicles with reductions of 23 percent, 61 percent, and 69 percent reductions, respectively.

Figure 7-14 compares the 1999 benchmark threshold level of 2,347 tpy of NO_X emissions to estimated NO_x emissions for 2001 through 2011. Cumulatively, as of December 31, 2011, NO_x emissions at Logan Airport were approximately 7,267 tons below the benchmark set by the AQI. As shown in Table 7-13, based upon current projections, Massport expects that because the emission inventory is projected to be well below the 1999 threshold of 2,347 tpy through 2015, no credits will need to be purchased through the AQI period ending in 2015. Although NO_x emissions are predicted to increase from 2011 to 2030, NO_x emissions in 2030 will still remain well below (15 percent) this 1999 benchmark.

Figure 7-14 NO_X Emissions Compared to AQI[1]



As part of the reporting process, the AQI calls for an itemization of NO_x emissions generated by activities at Logan Airport according to the individual airline operator. Table 7-13 shows the estimated amounts of NO_x air emissions generated by each airline in units of tpy and Table 7-14 shows NO^x in tons per LTO.

Based on Table 7-14, international carriers are the higher NO_x emitters per LTO because their longer stage lengths require aircraft equipped with larger and/or additional engines and heaver takeoff weight (more fuel). Overall, international carriers emit 15.0 percent of the total aircraft NO_x emissions at Logan Airport. Other findings include:

- Carriers with the greatest number of flights tended to generate the highest percentage of total NO_x emissions;
- Combined, the four largest air carriers (by LTO), emitted 52.6 percent of the total aircraft NO_x emissions;
- Commercial airlines (excludes cargo and GA) accounted for 93.1 percent of total aircraft NO_x emissions;
- Cargo aircraft operators accounted for 5.7 percent of total aircraft NO_x emissions; and
- GA aircraft accounted for 1.2 percent of total aircraft NO_x emissions.

Table 7-13 AQI Inventory Tracking of NO_x Emissions (in tpy)[1] for Logan Airport

	Actual Conditions[2]													Forecasted Conditions[3]			
	1999[4]	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Annual Emissions	2,347[5]	2,315	2,097	1,665	1,499	1,745	1,703	1,688	1,806	1,701	1,609	1,608	1,647	1,676	1,697	1,719	1,740
Above (Below) 1999 Levels Before Reductions	NA	(32)	(250)	(682)	(848)	(602)	(644)	(659)	(541)	(646)	(738)	(739)	(700)	(671)	(650)	(628)	(607)
Potential Reductions/ Increases[6]																	
Alternative Fuel Vehicles/Shuttle Bus	(11)	(4)	(4)	(3)	(3)	(10)	(9)	(8)	(7)	(5)	(4)	(2)	(1)	(2)	(1)	0	1
Alternate Fuel Ground Service Equipment[7]	(14)	(14)	(13)	(11)	(10)	(9)	(9)	(10)	(6)	(5)	(4)	(3)	(6)	(10)	(11)	(11)	(11)
Total Potential Reductions	(25)	(19)	(17)	(14)	(13)	(19)	(18)	(18)	(13)	(10)	(8)	(5)	(7)	(13)	(12)	(11)	(10)
Above (Below) 1999 Levels After Reduction	(25)	(51)	(267)	(696)	(861)	(621)	(662)	(677)	(554)	(656)	(746)	(744)	(707)	(684)	(662)	(639)	(617)
Credit Trading[8]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Net Total w/Reductions and Credits	2,322	2,296	2,080	1,651	1,486	1,726	1,685	1,670	1,793	1,691	1,601	1,603	1,640	1,663	1,685	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 1999 and 2004 analysis years were updated in the 2004 ESPR using EDMS v4.21. The 2000 and 2001 analyses were completed using EDMS v4.03 and MOBILE6. The 2002 to 2003 analyses were completed using EDMS v4.11 and MOBILE6. The 2004 analysis was completed using EDMS v4.21 and MOBILE6.2.01. The 2005 analysis was completed using EDMS v4.5 and MOBILE6.2.03. The 2006 analysis was completed using EDMS v5.0.1 and MOBILE6.2.03. The 2007 analysis was completed using EDMS v5.0.2 and MOBILE6.2.03. The 2008 analysis was completed using EDMS v5.1 and MOBILE6.2.03. The 2009 analysis was completed using EDMS v5.1.2 and MOBILE6.2.03. The 2010 and 2011 analysis was completed using EDMS v5.1.3 and MOBILE6.2.03.

3 The years 2012 through 2015 were interpolated using the 2030 analysis provided in Table 7-8 of the *2011 ESPR*. These emission estimates will be updated in the next ESPR based on up-to-date operational forecasts for the Airport.

4 The year 1999 is the "baseline" year for the AQI. Thus, 2,347 tons/year is considered the AQI threshold for NOx emissions.

5 The original value of 2,235 tons/year in the AQI was based on the 2001 EDR results and EDMS v4.03. This value was updated in the 2004 ESPR using EDMS v4.21.

6 Other initiatives that Massport and Logan Airport tenants may use for possible emission reductions include: Consolidated Car Rental Facility (ConRAC), Central Heating and Cooling Plant boilers, 400-Hz power at gates, and low NOx fuels in Logan Express buses.

7 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.

8 Since the AQI threshold is not exceeded in 2011, nor are the emissions expected to exceed the threshold in the near future, no credits will need to be purchased in the immediate term.

Table 7-14 Contribution of NO_X Air Emissions by Airline, 2011 (Estimated)

Air Carrier, by Airline	Total Emissions (tons/year) LTOs	Total Emissions (tons/year) NO_x	Normalized Emissions (tons/LTO) NO_x per LTO	Air Carrier, by Airline	Total Emissions (tons/year) LTOs	Total Emissions (tons/year) NO_x	Normalized Emissions (tons/LTO) NO_x per LTO
ACM Aviation	20	0.04	0.002	Iberia	222	7.53	0.034
Aer Lingus	565	16.95	0.030	Icelandair	464	9.88	0.021
Aeromexico	16	0.17	0.011	Island Airlines	825	0.02	<0.001
Air Canada[1]	5,483	15.54	0.003	Jet Charter	15	0.02	0.002
Air France	506	22.62	0.045	JetBlue Airways	31,964	264.65	0.008
Air Transport	33	0.63	0.019	Key Air	14	0.03	0.002
Airnet	369	0.02	<0.001	Lufthansa	866	35.60	0.041
Airtran Airways	6,435	50.75	0.008	Mesa	130	0.44	0.003
Alaska Airlines	878	11.04	0.013	Miami Air	88	1.03	0.012
Alitalia	302	8.24	0.027	Other Air Carrier	40	0.35	0.009
Allegiant Air	65	0.56	0.009	Other International	26	1.50	0.058
American Airlines[2]	14,983	158.99	0.011	Porter Airlines	1,571	1.48	0.001
Astraeus	50	0.49	0.010	Republic	2,198	7.62	0.003
Atlantic Southeast	2,544	8.66	0.003	Royal Air Freight	5	<0.01	<0.001
Bombardier Business Jet	431	0.56	0.001	SATA International	200	3.80	0.019
British Airways	1,081	65.58	0.061	Shuttle America	1,974	6.64	0.003
Capital Cargo	113	1.00	0.009	Southwest Airlines	8,706	84.87	0.010
Chautaugua	1,474	4.47	0.003	Spirit	1,527	16.08	0.011
Colgan	4,750	2.99	0.001	Sun Country	256	2.91	0.011
Continental[3]	5,536	56.64	0.010	Swiss International	362	12.46	0.034
Delta Air Lines[4]	21,308	205.58	0.010	TACV-Cabo Verde	118	2.09	0.018
DHL	246	4.67	0.019	Trans States	303	0.92	0.003
Empresa Peru	30	0.34	0.011	Twin Cities Air Service	618	0.02	<0.001
FedEx	1,496	62.04	0.041	United Air Lines	7,676	112.42	0.015
Frontier	565	5.05	0.009	UPS Airlines	670	17.27	0.026
GA	13,391	17.36	0.001	US Airways[5]	22,149	161.70	0.007
Horizon	75	0.26	0.003	USA Jet	16	0.14	0.009
Hyannis Air Service	16,873	0.72	<0.001	Virgin	360	15.97	0.044
				Virgin America	1,513	15.01	0.010
				Total	**184,494**	**1,504.43**	**0.008**

Source: Massport

Notes: Other International may include: Provincial Air, Saudi Arabian Airlines, etc.
The "Other" Categories may include airlines with less than 10 operations.
Normalized emissions are based on a Landing and Takeoff Cycle (LTO).
This list combines the major airlines with their commuters (i.e., American Eagle with American Airlines and Continental Airlines with Continental Express, etc.).
Cargo carriers include: Air Transport, Airnet, Capital Cargo, DHL, FedEx, Royal Air Freight, and UPS.
GA – General Aviation

1 Includes Jazz.
2 Includes American Eagle.
3 Includes Continental Express.
4 Includes Delta Connection and Delta Shuttle.
5 Includes US Airways Express.

Alternative Fuel Vehicles (AFV) Program

A component of Massport's Air Quality Management Program is the AFV Program. The AFV Program is designed to replace conventionally-fueled fleet with alternatively fueled or powered vehicles, when feasible, to help reduce emissions associated with Logan Airport operations. One Ford F-150 pick-up, four F-250 pick-ups, three F-350 pick-ups, one E-150 van, and four Escapes powered by E85 flex fuel were acquired in 2011. Massport now operates 72 vehicles powered by CNG, propane, electricity, E85 flex fuel, or hybrids powered by gasoline and alternative power sources. Table 7-15 shows the number of Massport AFVs by vehicle type and the number of vehicles Massport added to and removed from its fleet in 2011. As discussed in *Chapter 1, Introduction/Executive Summary,* several projects and programs support AFVs at Logan Airport including:

Logan Airport Clean Fuel Bus. Source: Massport

- The replacement of 94 rental car buses and older CNG buses with a fleet of 50 alternative fuel (diesel-electric hybrids and CNG) buses, which will serve the new Consolidated Rental Car Facility (ConRAC), Massport terminals and other shuttle routes. This project will be funded by the FAA's Voluntary Airport Low Emissions (VALE) Program grant;
- Operation for almost two decades of one of the largest privately operated, publicly-accessible, CNG stations in New England, which in 2011, dispensed approximately 29,900 gasoline-equivalent gallons per month for Massport vehicles and an additional 11,600 gasoline-equivalent gallons per month for other non-Massport vehicles;
- The introduction of battery powered tugs and belt loaders for the Delta Air Lines ground service fleet at Terminal A;
- Construction of the new ConRAC in the Southwest Service Area (SWSA) including electric vehicle charging stations that conform to the new North American fast-charging standard; renovation to the existing gas station in the North Cargo Area in 2008, which included the installation of an E85 (first-generation biofuel) fuel dispensing tank; and continued operation of Massport's "CleanAirCab" incentive program for AFVs, which allows hybrid or alternative fuel taxis to go to the head of the taxi line to serve passengers.

In addition, Logan Airport's new Green Bus Depot is designed to maintain the expanded CNG-fueled and clean diesel-electric hybrid shuttle bus fleet.

Massport also began offering preferred parking for customers driving hybrid and AFVs in the spring of 2007.

Table 7-15 Massport's Alternative Fuel Vehicle Fleet Inventory at Logan Airport

Fuel Type	Vehicle	Number
Electric	On-road vehicles	2
	Segways	2
Diesel/Electric	Bus	32
Compressed Natural Gas (CNG)	Ford Crown Victoria	1
	Van	2
	Pick-Up Truck	6
	Honda Civic	9
	Shuttle Bus	26
	Bus	18
Gasoline/Electric Hybrid	Ford Escape	8
Propane	Non-Road Vehicles (Forklifts)	2
E85 Flex Fuel	Crown Victoria	1
	Pick-Up Truck	8
	Van	1
	Ford Escape	4
	Total	**122**
	Total acquired in 2011	**13**
	Total acquired in 2012	**50**

Source: Massport.

Air Quality Management Goals

Massport's air quality management program focuses on decreasing emissions, when feasible, from all Airport-related sources, in addition to studying innovative means to achieve emissions reductions. Massport's air quality improvement goals, the measures proposed to accomplish them, and some 2011 milestones are presented in Table 7-16.

In addition to measures described in Table 7-16, Massport, through its involvement in the Massachusetts Clean Cities Program, has supported the education of the general public and corporate and public fleet managers with respect to sustainable transportation through its sponsorship and support of the Altwheels Transportation Festival and Altwheels Fleet Day since its inception in 2003.

Table 7-16 Air Quality Management Plan Status

Air Quality Emissions Reduction Goals	Plan Elements	2011 Status
Reduce emissions from Massport fleet vehicles	Convert Massport fleet vehicles to electricity or compressed natural gas (CNG) by retrofitting or procurement.	Massport procured 13 alternative fuel vehicle/alternative power vehicles (AFV/APV) in 2011. Massport uses the Energy Policy Act (EPAct) of 1992 to expedite Massport's AFV/APV program. Under EPAct, Massport is required to purchase 75 percent of its light-duty vehicles as AFVs, excluding public safety vehicles. There were a total of 7 accrued banked EPAct credits in 2011, up from 4 in 2010. In 2012, Massport acquired a fleet of 50 AFV (diesel-electric hybrids and CNG) buses, which will serve the new consolidated rental car facility (ConRAC), Massport terminals, and other shuttle routes.
Encourage use of alternative fuel and alternative power vehicles by private fleet and airside service vehicle owners	Provide infrastructure to support alternative fuels including CNG and electricity.	Massport continues to operate New England's CNG station, which is open to the public. In 2011, the CNG station dispensed approximately 41,500 gallon equivalents per month for all CNG vehicles, including Massport vehicles. Massport plans to support the current and future standard systems for plug-in electric vehicles (EVs). For example, the ConRAC currently under construction in the Southwest Service Area (SWSA) will include the infrastructure necessary to accommodate future plug-in stations for electric vehicles. Central Garage and Terminal B both have plug-ins for EVs.
	Work with ground access fleet and airside service-vehicle owners to encourage conversion.	Massport encourages conversion to AFVs/APVs by others through such policies as 50 percent discounts in AFV/APV ground access fees to limousines, vans, and buses; limited "front-of-line" taxi pool privileges to hybrid and AFVs/APVs; and preferred parking for hybrid and AFVs/APVs at Logan Airport parking facilities.
	Use of pre-conditioned air (PCA) at new and renovated terminals and terminal gates.	All contact gates have PCA and/or 400-Hz power. This reduces the need for auxiliary power unit (APUs) and, consequently, reduces associated emissions. The improvements of Terminal B will also include the installation of PCA at all renovated gates.
Minimize emissions from motor vehicles	Implement a program to increase high occupancy vehicle (HOV) ridership by air passengers.	As described in detail in *Chapter 5, Ground Access,* there are a number of HOV services serving Logan Airport that are aimed at air passengers, including the MBTA Blue Line and Sliver Line, Logan Express, and water transportation. Massport promotes the use of these services by employees, primarily through the Logan Airport Employee Transportation Management Association (Logan TMA) and various pricing incentives.
	Expand the Logan TMA for Airport employees.	The Logan TMA continues to provide commuting information to all Airport employees.
	Encourage employees to use bicycling as a mode of commuting.	Massport includes bike racks at all new facilities and at appropriate existing facilities to promote employees biking to work. Bicycle racks are currently provided at Terminal A, Terminal E, Logan Office Center, MBTA's Airport Station, Economy Parking Garage, Signature general aviation terminal, and the Green Bus Depot (Bus Maintenance Facility). Additional racks are planned in 2013 for the ConRAC facility.
Minimize emissions from Construction Equipment	Incorporate Clean Air Construction Initiative (CACI) into major earthwork construction projects.	For all construction projects heavy construction equipment is required to be equipped with diesel particulate filters or diesel oxidation catalysts in accordance with CACI.
Reduce emissions from fuel vapor loss	Provide state-of-the-art fuel storage and distribution equipment.	The Fuel Storage and Distribution System is in operation.
	Implement Tank Management Program.	Refer to *Chapter 8, Water Quality*. Tank management focuses on proper maintenance.
Reduce emissions from stationary sources	Employ Reasonable Available Control Technologies (RACT) for NO_x at Central Heating/Cooling Plant.	RACT policies have been implemented.
	Use alternative fuels in snow melters.	Ultra Low Sulfur Diesel (ULSD) fuel is used in all Massport snow melting equipment.
	Incorporate green building technologies and energy use reduction strategies.	Massport participates in the State Sustainability Program. Terminal A and the Signature Flight Support GA Facility are certified under the U.S. Green Building Council Leadership in Energy and Environmental Design® (LEED) Green Building Rating System™ and Terminal E features green building elements. An overview of sustainability initiatives is presented in *Chapter 1, Introduction/Executive Summary*.

Table 7-16 Air Quality Management Plan Status		
Air Quality Emissions Reduction Goals	**Plan Elements**	**2011 Status**
	On-site renewable energy	Massport has installed and is planning to expand on-site renewable energy systems in the form of Solar Photovoltaic (Solar PV) panels and micro-wind turbines. Further details on these installations can be found in *Chapter 1, Introduction/Executive Summary.*
Reduce aircraft emissions	Work with the FAA to study and implement airfield-improvement concepts and operational changes that may have air quality benefits.	Massport promoted such concepts through the Logan Airside Improvements Planning Project Environmental Impact Statement, which recommended physical and operational improvements to Logan Airport including construction of the new Runway 14-32 and Centerfield Taxiway, and taxiway improvements. Runway 14-32 became operational in November 2006 and the Centerfield Taxiway was fully opened in summer of 2009. In addition, in coordination with Massport, the Massachusetts Institute of Technology (MIT) completed a detailed survey of pilots at Logan Airport to better understand the use of single engine taxiing and issued a paper in March 2010, and in January 2011, MIT issued a paper on aircraft pushback control strategy to reduce congestion and taxi delay (Appendix L). Massport will communicate with airlines regarding the use of single engine taxiing, when safe to do so, within the Logan Airport operational context.

Source: Massport

Updates on Other Air Quality Initiatives

This section highlights other air quality initiatives at Massport in 2011.

Massachusetts Department of Public Health Study

In 2004, the Massachusetts Legislature appropriated funds for the Department of Public Health (DPH) to undertake an assessment of potential health impacts of Logan Airport in the East Boston neighborhood and any other communities located within a five-mile radius of the Airport. With the focus on noise and air quality, this study is currently underway and consists of an epidemiological survey combined with computer modeling of noise levels and air pollution concentrations. Massport has cooperated in this effort by providing funding to complete the study and Airport operational data in support of it. In the spring of 2011, Massport also gave technical assistance in support of the DPH study by providing geographic information systems (GIS) analysis of the roadway network in and around Logan Airport in a format compatible with the FAA's EDMS. DPH expects to publicly release the report in 2013.

Massport Air Quality Monitoring Study

Massport has now completed a $1.6 million air quality monitoring study in and around Logan Airport in compliance with its MEPA Section 61 findings for the Centerfield Taxiway component of the Logan Airside Improvements Project. The study gathered air quality data in the communities around Logan Airport before and after the new Centerfield Taxiway became operational, with an emphasis on ambient (i.e., "outdoor") levels of particulate matter and hazardous air pollutants (HAPs). The intent of the study was to assess potential air quality changes related to the operation of the new taxiway. Massport worked cooperatively with MassDEP and DPH to develop the scope of the monitoring study.

Air monitoring commenced in 2007 at ten different stations located on and off the Airport. The monitoring comprised both "real-time" and "time-integrated" monitoring methods, and includes measurement of fine particulates, VOCs, carbonyls, black carbon, and polynuclear aromatic hydrocarbons (PAHs). Massport also met periodically with MassDEP and DPH regarding the progress and results of the air monitoring.

The first year of the two-year study was completed September 2008 and the report is posted on Massport's website. The second phase of the Study concluded in September 2012 following the completion of the Centerfield Taxiway which is now fully operational. The findings from this Study will be submitted to MassDEP in 2013. For details on the study and report see Massport's website at: www.massport.com/environment/environmental_reporting/Air%20Quality/NitrogenDioxideMonitoring.aspx.

Single Engine Taxiing

Single engine taxiing is one measure that is being used by air carriers to help reduce fuel use and emissions. As a result, Massport supports the use of single engine taxiing, when it can be done safely, voluntarily and at the discretion of the pilot. Massport has conducted three surveys of Logan Airport air carriers (2006, 2009, and 2010) to understand the extent single engine taxiing is used at Logan Airport. In addition, Massport is an active member of the FAA Partnership for Air Transportation Noise and Emissions Reduction (PARTNER) program on reducing noise and emissions. In 2009, Massport offered to facilitate the undertaking by the Massachusetts Institute of Technology (MIT) of a more detailed survey of pilots at Logan Airport to better understand the use of single engine taxiing. MIT completed its survey and issued a paper in March 2010, which was provided in the *2009 EDR*. The MIT survey confirms earlier Massport survey findings that single engine taxiing is an important operational measure used by airlines to conserve fuel and is extensively used at Logan Airport. MIT issued a paper in January 2011 reporting on a control strategy to minimize airport surface congestion, and thus taxiing time, by regulating the rate at which aircraft are pushed back from their gates. A copy of this paper is provided in *Appendix L, Demonstration of Reduced Airport Congestion through Pushback Rate Control*. Also in January 2011, Massport sent a memorandum to air carriers in support of single engine taxiing when consistent with safety procedures. The memorandum highlighted best practices for single engine taxiing use based on the MIT survey findings. A copy of this memorandum is provided in *Appendix M, Reduced Single Engine Taxiing at Logan Airport Memorandum.*

MIT and the Center for Air Transportation Systems Research developed a methodology to account for single engine taxi procedures during the taxi in or out modes.[25,26,27] Some of the single engine taxi challenges noted in these studies include: (1) excessive thrust and associated issues; (2) maneuverability problems, particularly related to tight taxiways turns and weather; (3) problems starting the second engine; and (4) distractions and workload issues. Thus, pilots do not use single engine taxiing during each aircraft operation in practice, and when they do use it, it is not for the entire operation. Pilots use it even less often during taxi out. The following assumptions were developed based on available information such as aircraft pilot surveys:

- Practiced during 75 percent of the arrivals (based on pilot surveys). When practiced, conducted 3.1 minutes after landing (engines cool down period).
- Thus, the 2011 taxi in time of 7.0 minutes would involve 3.1 minutes of required full engine usage, of the remaining 3.9 minutes; a single engine taxi procedure would be employed 75 percent of the aircraft operations. The resultant taxi in time would be 5.5 minutes.
- Practiced during 10 percent of the departures (based on pilot surveys). When practiced, conducted 4.6 minutes before takeoff (engines warm up period).

25 *A Survey of Airline Pilots Regarding Fuel Conservation Procedures for Taxi Operations*, Massachusetts Institute of Technology.
26 *Opportunities for Reducing Surface Emissions through Airport Surface Movement Optimization,* Massachusetts Institute of Technology, 2008.
27 Analysis of Emissions Inventory for Single Engine Taxi-out Operations, Center for Air Transportation Systems Research.

- Thus, the 2011 taxi out time of 18.2 minutes would involve 4.6 minutes of required full engine usage, of the remaining 13.6 minutes; a single engine taxi procedure would be employed 10 percent of the aircraft operations. The resultant taxi in time would be 17.5 minutes.
- Practiced with aircraft with two engines, but not aircraft with more than two engines.

The resulting taxi times (relative to the use of two engines) at Logan Airport during 2011 would be reduced from 7.0 to 5.5 minutes (taxi in) and from 18.2 to 17.5 minutes (taxi out) or 9 percent reduction in total taxi time (and fuel usage during taxiing) for applicable aircraft operations. As a result of single engine taxi practices, approximately 1,477,000 gallons of jet fuel were saved during 2011; resulting in the reduction of 14,335 metric tons of GHG emissions.

Logan Airport Energy Planning

In an effort to reduce energy consumption and air emissions associated with the Central Utility Plant, Massport commissioned a study to evaluate operational, economic and environmental benefits through cogeneration.[28] In general, institutional, manufacturing, and large commercial facilities such as Logan Airport require both thermal energy (heat) and electricity. Traditionally, as is the case with Logan Airport, these products have been produced in two separate processes. Thermal energy is produced with a boiler while electricity is typically purchased from an electric utility or third party supplier, which generates power through a large central plant. By generating electricity alone, 67 percent of the available energy in the fuel is lost due to heat rejection and inherent system processing inefficiencies. By combining the two processes into one, the waste heat is captured and used as thermal energy. This process is referred to as cogeneration or a Combined Cooling, Heat and Power (CCHP) Plant. The potential benefits of developing a CCHP could enhance Logan Airport's energy profile by improving the operations of its Central Utility Plant to serve Logan Airport's thermal needs and a portion of its electrical requirements. The cogeneration study identified five different potentially feasible options for a CCHP that could satisfy the needs of the Airport and reduce its energy consumption Airport-wide. Massport is currently reviewing the results of this study.

In 2009, Massport began preparing an Energy Master Plan for all Massport facilities. The planning process involved data collection and establishing regulatory targets and baselines. One of the goals of the Energy Master Plan is to help Massport meet the State's Leading by Example Clean Building Targets[29], which by 2012, aim to reduce GHG from state-controlled buildings by 25 percent, reduce energy intensity at state-owned and leased buildings by square foot by 20 percent, and procure 15 percent of energy through renewable energy sources. The Energy Master Plan will provide Massport with a comprehensive strategy to reduce energy use using a portfolio of achievable measures that will result in quantifiable energy savings and cost reduction. In 2010, the Massport Board approved the Energy Master Plan and approved funding to implement energy efficiency improvements targeted at achieving energy and renewable energy targets as defined by the Governor's Executive Order 484 - Leading by Example.

Southwest Service Area Redevelopment Program

The principal feature of the SWSA Redevelopment Program is the consolidation of the rental cars (ConRAC) and associated functions. The ConRAC will consolidate on-airport rental car operations and facilities into one integrated user-friendly facility in order to better serve both the tenants and the traveling public, and reduce ground

28 *Logan International Airport Energy Strategic Plan*, prepared for Massport, prepared by Source One, February 2008.
29 Massachusetts' *Leading By Example Program* is intended to reduce the environmental impacts of state government buildings and operations. The program includes energy efficiency standards for state buildings, such as clean energy and greenhouse gas goals, and as well as sustainable practices such as waste reduction, water conservation, and recycling.

transportation and air quality impacts on-Airport and off-Airport in the surrounding neighborhoods. The ConRAC is designed and is being constructed and operated for Leadership in Energy and Environmental Design® (LEED) certification (striving to achieve a LEED Silver rating or better) and to meet the Massachusetts LEED Plus sustainable design and construction standards established by the Commonwealth's Executive Office for Administration and Finance.[30]

By constructing an on-site consolidated rental car facility, the ConRAC will reduce the need for the rental car operators to shuttle vehicles from off-Airport storage locations, resulting in fewer VMT and lower air emissions (including mobile source GHG emissions) within the East Boston community, Route 1A, and adjacent neighborhoods. Through the implementation of the Unified Bus System, the new ConRAC will facilitate the reduction of the current rental car shuttle bus fleet by 70 percent and the associated VMTs, and air emissions. The Unified Bus System will use clean fuels (CNG and clean diesel-electric hybrid), further reducing emissions compared to the existing rental car bus fleet. Also, the Unified Bus System includes combining the rental car shuttle bus service with existing Massport buses that service the Massachusetts Bay Transportation Authority (MBTA) Blue Line Airport Station (routes 22/33/55), resulting in further decreases to the size of the overall bus fleet serving the Airport, and reduced VMT and air emissions. Other air quality benefits of the SWSA Redevelopment Program include the reduction of curb-side congestion at the main terminal complex through implementation of the Unified Bus System and reduced overall energy demand (and associated stationary source GHG emissions) through improved building energy design.

On May 28, 2010, the Secretary of EOEEA issued a Certificate that determined that the project adequately and properly complies with MEPA and is under construction. *Chapter 3, Airport Planning* provides detail on the environmental and operational benefits of the SWSA Redevelopment Program related to the consolidation of ground transportation facilities and services and traffic circulation and access improvements. Benefits of the consolidation will include customer service improvements, environmental management enhancements, reduced VMT and the associated reductions in air emissions. ConRAC construction began in July 2010, starting with various enabling phases of construction and will be completed in 2014.

Engagement in Aviation-Related Environmental Issues

Massport maintains memberships and active participation in a number of organizations involved in addressing aviation-related environmental issues, including air quality. These include serving on environmental committees for the TRB, AAAE, ACI, and Women's Transportation Seminar (WTS) and symposia.

Ultrafine Particles (UFP)

To date, there are no Massachusetts or Federal air quality standards for the emissions or the ambient levels of UFP due to limited health effects evidence and air quality data.[31] Future ESPRs/EDRs will report on UFP standards as they develop. The monitoring of UFP is being conducted at two airports in the U.S. but the data from these programs is preliminary and not necessarily adaptable to other airports. These UFP monitoring studies include the following:

- T.F. Green Airport (PVD) – Located in Warwick R.I., this UFP monitoring study is being conducted by the Rhode Island Airport Cooperation (RIAC) in accordance with state regulations. Under this multi-year program, UFP are being measured continuously at four sites located around the perimiter of the airport.

30 According to Executive Order 484, titled "Leading by Example: Clean Energy and Efficient Buildings," all new construction and significant renovation projects for state government buildings over 20,000 square feet must meet the Massachusetts LEED* Plus green building standard.
31 National Ambient Air Quality Standards for Particulate Matter, Final Rule, "*Federal Register* 78:10 (15 January 2013) p. 3122.

Weather data (i.e., wind direction and speed) are also being collected. The UFP data from this program are provided to the Rhode Island Department of Environmental Management (RIDEM), but no findings or relationships to airport activity have been reported thus far.

- Los Angeles International Airport (LAX) – UFP are being measured at this California airport as part of a research study being undertaken by Los Angeles World Airports. In this study, UFPs are being measured over two seasonal campaigns at locations both on and off the airport property. Again, meteorological data are being collected along with airport operational data as a means of ascertaining the source(s) of the UFP. This study is still underway and therefore the results are not yet available.

Statewide, National and International Initiatives

Advancements on the national and international levels to decrease Airport-related air emissions has continued to focused primarily on three initiatives in 2011: (1) the advanced quantification of PM and HAPs emissions from aircraft engines; (2) the continued phasing-in of AFV; and (3) the implementation of GHG emissions reduction strategies. These initiatives are briefly described as follows.

- **Particulate Matter and Hazardous Air Pollutant Research—**Conducted by the FAA/National Aeronautics and Space Administration (NASA)/EPA and others, research continues to better characterize PM and HAPs emissions from aircraft engines and to assess their potential health effects. Similarly, air quality monitoring efforts at other airports are also underway (or planned) at various locations to advance what is known about ambient ("outdoor") levels of air pollutants in the vicinities of the nation's airports.[32] In addition to conducting its own air monitoring programs (see updates on the Measured NO_2 Concentrations Report and Massport Air Quality Monitoring Study, above), Massport continues to closely track these issues through its involvement in aviation industry organizations such as ACI and AAAE.
- **Alternative Fuel Vehicle Conversions—**Airlines and other GSE users are continually replacing their older fossil-fueled vehicles and equipment with more fuel-efficient, low- and non-emitting (e.g., electric) technologies. Airport-fleet vehicles are also being converted to alternative fuels (e.g., propane). In response, GSE and automobile manufacturers are offering a wider selection of AFVs, many of which are designed specifically for airport use. Massport continues to support the conversion of fossil-fueled vehicles and equipment to alternative or lower-emitting fuels.
- **Participation in Massachusetts Climate Protection Plan—**Massport was one of 15 state agencies and authorities that participated in the development of the state's Climate Protection Plan: the Commonwealth's initial step towards reducing GHG. Massport is participating on two of the Plan's teams: Transportation System Planning and Transportation Technologies and Operations, with a focus in GHG emission reductions associated with Airport operations. Current reduction strategies include:
  - Include energy use and GHG emissions as criteria in transportation decisions;
  - Maintain and update public transit systems;
  - Expand programs to promote efficient travel;
  - Seek opportunities to reduce emissions at Logan Airport;
  - Improve aircraft movement efficiency;
  - Promote the use of cleaner vehicles and fuels in public transit fleets;
  - Continue to promote the use of clean diesel equipment on publicly-funded construction projects;
  - Eliminate unnecessary idling of buses; and
  - Advocate for aircraft efficiency at regional and national levels.

32 These air quality monitoring programs at other airports include T.F. Green Airport (Providence, R.I.); Los Angeles International and Santa Monica Airports in CA.

In August 2008, the Commonwealth passed the Global Warming Solutions Act (GWSA). The GWSA requires the reduction of GHG emissions by 80 percent from 1990 levels by 2050, with a reduction of up to 25 percent by 2020. In May of 2012, EOEEA Secretary convened an Implementation Advisory Committee (IAC) that will advise the Commonwealth's implementation of the GWSA. The IAC features leaders from the business, energy, environmental, building, transportation, and academic communities in Massachusetts. Massport is participating on the Climate Adaptation subcommittee of the IAC.

On a parallel track, to address adaptation, the Commonwealth also commenced a Climate Change Adaptation project. An Advisory Committee was established to define and assess potential state-wide vulnerabilities associated with potential climate change impacts, and evaluate strategies for adapting to the predicted effects of climate change. In this ongoing effort, and since October 2009, Massport participated in the transportation sector meetings of the "Key Infrastructure" working group. In addition to considering potential impacts to Massport and other statewide maritime facilities, the Key Infrastructure team examines the potential issues at airports related to service disruption, access issues, flooding, and other storm-related impacts.

This Page Intentionally Left Blank

8

Water Quality/ Environmental Compliance and Management

Introduction

The Massachusetts Port Authority's (Massport's) approach to environmental management and compliance is a key component of its commitment to sustainability and responsible stewardship at Logan Airport (refer to *Chapter 1, Introduction/Executive Summary* for details). Through monitoring and documentation, environmental performance is assessed, allowing policies and programs to be developed, implemented, evaluated, and continuously improved.

Massport's primary water quality goal is to prevent or minimize pollutant discharges, thus limiting adverse water quality impacts associated with airport activities. Massport employs several programs to promote awareness of Massport and tenant activities that may impact surface and groundwater quality, thus improving water quality. Programs include implementing best management practices (BMPs) for pollution prevention by Massport, its tenants, and its construction contractors; training of staff and tenants, and a comprehensive stormwater pollution prevention plan. In addition, Massport voluntarily participates in the State's Leading by Example Program,[1] continuing its commitment to operate Logan Airport in an environmentally sound manner. Massport complies with the Massachusetts Contingency Plan (MCP) by monitoring fuel spills and tracks the status of spill response actions. The MCP lays out a set of regulations that govern the reporting, assessment, and cleanup of spills of oil and hazardous materials in Massachusetts.[2] Massport also maintains a Tank Management Program, which includes a tank permitting, monitoring, upgrade, and replacement program. Information on Massport's Logan Airport Stormwater Pollution Prevention Plan (SWPPP)[3], Spill Prevention Control and Countermeasure Plan (SPCC)[4], and the MCP are provided in this chapter.

1 Massachusetts' Leading By Example Program is intended to reduce the environmental impacts of state government buildings and operations. The program includes energy efficiency standards for state buildings, such as clean energy and greenhouse gas goals, and as well as sustainable practices such as waste reduction, water conservation, and recycling.
2 310 Code of Massachusetts Regulations (CMR) 40.0000.
3 In accordance with the requirements of the current Logan Airport NPDES stormwater permit that was issued on July 31, 2007, Massport and its co-permittees were required to develop SWPPPs.
4 In accordance with the Clean Water Act, 40 CFR 112, *Oil Pollution Prevention*.

The federal Clean Water Act (CWA) requires permits for pollutant discharges into U.S. waters from point sources and for stormwater discharges associated with industrial activities. Massport holds permits under the U.S. Environmental Protection Agency's (EPA) and Massachusetts Department of Environmental Protection's (MassDEP) National Pollutant Discharge Elimination System (NPDES) Program. The NPDES permit covers Massport and its co-permittees at Logan Airport. It establishes effluent limitations and monitoring requirements for discharges from specified stormwater outfalls.

Massport is responsible for ensuring compliance with applicable state and federal environmental laws and regulations. Massport promotes appropriate environmental practices through pollution prevention and remediation measures. Massport also works closely with airport tenants and airport operations staff in an effort to improve compliance. Massport's environmental programs pertaining to water quality and environmental compliance and management include:

- Stormwater management;
- Water quality management;
- Fuel use and spills;
- MCP compliance;
- Storage tank compliance;
- Compliance auditing and inspections;
- Environmental Management System (EMS) implementation; and
- Clean State Initiative and Leading by Example Program participation.

Key Findings

The following summarizes the key water quality and compliance findings for 2011:

- International Organization for Standardization (ISO) 14001 certification for Facilities II (vehicle maintenance, landscaping, and snow removal) began in December 2006. Recertification of Facilities II was obtained in December 2009. In 2010, Massport began the process of expanding the Logan Airport EMS to include Facilities I (Central Heating and Cooling Plant), Facilities II (Vehicle Maintenance, Landscaping, and Snow Removal), and Facilities III (Electrical and Structural). A certification audit of the expanded Logan Airport EMS took place in early June 2011, and a certificate was issued in July 2011. The current Logan Airport EMS covers Facilities I (Central Heating and Cooling Plant), Facilities II (vehicle maintenance, landscaping, and snow removal), and Facilities III (Electrical and Structural).
- In 2011, there were 12 oil and hazardous material spills that required reporting to MassDEP, five of which involved a storm drainage system.[5] Further details on spills can be found in the *Fuel Use and Spills* section of this chapter.
- One outfall sample out of a total of 19 samples at the Maverick Street Outfall and one outfall sample out of a total of 23 samples at the North Outfall exceeded the regulatory limits of the NPDES Permit for the North, West, and Maverick Street Outfalls. These exceedances were reported in April and November 2011, respectively, as required.

5 State environmental regulations require that oil spills of 10 gallons or more in volume be reported to MassDEP.

- Massport's SWPPP addresses stormwater pollutants in general, and also addresses deicing and anti-icing chemicals, potential bacteria, fuel and oil, and other sources of stormwater pollutants. The 2011 Annual Certificates of Compliance were submitted to EPA and MassDEP on December 13, 2011, for Massport and each tenant co-permittee.
- In accordance with the MCP, Massport continues to assess, remediate, and bring to regulatory closure areas of subsurface contamination. Massport is working towards achieving regulatory closure of the remaining MCP sites associated with known releases, as well as addressing sites encountered during construction. Progress has been made for all MCP sites with updates included in Table 8-3.

Stormwater Management in 2011

On July 31, 2007, EPA and MassDEP issued an individual NPDES Stormwater permit for Logan International Airport (NPDES Permit MA0000787). The new permit became effective on September 29, 2007, replacing the previous NPDES Permit dated March 1, 1978. The NPDES permit is on EPA's website at: www.epa.gov/NE/npdes/logan/pdfs/finalma0000787permit.pdf. Massport holds a separate NPDES permit for the Fire Training Facility (NPDES Permit MA0032751). The following sections describe the requirements of the two permits, and Massport's compliance with these requirements.

Stormwater Outfall NPDES Permit Requirements and Compliance

The following sections describe stormwater outfalls that are subject to the NPDES Permit, the monitoring requirements, and the monitoring results for 2011.

Outfalls Subject to the NPDES Permit

The NPDES permit regulates stormwater discharges from the North, West, Northwest, Porter Street, and Maverick Street Outfalls, and all of the airfield outfalls. The areas drained by the outfalls are the North Drainage Area (152 acres); West Drainage Area (557 acres); Northwest Drainage Area (23 acres); Porter Street Drainage Area (130 acres); Maverick Street Drainage Area (34 acres); and the Airfield Outfall Drainage Areas (A1 through A44) which drain the remainder of the airfield including runways, taxiways, and the perimeter roadway (910 acres). The North and West Drainage Areas also drain a portion of the airfield. These drainage areas are shown in Figure 8-1 and further detailed in Table 8-1. The North and West Outfalls have end-of-pipe pollution control facilities for the removal of debris and floating oil and grease from stormwater prior to discharge into Boston Harbor.

Table 8-1 Stormwater Outfalls Subject to NPDES Permit Requirements			
Outfall Name and Number	**Drainage Area (Acres)**	**Boston Harbor Discharge Location**	**Major Land Uses**
North (001)	152	Wood Island Bay	Terminal E, apron, taxiway, cargo areas, fuel farms, and runways
West (002)	557	Bird Island Flats	Taxiways, terminal areas, aprons, cargo areas, and runways
Porter Street (003)	130	Bird Island Flats	Hangars, vehicle maintenance facilities, cargo areas, car rental facilities, and roadways
Maverick Street (004)	34	Jeffries Cove	Car rental facilities, taxi/bus/limousine pools, parking areas, flight kitchens
Northwest (005)	23	Wood Island Bay	Flight kitchen, vacant area being used for construction lay down and staging
Airfield (A1 through A44)[1]	910	Perimeter of Airfield	Runways, taxiways, and perimeter roadway

Source: Massport

1 In accordance with the requirements of the NPDES permit, Massport developed an Airfield Stormwater Outfall Sampling Plan (March 27, 2008). The Plan requires quarterly wet weather sampling at a minimum of seven of the airfield outfalls (A1 through A44) in order to obtain representative samples of the quality of stormwater runoff from the airfield.

Monitoring Requirements

The NPDES permit requires grab samples (single samples collected at a particular time and place) to be taken monthly from the North, West, Porter Street, and Maverick Street Outfalls. Samples are tested for pH, oil and grease, total suspended solids (TSS), benzene, surfactants, fecal coliform bacteria, and *Enterococcus* bacteria during both wet and dry weather. Grab samples are also taken quarterly from these four outfalls during wet weather to test for eight different polycyclic aromatic hydrocarbons (PAHs).

Figure 8-1 Logan Airport Outfalls

Source: Aerial photo Massport

Additional sampling requirements of the NPDES permit include sampling for deicing compounds twice during the deicing season (October through April) at the North, West, and Porter Street Outfalls. The NPDES permit sets discharge limitations for pH, oil, and grease, and TSS from the North, West, and Maverick Street Outfalls and for pH from the Porter Street Outfall. The NPDES permit does not include any discharge limitations for the Northwest Outfall, airfield outfalls, or the deicing monitoring, and requires only that the sampling results be reported. *Appendix J, Water Quality/ Environmental Compliance and Management* contains additional information on the sampling requirements of the NPDES permit.

Monitoring Results

During 2011, two stormwater samples taken at the West Outfall exceeded the limits for TSS and oil and grease and three stormwater samples taken at the Maverick Street Outfall exceeded the limits for TSS established in the NPDES permit. The TSS and oil and grease exceedances at the West Outfall occurred during two separate sampling events on January 18 and April 13, 2011. The TSS exceedances at the Maverick Street Outfall occurred during three separate sampling events on March 11, July 25, and November 3, 2011.

Stormwater samples taken at the West Outfall on January 18, 2011, exceeded the 100 milligrams per liter (mg/L) daily maximum limit for TSS and the 15 mg/L daily maximum limit for oil and grease established in the NPDES permit. The analytical results for the sample indicated a concentration of 230 mg/L for TSS and 28 mg/L for oil and grease. As indicated in the Discharge Monitoring Report dated February 15, 2011, the exceedances of the TSS and oil and grease discharge limit at the West Outfall may be attributable to the amount of precipitation that occurred on the sampling date. Prior to the sampling date, there was a significant snow event followed by five days of dry weather. The excessive runoff generated on the sampling date, which included stormwater and snow melt, carried a higher than normal pollutant loading due to accumulated sediment and other stormwater contaminants such as oil and grease associated with roadways and paved areas.

The second TSS and oil and grease exceedance at the West Outfall occurred in a stormwater sample taken on April 13, 2011. The analytical results for the sample indicated a concentration of 560 mg/L for TSS and 24 mg/L for oil and grease. Upon being informed of the exceedances, Massport inspected activities within the 450-acre West Outfall drainage area to identify potential sources of the TSS and petroleum detected in the outfall samples. As reported in the Discharge Monitoring Report dated May 16, 2011, Massport found no specific sources. It is possible that the rainfall event that occurred during the stormwater sampling following a relatively dry month generated the increased pollutant loading.

An exceedance of the TSS discharge limit established by the NPDES permit at the Maverick Street Outfall occurred in a stormwater sample obtained on March 11, 2011. The analytical results for the sample indicated a concentration of 110 mg/L which exceeds the limit of 100 mg/L for TSS. Prior to the exceedance, Massport had notified its tenants who operate within the Maverick Street Outfall drainage area to inspect and clean catch basins as required at the end of the winter roadway sanding period. Massport confirmed that all tenants conducted these activities and daily sweeping continues of all paved areas.

A second exceedance of the TSS discharge limit at the Maverick Street Outfall occurred in a stormwater sample obtained on July 25, 2011. The analytical results for the sample indicated a concentration of 370 mg/L. Massport conducted an inspection of the Maverick Street Outfall drainage area following the exceedance. The drainage area is located within the Southwest Service Areas of Logan Airport which is undergoing construction activity associated with Massport's Consolidated Rental Car Facility (ConRAC) Project. During the inspection, significant quantities of stockpiled soil were observed although no siltation was observed at the outfall and appropriate sedimentation controls were in place throughout the construction area. Massport directed its contractor for the ConRAC project to replace the catch basin inserts and wattles and remove any accumulated sediment from the catch basin locations. A follow-up inspection confirmed that these activities occurred.

The final exceedance of the NPDES permit discharge limits observed at Logan Airport during 2011 was an exceedance in the TSS discharge limit at the Maverick Street Outfall. The stormwater sample obtained on November 3, 2011 was found to have a TSS concentration of 150 mg/L. Similar to the July exceedance of the TSS discharge limit, Massport again directed the ConRAC contractor and field inspectors to conduct a thorough inspection of the construction area, in addition to their routine weekly NPDES inspection, and also confirm that there was no dewatering occurring that could impact the stormwater drainage system. The inspection identified three catch basin filter inserts that were filled or deteriorated. These deficiencies were corrected. There was no construction dewatering observed during the inspection that would have impacted the drainage system.

There were no TSS exceedances reported at the North Outfall or at the Porter Street Outfalls. The highest concentration of TSS observed at the North Outfall was 40 mg/L, which occurred on February 25 and November 10, 2011. The highest TSS concentration observed at the Porter Street Outfalls was 81 mg/L of TSS (July 25, 2011). There were no other exceedances for the other NPDES permit discharge limits, which include oil and grease and pH.

The NPDES permit requires only that sampling results be reported for the Northwest Outfall and airfield outfalls, and the permit does not contain discharge limits for these outfalls. The highest concentrations observed at the Northwest Outfall were 11 mg/L of oil and grease (February 25, 2011) and 170 mg/L of TSS (February 25, 2011). The highest concentrations observed at the airfield outfalls were less than 4.4 mg/L of oil and grease and 200 mg/L of TSS on July 8, 2011.[6] Deicing sampling at the North, West, Porter Street, and airfield outfalls occurred in January and February 2011 are reported as required by the EPA and MassDEP (see Tables J-12 and J-13 in *Appendix J, Water Quality/ Environmental Compliance and Management).*

The NPDES water quality monitoring results are posted on Massport's website (http://www.massport.com/environment/environmental_reporting/Water%20Quality/MonitoringResults.aspx), and Massport provides copies of the monitoring results to EPA and MassDEP.

Due to the large size of the drainage areas and relatively low concentration of pollutants, it is not always possible to trace exceedances to specific events. Where a known event such as a spill is reported, Massport routinely checks the drainage system for impacts from the event and takes corrective actions if necessary. The 2011 water quality monitoring results for discharge from the outfalls is provided in *Appendix J, Water Quality/ Environmental Compliance and Management* along with the history of water quality monitoring results that dates back to 1993.

Stormwater and Sanitary Sewer System Inspections and Repairs

Between 2006 and 2008, Massport conducted inspections of the sanitary sewer and stormwater drainage system serving Logan Airport to document the condition of the systems and identify potential impacts from the sewer to the stormwater drainage system. Such impacts could result from leaks or breaks from the sanitary sewer or from direct, inadvertent, illegal cross connections to the stormwater drainage system. As a result of

6 The 2008 NPDES permit does not set maximum daily discharge limitations for the Runway/Perimeter Stormwater Outfalls.

these surveys, the Boston Water and Sewer Commission (BWSC) completed replacement of sections of the sanitary sewer during 2009 and 2010.

Massport is in the process of preparing construction documents for repairing sections of the sanitary sewer system and the total estimated cost of the repairs is approximately $500,000. The extent and complexity of the repair work is greater than what was previously assumed and it has been necessary for Massport to retain an outside consultant to design the repairs. The repair work is scheduled to begin during the first quarter of 2013 and the completion of the work is anticipated by mid-2013.

In 2011, Massport's Facilities Department conducted inspections and cleaning of manhole and catch basin structures at locations throughout the Airport. In accordance with Part I.B.10.h of the Logan Airport NPDES Permit, the inspection and cleaning activities focused on structures within 100 yards of aircraft, vehicle, and equipment maintenance facilities. Unlike the inspection/cleaning program completed in 2010, the work conducted in 2011 did not include the drainage system located within the Southwest Service Area, which is presently under construction. A total of 71 manhole and catch basin structures were accessed in 2011 and their conditions were documented. Sediment depths were recorded and the sediment was then removed, as necessary, from the structures. A total of approximately 10 cubic yards of sediment and debris was removed during cleaning of the structures. In addition to the inspection and cleaning of manhole and catch basin structures, Massport directed its term contractor to inspect and clean 11 water quality construction structures (i.e., stormceptor units). The condition of the units was documented and approximately 25 cubic yards of sediment and debris was removed.

Bacteria Source Tracking

In accordance with Part I.B.9 of the Logan Airport NPDES Permit, Massport has implemented a SWPPP to investigate potential sources of bacteria in the stormwater runoff. Massport's worked with the MassDEP Wall Experiment Station (WES) to develop a sampling and analysis plan to evaluate sources of bacteria including the potential presence of bird feces in the stormwater discharges at the North Outfall. In the fall of 2010, Massport's contractor collected stormwater samples at the North Outfall, in addition to collecting a sample of bird fecal matter, for laboratory analysis. The laboratory conducted technologically advanced analyses of the samples using DNA data to identify potential bird markers in the stormwater. The stormwater samples were also analyzed for human markers and fluorescent whitening agents. The DNA testing conducted by the WES laboratory to identify potential bird markers in the stormwater was inconclusive. Due to limited resources available to the laboratory, further DNA testing of samples was suspended. The results of the analysis conducted on stormwater samples for the presence of human markers were mixed; some results were inconclusive, while others indicated that no human markers were present in the stormwater samples.

Fire Training Facility NPDES Permit Requirements and Compliance

NPDES Permit No. MA0032751[7] regulates treated wastewater from the Fire Training Facility on Governors Island (Figure 8-1). The treated wastewater from fire training exercises is stored, treated by separation and a carbon filter to remove fuel contaminants, and is typically beneficially reused onsite to recharge the fire training pit. If no storage is available, treated wastewater is tested prior to discharge to the storm sewer to ensure compliance with the Fire Training Facility's NPDES permit. Discharge monitoring reports are submitted monthly to EPA. In 2011, Massport reused all but approximately 20,000 gallons of

7 NPDES Permit No. MA0032751 - *Logan International Airport Fire Training Facility*. Issued November 1, 2006.

wastewater generated at the Fire Training Facility. The excess water was shipped off-site for disposal at NewStream located in Attleboro, Massachusetts.

Fuel Use and Spills in 2011

Management of fueling operations at Logan Airport is designed to minimize impacts on water quality through the implementation of Stormwater Pollution Prevention BMPs, including the use of reliable storage, secondary containment, and effective spill cleanup procedures. Massport's jet fuel storage and distribution infrastructure, installed in 2000 and 2001, includes a zoned leak detection system for underground fuel piping, which identifies volumetric changes of product in the pipe at operating pressure and zero pressure. The system combined the storage facility with a hydrant fuel system that reduced the need for trucks and dispensing. The former fuel farms were removed in 2000.

The fuel storage and distribution system was designed to ensure, to the extent technologically feasible, the reliable detection of leaks. The aboveground jet fuel storage facility and distribution system are leased and operated by a single party, BOSFUEL, an airline consortium. The management of the facility by one entity was put in place to minimize potential fuel spills and maximize water quality protection for the storage and distribution facilities. Cathodic protection, leak detection, secondary containment, and tank overfill protection methods such as alarms, inventory gauging sensors in the tanks, and emergency fuel shut-off systems have been installed. The operation and maintenance of these controls have been included in the Operation and Maintenance Manual used by BOSFUEL's contractor to operate and maintain the facility. Built-in environmental controls, unified operations, and the ongoing contingency planning provide heightened environmental protection and more efficient fuel handling operations than the previous system. In 2010, BOSFUEL, in coordination with Massport, completed the replacement of the portion of the jet fuel distribution system that had not been part of the fuel storage and distribution system improvements completed in 2001. The fuel line replacement, which began in 2008, involved the installation of approximately 6,500 linear feet of pipe in the vicinity of Terminals B and C.

The Massport Fire Rescue Department keeps logs of all spills at Logan Airport (see Table 8-2). State environmental regulations require that oil spills of 10 gallons or more in volume be reported to MassDEP. Spills that enter storm drains of any volume must also be reported to Massport. During 2011, five of the spills entered the storm drainage system. Massport keeps records of all spills, including those less than the reporting threshold. In 2011, of the 108 oil and hazardous material spills reported to the Massport Fire Rescue Department, 12 spills (11 percent) were reportable, due to their volume. Of the 12 reportable spills, six commercial airlines were responsible for eight of the spills; one fixed-based operator was responsible for two spills; one spill was the result of equipment failure; and one spill was the result of a bus accident. By volume, jet fuel spills accounted for 59 percent of total fuel spilled; diesel fuel accounted for 10 percent; hydraulic oil accounted for 26 percent; and gasoline, motor oil and other fuels accounted for five percent. A summary of Logan Airport jet fuel usage and spill records from 1990 to 2011, and greater detail pertaining to type and quantity of the spills can be found in *Appendix J, Water Quality/Environmental Compliance and Management*.

Table 8-2 Logan Airport Oil and Hazardous Material Spills[1] and Jet Fuel Handling

Year	Total Number of all Spills	Total Number of all Spills >10 gallons	Total Volume of all Spills (Gallons)	Estimated Volume of Jet Fuel Handled (Gallons)	Total Volume of Jet Fuel Spilled (Gallons)
2004	126	18	894	373,996,141	574
2005	97	15	2,319	368,645,932	585
2006	92	11	752	364,450,864	644
2007	108	7	604	367,585,187	361
2008	99	20	944	345,631,788	662
2009	95	6	1004	327,358,619	915
2010	87	15	476	335,693,997	360
2011	**108**	**12**	**572**	**340,421,373**	**337**

Source: Massport Fire Rescue Department and Massport Environmental Management Department.
Notes: Oil and hazardous material spills and jet fuel handling data from 1990 through 2011 is provided in *Appendix J, Water Quality/Environmental Compliance and Management.*
1 Materials include: jet fuel, hydraulic oil, diesel fuel, gasoline, and other materials such as glycol and paint.

Tank Management Program

Since 1993, Massport has had a Tank Management Program in place that is designed to ensure that all Massport-owned tanks are in regulatory compliance with federal and state tank regulations. From 1993 through 2005, Massport completed six construction phases of storage tank modifications that included removal, replacement, and upgrades to existing tanks and the related piping systems in order to comply with federal and state tank regulations. In 2009, Massport installed a remote tank monitoring system for heating oil underground storage tanks (USTs) to allow for continuous monitoring of inventory levels, as well as leak detection. As a BMP, Massport continues to monitor tank systems and upgrade facilities, as needed.

Massport and its tenant tank owners spent much time and effort in 2011 continuing to comply with new state storage tank regulations.[8] These new regulations transferred jurisdiction of all USTs from the Department of Fire Services (DFS) to MassDEP. Jurisdiction of all aboveground storage tanks (ASTs) with capacity volumes greater than 10,000-gallon remains with the DFS, and those ASTs with less than 10,000-gallons capacity are now under local (Massport Fire Department) jurisdiction. There are three ASTs at Logan Airport with volumes greater than 10,000 gallons; two of these tanks are located in the North Service Area, and contain glycol; and the third tank is located at the Central Heating Plant, and is used for storage of heating oil. Compliance with the new tank regulations included the following:

- Responses to ongoing MassDEP audits of third party inspection submittals;
- Re-permitting all ASTs using a newly created Massport Fire Department annual permit;[9] and
- Updating and tracking of AST permit status, using the Massport AST database.

Massport is also implementing a successful tank release prevention strategy, which includes:

- A continuing program of monthly inspections, testing, and minor repairs of all Massport-owned tanks, related piping, and tank monitoring systems. Annual Stage II Vapor Recovery testing in June 2011, of

8 527 Code of Massachusetts Regulations (CMR) 9.00.
9 Although ASTs with a capacity of less than 10,000-gallons is no longer under the jurisdiction of the Massachusetts DFS, the ASTs are still subject to the Massachusetts fire regulations and therefore must obtain an annual permit through the Massport Fire Department which has jurisdiction over the less than 10,000-gallon ASTs. ASTs with capacity of over 10,000 gallons also need to obtain this annual permit before those tank owners may obtain a permit from DFS.

Massport's USTs and piping systems at four facility locations. Stage II Vapor Recovery Systems collect gasoline vapors from vehicles' fuel tanks when customers dispense gasoline products into their vehicles at gasoline dispensing facilities. The Stage II system uses special nozzles and coaxial hoses at each gasoline pump to capture vapors from vehicle fuel tanks during the refueling process and reroute them to the station's storage tank(s). Testing included replacement of defective hoses and/or nozzles, as needed.

- Annual DFS inspections of all three of Massport's ASTs greater than 10,000 gallons in volume.
- Review of all proposed tenant tank upgrades, installations, and tank removals (under Massport's Tenant Alteration Application process) to ensure compliance with applicable state and federal regulations and with Massport policy.
- Ongoing upgrade and maintenance of a database that contains information on all USTs located on Massport property. For each tank, the database tracks location, permit status, compliance status with applicable tank regulations, and tank and monitoring system equipment summaries. Information on ASTs is kept in a separate database which was developed in 2010.
- Massport also provides tenants with information regarding the revised storage tank regulatory requirements and offers assistance with tenants' tank permitting procedures.

Site Assessment and Remediation

The MCP (310 Code of Massachusetts Regulations 40.0000), which is administered by the MassDEP, pertains to releases of oil or hazardous materials into the environment. The MCP prescribes the site cleanup process based on the nature and extent of a release's contamination. The MCP defines the roles for those parties affected by and potentially responsible for the release and establishes the release reporting program and submission deadlines for tracking events from initial release to regulatory closure.

In accordance with the MCP, Massport continues to assess, remediate, and bring to regulatory closure areas of subsurface contamination. There are a number of phases for the investigation of contaminated sites. Phase I involves initial site investigations for the presence of contamination and Phase II assessments are more comprehensive site investigations. Phase III identifies, evaluates, and selects remediation actions and Phase IV involves the implementation of selected remedial actions. Phase V involves the operation, maintenance and/or monitoring of the remediation program. Massport leads the performance of a variety of response actions, including remediation at sites where Massport is the responsible party, where there are multiple responsible parties, and where no responsible party has been identified.

Table 8-3 describes Massport's progress in 2011 in achieving regulatory closure of the MCP sites identified in Figure 8-2.

Table 8-3 MCP Activities Status of Massport Sites at Logan Airport

Location (Release Tracking Number) and MassDEP Reporting Status	Action/Status
1. Fuel Distribution System (3-1287)	
Phase II Report filed in April 1997	Indicated fuel floating on the groundwater table in 10 discrete locations in the terminal areas; cleanup required to achieve regulatory closure.
Phase III Report filed in April 1997	Reported product recovery as the preferred cleanup alternative; none of the areas to be cleaned up by a responsible party (i.e., a tenant responsible for the contamination). Cleanup was anticipated to span a minimum of three years.
Phase IV Remedy Implementation Plan filed in March 1998	The plan described seven discrete locations of separate phase hydrocarbons (SPH) (jet fuel floating on the groundwater) to be remediated at Terminals C and E as well as three discrete areas at Terminal B to be remediated by tenants who were responsible for the historical release. The remediation strategies that Massport undertook at the seven areas differed depending on the product thickness. Strategies included trench-based product recovery, multi-phase extraction, excavation, and dewatering during construction, and passive remediation.
Phase V Inspection and Monitoring Status Reports filed in September 1998, March 1999, and October 1999	The Status Reports documented remedial actions at seven areas including passive recovery of SPH at Areas 1, 6, and 7, and pumping to recover SPH at Area 3. Interim passive recovery was also implemented at Areas 2 and 4, pending the evaluation of active recovery systems. Remedial objective of less than 1/2 inch of product has been met at Areas 1, 2, 5, 6, and 7, but monitoring continues. MCP closure will be achieved at these areas by applying for an AUL.
Tier II Extension Request submitted in March 2000	Site Closure was not achieved by the March 2000 deadline. A Tier II Extension Request was submitted, providing a plan for continued SPH recovery and monitoring until the remedial objective has been accomplished.
Response Action Outcome (RAO) Submitted March 2001	Under the Class C RAO, monitoring continues at this location along the fuel line for the presence of SPH.
Tier II Extension Request Submitted in July 2002	The Tier II Extension Request and RAM Plan were submitted prior to construction of the Baggage Screening Project in the area of the Fuel Distribution System.
2003	Massport submitted status reports detailing fuel recovery efforts along the distribution system.
2004	Massport submitted status reports to MassDEP detailing fuel recovery efforts along the distribution system in March and September 2004.
2005	Inspection and Monitoring Status Reports were submitted to the MassDEP in March 2005 and March 2006 detailing monitoring and product recovery efforts along the fuel distribution system during the period between September 2004 and September 2005.
2006	An Inspection and Monitoring Status Report was submitted to the MassDEP detailing monitoring and product recovery efforts along the Fuel Distribution System (FDS) between March and September 2006. Massport continues to review data for tightness testing of the fuel line, and completed leak testing of fuel hydrants pits adjacent to Terminal B and Terminal C. Massport continues to meet with BOSFUEL the operator of the FDS, to assess conditions along the FDS at Terminal B and Terminal C, referred to as the Retained Facilities portion of the FDS, and to coordinate the replacement of the Retained Facilities.

Table 8-3 MCP Activities Status of Massport Sites at Logan Airport (Continued)	
Location (Release Tracking Number) and MassDEP Reporting Status	**Action/Status**
1. Fuel Distribution System (3-1287) (continued)	
2007	Inspection and Monitoring Status Reports were submitted to the MassDEP detailing monitoring and product recovery efforts along the FDS between September 2006 and September 2007. A Periodic Evaluation Report was submitted in January 2008 which indicated that a Condition of No Substantial Hazard existed at the FDS and a permanent solution was not currently feasible. Massport coordinated with BOSFUEL who prepared construction documents for replacing a portion of the FDS. Construction was conducted under a RAM Plan.
2008	Inspection and monitoring reports were submitted to the MassDEP detailing monitoring and product recovery efforts along the FDS between September 2007 and September 2008. Massport coordinated with BOSFUEL during construction to replace a portion of the FDS. The work was conducted under a RAM Plan that was submitted to the MassDEP in May 2008. A RAM Status Report was submitted in September 2008. Construction of the pipeline replacement was approximately 90 percent complete.
2009	Inspection and monitoring reports were submitted to the MassDEP detailing monitoring and product recovery efforts along the FDS between September 2008 and December 2009. The BOSFUEL project to replace a portion of the FDS continued, with work being completed on pipeline connections, testing of the new fuel line, and abandonment of the old fuel line. RAM Status Reports for the BOSFUEL Project were submitted in February and September 2009.
2010	Inspection and monitoring reports were submitted to the MassDEP detailing monitoring and product recovery efforts along the FDS between September 2009 and September 2010. A RAM Completion Report for the BOSFUEL Project was submitted in February, and the report was revised in March 2010.
2011	*A Periodic Review of the Temporary Solution for the FDS was submitted in April 2011. Additionally, three Post-Class C RAO Status Reports were submitted for the FDS in February, June, and December 2011, summarizing the routine inspection and monitoring activities.*
2. North Outfall (3-4837)	
Phase II and Phase III Reports filed in March 1997	Indicated petroleum contamination present at the site was likely the result of decades of airport operation; risk assessment reported no significant risk to human health, or to the aquatic and avian community.
RAO submitted in March 1998	Class C RAO using a Temporary Solution (periodic site monitoring and assessment); remediation steps included (not limited to) installation of a new fuel distribution system and decommissioning of certain fuel lines, and natural biodegradation processes; goal is to have petroleum contamination reduced to an area less than 1,000 square feet. Installation of the new fuel distribution system and decommissioning of sections of the old system were completed.
	Massport initiated site evaluation to document the reduction of petroleum contamination following the decommissioning of the North Fuel Farm and fuel distribution system.
Post Class C RAO evaluation report submitted in December 2002	Massport has eliminated substantial hazards at this site and submitted a Class C RAO statement. In accordance with applicable regulations, Massport will conduct a periodic evaluation at five-year intervals until a Permanent Solution has been achieved. The next periodic evaluation was scheduled for 2007.
2004	Evaluation report indicated that a “Condition of No Significant Risk” has not been achieved at this site. Massport scheduled another assessment in 2007.

Table 8-3 MCP Activities Status of Massport Sites at Logan Airport (Continued)

Location (Release Tracking Number) and MassDEP Reporting Status	Action/Status
2. North Outfall (3-4837) (continued)	
2005	No change in status for 2005.
2006	Massport prepared the five-year review of the Class C RAO for this site, which was due in December 2007.
2007	Massport completed its five-year review of the Class C RAO and transmitted it to MassDEP in December 2007. It was determined that a “Condition of No Significant Risk” has not been achieved at this site at this time. The next five-year re-evaluation will be conducted in 2012.
2008	No change in status.
2009	No change in status.
2010	No change in status.
2011	*No change in status. Massport provided updated data for the MassDEP website.*
3. Former Robie Park (3-10027)	
2005	A Phase I was completed in 2005 with an RAO retraction. The RAO had been completed by the former property owner.
2006	No change in status for 2006.
2007	No change in status for 2007.
2008	A Phase II Scope of Work was prepared on May 9, 2008. A RAM Plan was submitted to MassDEP on September 16, 2008.
2009	A Phase V Remedy Operation Status Plan was submitted on March 31, 2010.
2010	Two Remedy Operation Status Reports were submitted on September 29, 2010 and March 28, 2011. The next status report was scheduled for September 30, 2011.
2011	*Phase IV Project Status Reports 3 and 4 were submitted in March and September 2011, respectively.*
4. Former Robie Property (3-23493)	
2005	A Phase I was completed in 2005.
2006	No change in status for 2006.
2007	No change in status for 2007.
2008	A Phase II was submitted to MassDEP on October 21, 2008.
2009	An Activity and Use Limitation (AUL) was recorded with the Suffolk County Registry of Deeds for the site on December 16, 2009.
2010	A Class A-3 RAO was submitted on January 4, 2010, corresponding with the recording of an AUL. On May 21, 2010, a RAM Plan for the Economy Parking Structure was submitted. The first RAM Status Report was submitted on September 21, 2010. An AUL Amendment was recorded on December 9, 2010.
2011	*A RAM Completion Statement was submitted on March 15, 2011. Regulatory closure has been achieved. No further response actions are required.*

Table 8-3 MCP Activities Status of Massport Sites at Logan Airport (Continued)	
Location (Release Tracking Number) and MassDEP Reporting Status	**Action/Status**
5. Tomahawk Drive (3-27068)	
2007	Release notification form submitted in August 2007.
2008	A Class B-1 RAO was submitted to MassDEP on January 9, 2009. No further response actions were required.
2009	No further response actions were required.
2010	No further response actions were required.
2011	*No further response actions required.*
6. Fire Training Facility (3-28199)	
2008	Oral notification of release was provided to MassDEP/BWSC on December 10, 2008
2009	A Phase I/Tier classification was submitted on December 17, 2009.
2010	A RAM Plan was submitted to MassDEP on August 6, 2010. A RAM Status Report was submitted to MassDEP on December 3, 2010.
2011	*A RAM Completion Statement was submitted on April 25, 2011.*
	A Phase II Scope of Work was prepared and submitted to MassDEP on January 18, 2011. Phase II and Phase III Reports were submitted on December 8, 2011. A RAM Completion Statement was submitted on April 25, 2011.
7. Southwest Service Area (3-28792)	
2009	Release notification form was submitted to MassDEP/BWSC on October 8, 2009.
2010	A Class B-1 RAO was submitted to MassDEP on October 18, 2010. No further response actions required.
2011	*No further response actions required.*
8. Airfield Duct Bank Site (3-29716)	
2010	Release notification form was submitted on December 22, 2010.
2011	*A Class A-1 RAO was submitted on December 23, 2011. No further response actions required.*
9. West Outfall Release (3-29792) *2011*	*Release notification form was submitted on April 8, 2011. Two IRA Status Reports were submitted to MassDEP on June 9 and December 5, 2011. An RAO was submitted on February 13, 2012. No further response actions required.*
10. Hertz Parking Lot Site (3-30260) *2011*	*Release notification form was submitted on August 29, 2011. A RAM Plan was submitted to MassDEP on September 1, 2011.*

Source: Massport

Notes: This list includes Massport MCP sites only. Additional sites are the responsibility of Logan Airport tenants. Refer to Figure 8-2 for location of MCP sites.

AUL	Activity and Use Limitation	Phase I	Initial Site Investigation
MCP	Massachusetts Contingency Plan	Phase II	Comprehensive Site Assessment
RAM	Release Abatement Measure	Phase III	Identification, Evaluation, and Selection of Comprehensive Remedial Actions
RAO	Response Action Outcome	Phase IV	Implementation of Selected Remediation Action
SPH	Separate Phase Hydrocarbon	Phase V	Operation, Maintenance and/or Monitoring
FDS	Fuel Distribution System		
ROS	Remedy Operation Status		
IRA	Immediate Response Action		

Figure 8-2 Massachusetts Contingency Plan Sites

Note: Refer to Table 8-3 for the numbered projects.

Environmental Compliance and Management

Massport works to minimize environmental impacts at Logan Airport through ongoing programs and new initiatives. In October 2000, the Massport Board approved an Authority-wide Environmental Management Policy, which articulates Massport's commitment to protect the environment and to implement sustainable design principles.

> *"Massachusetts Port Authority (Massport) is committed to operate all of its facilities in an environmentally sound and responsible manner. Massport will strive to minimize the impact of its operations on the environment through the continuous improvement of its environmental performance and the implementation of pollution prevention measures, both to the extent feasible and practicable in a manner that is consistent with Massport's overall mission and goals."*

Massport's overall environmental compliance and management efforts address the following goals:

- Protect water quality Airport-wide;
- Protect groundwater resources;
- Protect surface water resources (Boston Harbor);
- Minimize air quality impacts;
- Protect resources during construction;
- Mitigate construction impacts;
- Reduce occurrences of fuel leaks and spills; and
- Preserve coastal resources adjacent to the Airport.

The progress report for environmental compliance and management in Table 8-4 summarizes Massport's mechanisms for implementing these goals and details where changes to these efforts occurred in 2011.

Table 8-4 Progress Report for Environmental Compliance and Management

Plan Elements	Progress Report for 2011
Environmental Compliance Inspections	In 2011, Massport performed tenant inspections at a number of its National Pollutant Discharge Elimination System (NPDES) co-permittees' (Logan Airport tenants) leaseholds and made recommendations suggesting how to rectify issues identified during the inspections.
Environmental Management System (EMS) and International Organization for Standardization (ISO) 14001	ISO 14001 certification began for Facilities II (vehicle maintenance, landscaping, and snow removal) in December 2006. Recertification of Facilities II was obtained in December 2009. In 2010, Massport began the process of expanding the Logan Airport EMS to include Facilities I (Central Heating and Cooling Plant), Facilities II and Facilities III (Electrical and Structural). A certification audit of the expanded Logan Airport EMS took place in early June 2011, and a certificate was issued in July 2011. The current Logan Airport EMS covers Facilities I (Central Heating and Cooling Plant), Facilities II (vehicle maintenance, landscaping, and snow removal), and Facilities III (Electrical and Structural).
Tenant Technical Assistance	Massport continued publication of *EnviroNews*, a quarterly newsletter that informs tenants of regulatory calendar milestones, permitting requirements, pollution prevention, and best management practices (BMPs). It recommends use of sustainable materials and provides information on Massport and other environmental requirements (2011 newsletters are provided in *Appendix J, Water Quality/Environmental Compliance and Management)*.

Table 8-4 Progress Report for Environmental Compliance and Management (Continued)	
Plan Elements	**Progress Report for 2011**
Stormwater Pollution Prevention Plan (SWPPP)	In accordance with the requirements of the current stormwater outfall NPDES permit for Logan Airport that was issued on July 31, 2007, Massport and 25 other co-permittees were required to develop SWPPPs. Massport completed its SWPPP in December of 2007. Tenant SWPPPs were completed in March 2008. Massport's SWPPP addresses stormwater pollutants in general, and also addresses deicing and anti-icing chemicals, potential bacteria, fuel and oil, and other sources of stormwater pollutants. BMPs are included in the SWPPP. In accordance the other requirements of the NPDES permit, Massport is required to conduct training for personnel responsible for implementing activities identified in the SWPPP. The 2011 Annual Certificates of Compliance were submitted to EPA and MassDEP in December 2011 for Massport and each of its co-permittees.
Construction	Massport developed Sustainable Design Standards and Guidelines (SDSG) for use by architects, engineers, and planners who manage capital improvement projects for Massport (More information on SDSG is provided in *Chapter 1, Introduction/Executive Summary*). The SDSG, first issued in 2009 and revised in 2011, are designed to foster innovation yet include clear targets to achieve more sustainable project design and practices. The SDSG are intended to evolve over time, based on changes in technologies and industries. *Chapter 1, Introduction/Executive Summary* contains additional information on the SDSG. Massport provides a generic SWPPP to contractors for all Logan Airport construction projects, which provides guidance in preparing project-specific SWPPPs and BMPs to control sedimentation and other pollutants from construction projects. Massport monitors construction projects at Logan Airport for compliance with project SWPPPs and regulatory requirements. For all construction projects, Massport requires the use of ultra-low-sulfur diesel fuel in construction equipment, recycling of all construction waste to the maximum extent possible, and construction equipment retrofits with pollution control devices such as diesel oxidation catalysts and/or particulate filters.
Spill Prevention Control and Countermeasure (SPCC) Plans	Tenants meeting certain thresholds are required to prepare their own SPCC plans for their facilities. Massport checks for SPCC plans during its environmental compliance inspections. Additionally, tenants receive information on Massport BMPs, which focus on spill management and prevention.
Air Emissions Reduction	All Massport diesel vehicles are now fueled with ultra-low-sulfur diesel. In 2007, Massport investigated the use of parking heaters, which operate independently of a vehicle's engine, in order to measure fuel savings/air emissions reductions of reduced vehicle idling during snow operations. The investigation was discontinued in 2008 after Massport found that the parking heaters resulted in draining vehicle batteries. Massport will continue to explore anti-idling technologies as part of the EMS.

Source: Massport

Clean State Initiative and Leading By Example Program

- On April 18, 2007, the Governor signed Executive Order 484, establishing the Leading by Example – Clean Energy and Efficient Buildings Program (known as the Leading by Example Program).[10] Executive Order 484 supersedes Executive Order 438 which established Massachusetts' former Sustainability Program. The Leading by Example Program was created to help state agencies minimize the environmental impacts of their operations and activities and to promote innovative solutions to critical environmental problems. The Executive Order sets aggressive targets for state facilities in greenhouse gas emission reductions, energy conservation and efficiency, renewable energy, green buildings, and water conservation. Massport participates in this program voluntarily.
- As of 2009, Massport resolved all outstanding environmental matters of the Clean State Initiative, which was established under Executive Order 350.[11] The Clean State Initiative was established to ensure that all state agencies are aware of and are in compliance with the environmental laws of the Commonwealth. Massport worked to identify, evaluate, and correct matters of environmental noncompliance, which included re-plumbing of stormwater/sanitary piping work in the Terminal B garage in 2009. No other noncompliance issues have been identified.
- In 2009, Massport began developing an Energy Master Plan to reduce energy use and associated greenhouse gas emissions and increase the use of renewable energy for all Massport facilities. Further details on the Energy Master Plan are provided in *Chapter 7, Air Quality/Emissions Reduction.*

10 Governor Deval Patrick, Commonwealth of Massachusetts. Executive Order 484, Leading by Example – Clean Energy and Efficient Buildings. April 18, 2007. Available: http://www.mass.gov/governor/legislationeexecorder/executiveorder/executive-order-no-484.html.

11 Governor William Weld. Commonwealth of Massachusetts. Executive Order 350, Massachusetts Statewide Environmental Coordinating Council. February 3, 1993. Available: http://www.lawlib.state.ma.us/source/mass/eo/eotext/EO350.txt.

This Page Intentionally Left Blank

9

Project Mitigation Tracking

Introduction

This *2011 Environmental Status and Planning Report (2011 ESPR)* provides an update on the Massachusetts Port Authority's (Massport) mitigation commitments under the Massachusetts Environmental Policy Act (MEPA) for Logan Airport projects where an Environmental Impact Report (EIR) was filed. Each of the projects completed the state and federal environmental review processes and adopted a mitigation plan that has been formalized with individual Section 61 Findings.[1] Massport tracks both Massport and Logan Airport tenants' progress toward implementing and achieving their environmental mitigation commitments on schedule and according to the requirements set out in the Section 61 Findings for each project. As each project moves forward through its design and construction phases, its mitigation plan is implemented with ongoing tracking to ensure compliance. This chapter provides Section 61 mitigation commitment updates in 2011 for projects for which mitigation is ongoing or upcoming (Tables 9-1 through 9-7). Projects for which mitigation has been completed are not reported on in Environmental Data Reports (EDRs) and ESPRs. For projects with ongoing requirements, once those projects are constructed, mitigation tracking will report only on the continuing requirements.

Projects with Ongoing Mitigation

- **West Garage Project**, Executive Office of Environmental Affairs (EOEA, now Executive Office of Energy and Environmental Affairs (EOEEA)) #9790 (Phase I complete. Phase II construction was completed in early 2007). The status of continuing requirements is documented.
- **International Gateway Project**, EOEA #9791 (Phase I was completed in 2004; Phase II was completed in 2007; the final phase is not expected to be completed before 2015). The status of continuing requirements for Phases I and II is documented.
- **Replacement Terminal A Project**, EOEA #12096 (Terminal A opened March 16, 2005). The status of continuing requirements is documented.
- **Logan Airside Improvements Planning Project**, EOEA #10458 (Runway 14-32 opened on November 23, 2006. The Centerfield Taxiway was completed and became fully operational in 2009). The status of continuing requirements is documented.

1 Massachusetts General Law, Chapter 30, Section 61 (M.G.L. c. 30, § 61).

- **Southwest Service Area (SWSA) Redevelopment Program**, EEA #14137; on May 28, 2010, the Secretary of EOEEA issued a Certificate that determined that the Final EIR adequately and properly complied with MEPA and its implementing regulations. Massport's Board approved the Section 61 Findings for the SWSA Redevelopment Program on June 17, 2010. Construction of the program commenced in summer of 2010 and will be complete by 2014. The status of ongoing requirements is documented.

Recently Approved Project with Mitigation Conditions/Requirements

- **Logan Airport Runway Safety Areas (RSA) Project**, EEA #14442; on March 18, 2011, the Secretary of EOEEA issued a Certificate that determined that the Final Environmental Assessment (EA)/EIR adequately and properly complied with MEPA and its implementing regulations. Construction on the Runway 33L RSA began in June 2011 and was completed in November 2012. The replacement of the Runway 33L approach light pier was completed concurrently with Runway 33L RSA construction. Construction of the Runway 22R Inclined Safety Area (ISA) is not scheduled to begin until 2014. The status of the Runway 33L RSA enhancement project ongoing requirements is documented. Both project elements will be complete by the end of 2015.

Projects with Section 61 Mitigation

West Garage Project – EOEA #9790

Permitting History

- Certificate on the Final EIR issued on March 16, 1995
- Section 61 Findings approved on March 27, 1995

Project Status

The West Garage Project (Figure 9-1) was initially proposed to be constructed in two phases. Phase I of the Project provided 3,150 parking spaces that were consolidated from other areas of Logan Airport. The West Garage is directly connected to the Central Garage, centralizing the two structures' parking into a larger, single functioning, easily accessible garage. The West Garage Project also included construction of elevated walkways connecting the West Garage to Terminals A and E, and improvements to the terminal roadways. The original design of Phase II of the West Garage included the construction of a new structured parking facility adjacent to the West Garage. Instead, Massport concluded it was more cost efficient to proceed with Phase II by adding three additional levels (Levels 5, 6, and 7) to the existing Central Garage. Phase II of the West Garage Project provided approximately 2,800 additional parking spaces.

- Phase I – Construction commenced in October 1995 and the garage opened on September 8, 1998. The elevated walkways to the terminals were completed in 2002. Improvements to terminal roadways were completed in 2003.
- Phase II – Permitting completed in 2000 to add three levels to the Central Garage. Construction commenced in 2004 and the entire facility was completed in 2007.

Table 9-1 lists each of the continuing Section 61 mitigation commitment for the West Garage Project and Massport's progress in achieving these measures. Table 9-2 details the elements and status of the Alternative Fuels Program, which was a key mitigation effort associated with the West Garage Project. The mitigation measures in Tables 9-1 and 9-2 are from Section IV Mitigation of the *West Garage Project Final EIR*, January 31, 1995, and those measures referenced in the Massport Board vote on the West Garage Project. Many of the mitigation measures for this project have long since been implemented but it is noted in the tables when there have been recent updates.

Figure 9-1 West Garage Project

Phase I West Garage Construction
Phase II Addition to Central Garage

Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011)

Mitigation Measure	Status
Parking Pricing	
Parking pricing initiatives: keeping first-hour price high enough to provide a disincentive for pick-up/ drop-off.	**Implemented.** Massport continues to evaluate and adjust the first-hour price of parking. In light of the security prohibition on curbside parking, in 2002, Massport reduced the cost of the first half-hour from $4 to $2, the first time it had changed since the first-hour free rate was rescinded in 1998. In June 2007, rates increased to $3 for the first half-hour. Parking rates increased in March 2012 for on-Airport parking; further details on parking rate increases are provided in Table 5-6 of *Chapter 5, Ground Access to and from Logan Airport.*
Parking pricing initiatives: keeping the weekly price low enough to encourage vacation travelers to park for a week.	**Implemented.** Massport encourages long-term parking by providing lower cost parking at its Economy Lot. Data on long-term parking use are provided in *Chapter 5, Ground Access to and from Logan Airport.*
Massport will consider means to encourage the use of limited amount of on-Airport commercial parking for long-term parking and promote environmentally positive modes of airport access by air passengers.	**Implemented.** An important element of Massport's strategy to reduce the impact of Airport-related traffic on regional highways and local streets in neighboring communities is the Massport Parking Pricing Policy. Historically, Massport's Parking Pricing Policy encouraged long-term parking over short-term parking. That was accomplished by charging a premium for time spent in the on-Airport parking facilities between one and four hours and substantially reducing the per hour rate for parking durations longer than four hours. This strategy has proved to be a successful incentive for passengers to drive themselves and park long-term at Logan Airport rather than having someone else drop them off or pick them up. As described in *Chapter 5, Ground Access to and from Logan Airport*, parking exits have decreased as a result of longer terms stays.
Once sufficient data has been collected, Massport will evaluate parking behavior that may be attributable to the modified rates and consider further adjustments in pricing that will assist in achieving Massport's ground transportation goals.	**Implemented.** Massport's parking rate structure is compatible with continued growth in long-term parking, and the continued goal to increase the total high occupancy vehicle (HOV) use by air passengers toward 35.2 percent HOV access mode share. Adjustments to hourly parking rates have been made over time to reflect usage patterns.
Executive Director shall report to Massport annually regarding the effectiveness of parking pricing policy in achieving Massport's ground access goals initiatives and recommend appropriate policy adjustments.	**Implemented.** In October 2001, the Massport Board granted approval of commercial parking rates consistent with Massport's ground access goals. The higher rates went into effect November 12, 2001. In addition, in light of the new security restrictions on curbside parking, Massport reduced the cost of parking for the first half-hour from $4 to $2. In June, 2007, the cost of parking for the first half-hour increased to $3. These modifications foster the use of alternate forms of transportation for getting to Logan Airport, whereas the weekly cap at Economy Parking encourages long-term parking over pick-up and drop-off as a mode of access. Please refer to *Chapter 5, Ground Access to and from Logan Airport*, for additional details on Massport's parking pricing efforts.

**Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)**

Mitigation Measure	Status
Concurrent Ground Access Improvement Mitigation Measures	
Employee Trip Reduction Measures	
Massport will form a Transportation Management Association (Logan TMA) for Logan Airport employees to provide new opportunities for the development of targeted transportation demand management (TDM) strategies for Massport and airport tenant employees.	**Implemented.** In the 1995 Board Resolution, Massport's Executive Director was authorized to expend an initial amount of up to $50,000 for the purpose of organizing the Logan TMA. The Logan TMA was created in March 1997. Currently the Logan TMA is managed by Massachusetts Department of Transportation (MassDOT) through its MassRides program (www.commute.com). Massport continues to support the Logan TDM strategies by funding the Logan Sunrise Shuttle at an annual cost of $65,000. In turn, MassRides has a Logan TMA Coordinator who develops coordinates, and implements TDM strategies.
Massport will seek to develop, coordinate, and implement effective TDM strategies to reduce the number of single-occupant trips made by all Logan Airport employees.	**Implemented.** Massport continues to work with the MassDOT (which provides the Logan TMA coordinator position through its MassRIDES program) to support the Logan TMA. The 1995 Board Resolution authorized Massport to actively explore with the Logan TMA the feasibility of implementing various services. Massport assists the Logan TMA in providing services and by periodically conducting the Logan Airport Employee Survey (a survey was conducted in 2010). Results of the 2010 survey are summarized in *Chapter 5, Ground Access to and from Logan Airport.*
Massport will encourage participation by all employees, but will particularly target the airport's largest employers.	**Implemented.** Massport continues to target Logan Airport's largest employers. Refer to *Chapter 5, Ground Access to and from Logan Airport* for more details on the Logan TMA and its membership.
Massport will report on the formation and activities of the Logan TMA in the next Generic Environmental Impact Report (GEIR).	**Implemented.** The Environmental Status and Planning Reports (ESPRs) and Environmental Data Reports (EDRs) provide information on the Logan TMA, its services, membership, and employee commuter choices (via the Logan Airport Employee Survey). Information on Logan TMA is summarized in *Chapter 5, Ground Access to and from Logan Airport.*
Massport proposes to implement a new Logan Express service or other HOV service depending on the needs of the targeted market before Phase II of the West Garage Project is operational.	**Implemented.** The Peabody Logan Express facility opened in September 2001 (See *Chapter 5, Ground Access to and from Logan Airport* for additional information on Peabody Logan Express). Despite low ridership, Massport continues to operate this service.

**Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)**

Mitigation Measure	Mitigation Measure
Provide an airport shuttle service from South Station Transportation Center. Massport is preparing a feasibility and business plan for a South Station-Logan Airport shuttle service and will implement this service when the Third Harbor Tunnel is opened for commercial traffic. This service will be modeled on the existing, successful Logan Express services and will include frequent bus service between South Station and the airport terminals.	**Implemented.** In 1997, Massport sponsored the development of a joint public/private partnership with intercity bus operators serving the South Station Transportation Center. This partnership resulted in a bus connection that both the carriers and Massport promote. The service had limited success largely because of variable operator schedules and the fact that the service operates out of the South Station Transportation Center instead of a location closer to the South Station Red Line stop. Following the interim Logan DART service between Logan Airport and South Station in 2000 and coordination of other available bus services, in June 2005, Massport and the Massachusetts Bay Transportation Authority (MBTA) jointly commenced full Silver Line Airport Service providing a direct connection between South Station and each Logan Airport terminal. Refer to *Chapter 5, Ground Access to and from Logan Airport* for additional information on the Silver Line.
Massport will regularly evaluate the frequency of, and demand for, such shuttle service and will provide such service at the greatest frequency that is practical and effective.	**Implemented.** Massport continues regular collaboration with MBTA on the Silver Line Airport Service and makes adjustments as necessary. Since May 2012, Massport has sponsored a pilot program offering free rides on the Silver Line from Logan Airport to downtown Boston to promote HOV usage and heighten awareness of public transit options. The purpose of the pilot program is to promote ridership, operations, and customer service. Free service will continue through June 1, 2013.
Massport will implement a new water shuttle service in Boston Harbor before the opening of Phase I of the West Garage Project. The water shuttle would run between Logan Airport and one, or possibly, more sites in the Harbor.	**Implemented.** Massport identified a number of possible destinations for a new water shuttle service, with the Quincy Shipyard and Long Wharf sites meeting the basic service parameters. Harbor Express was chosen as the water shuttle operator and began operation between the Airport and these two sites in November 1996. Massport continues to support the Rowes Wharf Water Taxi and City Water Taxi operations. Refer to *Chapter 5, Ground Access to and from Logan Airport* for water shuttle ridership information.
The Executive Director shall make recommendations to Massport for budgetary appropriations to establish and implement the new ground access services on a schedule that permits Massport to implement the new ground access services within these time frames.	**Implemented.** The Executive Director/CEO recommends budgetary appropriations for ground access services on an annual basis.
Enhancement of Existing HOV Services: Logan Express	
Expand Logan Express hours of service.	**Implemented.** Service is offered from Braintree as early as 3:00 AM and as late as 11:00PM; from Framingham as early as 3:15 AM and as late as 11:00 PM; from Woburn as early as 3:00 AM and as late as 11:00 PM; and from Peabody as early as 3:15 AM and as late as 10:45 PM. Buses leave every hour or half hour. Logan Express buses now depart from Logan Airport as late at 1:15 AM. The Logan Express schedule is available at www.massport.com.
Provide a guaranteed ride home for Logan Express users.	**Implemented and subsequently modified.** From January 1995 until November 2001, Massport provided this service for air passengers and Logan TMA members. Due to financial constraints following September 11, 2001, this program was suspended for those passengers arriving after midnight with pre-purchased round-trip Logan Express tickets. Logan TMA members still benefit from this service through MassRides.

**Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)**

Mitigation Measure	Mitigation Measure
Provide Logan Express price incentives.	**Implemented.** Massport continues to monitor price incentives and implements additional incentives to promote Logan Express ridership, particularly during vacation periods and other periods of peak airport activity. In April 2011, Logan Express sites offered a discounted rate for parking. A survey of Logan Express passengers revealed that drop off activity at Logan Airport was reduced and the demand for parking at Logan Airport was reduced during the period of the discounted Logan Express parking. To encourage greater ridership, Massport restructured parking rates, which lowered parking rates to $7 per day from $11 per day at Logan Express parking lots. These rates went into effect on March 1, 2012 (and have resulted in increased Logan Express passenger activity at rates greater than the increase in Logan Airport air passengers). Further pricing incentives are under consideration.
Develop an additional Logan Express service.	**Implemented.** Massport opened a fourth Logan Express in Peabody, Massachusetts in September 2001, several years before the Section 61 Commitment date of the opening of Phase II of the West Garage Project. While the new service was initially planned to operate on a half-hour schedule like the Braintree, Framingham, and Woburn services, because of the dramatic air passenger reductions after September 11, 2001, (during Peabody's first week of service), to cut costs, Massport operated the Peabody Logan Express on hourly headways. In January 2004, in light of low levels of ridership on the Peabody Logan Express, Massport doubled service by going to a half-hourly schedule in an effort to stimulate ridership growth at Peabody. The service now operates on an hourly weekday schedule. In 2011, annual ridership levels were approximately 57,296 at Peabody, 519,036 at Braintree, 340,529 at Framingham, and 269,261 at Woburn.
Enhancement of Existing HOV Services: Water Transportation	
In conjunction with the MBTA, Massport will pursue joint ticketing opportunities for the Hingham Commuter Boat and the Logan Airport Water Shuttle.	**Implemented.** This ticketing program was explored, implemented in mid-1995 and discontinued in 2000 since many of the former users of this program now use the Harbor Express Service direct from Quincy to Logan Airport.
Massport is reviewing the fee schedules and operating requirements of the dock in order to make it more accessible and convenient to potential water taxi operators.	**Implemented.** In the fall of 1995, Massport made physical improvements to a low-freeboard float at the Logan Dock to create a dock capable of accommodating smaller vessels such as water taxis. In the fall of 2002, Massport completed expansion of the Harborside dock to accommodate the demand of additional vessels and to comply with handicapped accessibility requirements. The improved dock increases capacity from a two float system to a seven float system to accommodate the various water shuttles, taxis, and charter boats that are licensed to use it.
Initiate a new Boston Harbor Water shuttle service.	**Implemented.** Harbor Express service, between Logan Airport and the South Shore, began in November 1996, well before the opening of Phase I of the West Garage in September 1998. In 2001, the MBTA took over operations of this service.
Expand docking capacity at Logan Airport for water taxi and other services.	**Implemented.** Massport accommodates water taxi services, enhanced the dock as described above, provides communication links for passengers to call the taxi, and allows taxi passengers to use the free water shuttle buses to access the terminals from the dock. Water taxi information is posted on the Massport website. Details on the Water Taxi are provided in *Chapter 5, Ground Access to and from Logan Airport*.

**Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)**

Mitigation Measure	Mitigation Measure
Other Measures	
Coordinate with public and private entities to provide more extensive radio, television, and telephone announcements of poor traffic conditions with suggestions for alternative access modes.	**Implemented.** The 1-800-23LOGAN Customer Information Line includes the number of the telephone text information line. Callers to Customer Information Line may access the latest traffic information, flight status, parking information, cell phone waiting lot information, or learn about alternative forms of transportation to and from Logan Airport. Starting in August 1999, real-time traffic information and parking became accessible on Massport's website. Massport regularly contacts the media to inform the public about roadway changes, parking shortages and to encourage travelers to use HOV services. Similar information is disseminated on the Logan Airport e-mail subscriber list, the Massport website, Facebook, and on Twitter at twitter.com/bostonlogan.
HOV Marketing and advertising. Massport will continue the advertising and marketing programs for HOV services with an emphasis on promoting MBTA, Logan Express and water shuttle services to and from the airport.	**Implemented.** Massport spent over $27,000 on marketing of Logan Express in 2011. Massport continues to promote HOV services including availability, schedules and fares to consumers through the ground transportation Information Line at 1-800-23LOGAN and the website that provides up to the minute information. HOV advertising boards, schedules, and maps are placed at all Logan Airport terminals, at the MBTA Airport Station and at all shuttle bus pick-up/drop-off locations. Massport has actively promoted passenger water transportation in Boston Harbor for more than 20 years, playing a leadership role in policy development, planning, and promotions. This has included promoting vessel services at Logan Airport in the following ways: ▪ Annual updates and in-terminal and citywide distribution of a brochure promoting water transportation at Logan Airport; ▪ Annual updates of harbor-wide water transportation map showing routes serving Logan Airport and other routes and landings as well – Massport provides this map to the MBTA, area non-profits, and others interested in promoting passenger water transportation in Boston Harbor; ▪ Updated information promoting passenger water transportation at Logan Airport on 1-800-23-Logan and www.massport.com; ▪ Planning and promotions for kick-off press conference launching the first-ever electric water taxi to operate in Boston Harbor (Green Water Taxi operated by Rowes Wharf Water Transport); and ▪ Collecting, tracking, and disseminating passenger water transportation ridership data for Logan Airport passengers to aid in planning and facility development. Elsewhere in Boston Harbor, Massport prepared final design materials for a new hub water transportation terminal in the South Boston Waterfront which, when built, would serve as a state-of-the-art landing for water taxis and a potential terminus for future Logan Airport-based scheduled vessel routes.

**Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)**

Mitigation Measure	Mitigation Measure
Prepare an inventory of private scheduled services including origins/destinations, schedule, and cost.	**Implemented.** Massport continues to update and track information and services by more than 700 privately operated passenger services certified to operate at Logan Airport. Industry changes with such operations make publication of reliable service and schedule information impractical, if not impossible. However, Massport continued to expand and update information on transportation options to Logan Airport using the latest information technologies, including: ▪ Information and links to transportation companies on the Massport website. Some sites accessed through internet links provided passengers with on-line reservation services; ▪ Most scheduled service operators provided placards with current schedules posted in bus stop shelters located on the curb at each terminal. Individual bus schedules were also available at the information booths; and ▪ Transportation information database for on-line assistance at Logan Airport terminal information booths.
Proceed with environmental review and seek funding for construction of People Mover system.	**Implemented.** Massport completed the Environmental Assessment (EA) and Major Investment Study for the Logan Airport Inter-modal Transit Connector (AITC). The AITC evolved out of the People Mover process and evaluated new access routes to both the Blue Line and the South Station Transportation Center. On February 25, 1997, Massport submitted to the U.S. House Committee on Transportation and Infrastructure an application for the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) funds for the next phase of environmental review, planning and design of the AITC. Congressman J. Joseph Moakley was the congressional sponsor; the project also has the support from the Secretary of Transportation and the U.S. Environmental Protection Agency (EPA). The Logan AITC was included, for an unspecified funding level, in the 1997 ISTEA reauthorization bill. In 1998, Massport received a certificate on a Notice of Project Change (NPC) for the People Mover from the Secretary of EOEEA and a Finding of No Significant Impact (FONSI) on an EA from the Federal Transit Authority. In June 2001, Massport and the MBTA executed an interagency agreement for the purchase of eight Silver Line dual mode buses and the Massport Board approved the expenditure of approximately $13 million for this purchase. In 2004, Massport and the MBTA finalized the 10-year/$20 million dollar Inter-Agency Operating & Maintenance Agreement. Initial Silver Line service to the Airport began in December 2004 and full service began in June 2005 (refer to *Chapter 5, Ground Access to and from Logan Airport* for additional details).
Alternative Fuels program. Massport is carrying out an extensive program to convert existing Massport-owned service vehicles to environmentally preferable sources.	**Implemented.** Table 9-2 of this *2011 ESPR* details Massport's progress in achieving these measures.

**Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)**

Mitigation Measure	Mitigation Measure
Measuring, Monitoring, and Evaluating Ground Access Improvements	
Massport will assess progress towards the achievement of HOV goals using on-Airport Automated Traffic Monitoring Systems (ATMS).	**Implemented.** Massport has an ATMS plan that provides daily traffic counts at all gateways and other critical locations. Massport uses technologies that utilize on-Airport traffic signal controllers and loops for traffic counting. The Logan ATMS uses technologies that detect vehicle movement: inductive loop lines, and microwave sensors. Upgrades of the ATMS equipment, program software and infrastructure are underway and will result in accurate, meaningful vehicle counts. With the completion of the Terminal Area Roadway system and other regional highways expected in the near future, The project is complete and the upgraded ATMS is functioning as planned and designed.
Massport will assess progress towards the achievement of HOV goals by monitoring parked vehicles using systems such as the parking and revenue control (PARC) system.	**Implemented.** Massport monitors all parking activity at Logan Airport and inventories all commercial parking facilities on a daily basis. Updated PARC systems were installed in the Terminal B Garage in 2004, with Central/West Garage following in 2005. Terminal E and Economy Garage also have PARC systems.
Monitor HOV Services (Logan Express, MBTA, water shuttle, limousine/bus, and taxi).	**Implemented.** Massport maintains a "real time" log of dispatcher reports for Logan Express, the taxi pool, and the bus/limousine pool and other ground transportation operations at Logan Airport. Massport coordinates with the MBTA and the operators of all water shuttles serving Logan Airport to track ridership and service schedules. Daily Logan Express ridership and operations data are submitted monthly to Massport. Massport maintains a Passenger Water Transportation Ridership Summary on a monthly basis. Massport maintains a continuing record, the Ground Transportation Unit (GTU) Daily Event Log, of all occurrences impacting the Airport roadways, terminal curbs, and access roads. This log cites such events as accidents, lane closures, bus delays, as well as routine and non-transportation events.
Monitor passenger activity and employee modes of transportation.	**Implemented.** The most recent employee and air passenger surveys were conducted in the spring of 2010 and are summarized in *Chapter 5, Ground Access to and from Logan Airport* of this *2011 ESPR*. Additional detailed results were provided in the *2010 EDR.* The *2007 EDR* summarized the previous 2007 survey results in *Chapter 5, Ground Access to and from Logan Airport*. Air passenger surveys are used to measure Massport's success in achieving a 35.2 percent HOV mode share by the time Logan Airport accommodates 37.5 million passengers.
Massport supports the use of Automated Vehicle Identification (AVI) to monitor, manage, and facilitate efficient traffic operations at Logan Airport and elsewhere on the regional transportation system.	**Implemented.** An AVI system for Massport's Logan Airport shuttles and Logan Express buses is planned. All new buses are being procured with AVI/global positioning system (GPS), in anticipation of a planned "next bus" arrival notification system. In addition, the consolidated car rental facility (ConRAC) will have an operations room with the required equipment to track the new clean-fuel unified bus fleet.
Track the effectiveness of ground access measures.	**Implemented.** Massport continues to track the effectiveness of its ground access mitigation programs in its annual MEPA filings. See *Chapter 5, Ground Access to and from Logan Airport* for 2011 details.

Source: Massport
Note: Text in italics detailing the mitigation measures is from Section IV, Mitigation of the *West Garage Final EIR*, January 31, 1995.

Table 9-2 describes the Alternative Fuels Program, which was part of the West Garage Section 61 commitments.

Table 9-2 Alternative Fuels Program — Details of Ongoing Section 61 Mitigation Measures for the West Garage Project (as of December 31, 2011)

Program Element	Projected Date of Completion/ Acquisition	Status
Purchase four electric passenger utility vehicles	Winter 1995	**Implemented.**
Purchase five electric sedans	Winter and Summer 1995	**Implemented.**
Build compressed natural gas (CNG) quick-fill station	Spring 1995	**Implemented.** The station has been operational since 1995. It is New England's largest CNG quick fill station and serves Massport's vehicles, over two dozen Airport tenants, and nearby fleet vehicles. New higher flow dispensers at the station have reduced fueling time for heavy-duty vehicles, and have increased storage capacity at the station. Currently, more than a dozen companies and organizations are fueling natural gas powered vehicles at the station. In 2011, the station pumped approximately 41,550 gallon equivalents per month. Additional above-ground storage was also provided.
Purchase five electric buses	Spring and Summer 1995	**Implemented.** Massport purchased two electric buses and leased one. These vehicles operated at Logan Airport between 1996 and 2001. After more than six years of testing and evaluation, Massport determined that electric buses are neither durable nor dependable enough to function effectively in the demanding operating environment at Logan Airport. Massport's new unified bus fleet includes clean diesel/electric hybrid buses. Massport will continue to evaluate electric and other alternative fuel vehicles (AFV) as new technologies become available.
Purchase five electric pick-up trucks	Spring 1995	**Implemented.**
Use soy-blend diesel fuel	Spring 1995	**Implemented.** Massport's shuttle fleet operated on soy diesel from 1995 to 1999. In 1999, all the buses were replaced with CNG buses. This fleet was fully replaced in 2012 by CNG and clean-diesel/electric hybrid buses.
Purchase additional AFVs	Spring 1995	**Implemented.** Refer to *Chapter 7, Air Quality/ Emission Reduction* for a list of AFVs.
Purchase six CNG buses	Summer 1995	**Implemented.** The initial fleet of 26 CNG shuttle buses was fully replaced in 2012 with 32 60-foot clean diesel/electric hybrid buses and 18 42-foot CNG buses.
Purchase four electric vans	Summer 1995	**Implemented.**
Install quick-charge kiosks for electric vehicles	Summer 1995	**Implemented.**
Develop slow-charge infrastructure	Ongoing	**Implemented.** The electric charging infrastructure included 15 inductive charging locations but these are not in use since there are no vehicles currently using inductive charging. In 2012, Massport installed 13 new electric vehicle charging stations to accommodate a total of 26 vehicles in the Central and Terminal B parking areas.

Source: Massport

International Gateway Project (Terminal E) – EOEA #9791

Permitting History:

- Certificate on the Final EIR issued on December 2, 1996
- Section 61 Findings submitted to EOEEA June 26, 1997

Project Status

The International Gateway Project (Figure 9-2) expands and upgrades Terminal E to provide better service to international passengers. The original Terminal E was opened in 1974 and over time became outdated and too small to accommodate the growth in international travel. This project is being constructed in phases:

- **Phase 1 – Complete.** This phase of the project included a weather-protected outside airside bus portico with an elevator and escalator linking the ground floor with the second floor to accommodate passengers arriving on remotely parked aircraft that are unable to park at a gate because it is occupied by another aircraft.
- **Phase 2 – Complete.** This phase of the project enlarged Logan Airport's congested Federal Inspection Services (FIS) Facility, and improved the meeter/greeter lobby and the ticketing area of Terminal E to maximize passenger convenience and reduce processing times in the terminal. The project called for the reconstruction and expansion of Terminal E in and around the existing terminal while keeping it operational and safe. The new departure hall includes high ceilings, wood paneling, built-in artwork, and views of the city skyline. Additionally, to reduce curb and roadway congestion at Terminal E, this project also included a new separated roadway system for arrivals and departures.
- **Future Phase – Pending.** This phase involves the construction of a new West Concourse, which will add three new gates to Terminal E to accommodate wide-body aircraft.

Construction of this project commenced in the summer of 1998. Phase 1 was completed in 2004. The departure level of the new $321 million terminal, including the new ticketing hall and departure level roadway, opened in May 2003. Enlargement of the FIS Facility and construction of the new arrivals level was completed in July 2007. Phase 2 is now complete. Preliminary work was completed for the West Concourse; however, further work is not expected before 2015. Additional information on the status of this project is available in *Chapter 3, Airport Planning.*

Table 9-3 lists each of the continuing mitigation measures for the International Gateway Project in the Section 61 Findings along with Massport's progress in achieving these measures through the end of 2011. Many of the mitigation measures for this project have long since been implemented but it is noted in the tables when there have been recent updates. Completed design and construction phase measures are described in previous EDRs.

Figure 9-2 International Gateway Project

Note: Runway 14-32 construction completed in November, 2006.

Table 9-3 International Gateway Project Status Report (EOEA #9791)
Section 61 Mitigation Measures (as of December 31, 2011)

Mitigation Measure	Status
Alternative Fuel Outreach Program	
Massport is working cooperatively with the EPA and regional utility providers in coordinating an ongoing outreach program aimed at promoting the use of clean-burning alternative fuels. This program, which is also supported by fuel providers, vendors, and state and federal agencies, will offer information to airport tenants in the following areas: ■ *Notification of grant programs or other financial incentives for vehicle conversions.* ■ *Assistance in cost-benefit analysis for conversion of conventionally fueled vehicles to AFVs.* ■ *Assistance in placing airport tenants in contact with alternative fuel suppliers and product vendors.*	**Implemented.** Massport continues to work cooperatively with National Grid, Alternative Vehicle Service Group (AVSG), the City of Boston, and the Massachusetts Clean Cities Coalition to promote the implementation and integration of Alternative Fuel Vehicles (AFVs) into local private and public fleets. In May 2007, Massport adopted two new policies to promote alternative fuel and hybrid vehicle usage at Logan Airport by others: 1) limited front-of-line taxi pool privileges; and 2) preferred Parking locations in the Central Garage and the new Economy Garage. These policies remain in effect. In addition, Massport has supported and financially sponsored the Boston GreenFest since 2009 and AltWheels Fleet Day since 2003. These are annual forums to promote alternative fuels and sustainable transportation modes.
HOV Promotion	
Massport will reserve terminal space for ground transportation ticket sales, reservations, and information.	**Implemented.** This space has been provided in a staffed information area in the arrivals area of the new terminal. In a joint venture with Massachusetts Bay Transportation Authority (MBTA) new Charlie Card automated fare collection equipment was installed in all Logan Airport terminals in 2006. In mid-2012, in an effort to encourage greater transit ridership, Massport commenced a pilot program for free boarding of the Silver Line at Logan Airport through June 1, 2013.
Attractive and distinctive signage and graphics will be utilized inside the terminal and out at the curb to clearly mark access to Logan Express, MBTA, water transportation, and other HOV options.	**Implemented.** Signage has been installed in the terminal and at the curbside identifying high occupancy vehicle (HOV) curb locations. In 2012, Massport installated new digital signage at all terminal Silver Line curb locations to indicate next bus wait times.
As HOV services continue to develop and expand at Terminal E, Massport will expand its web page to encompass these new services and initiatives.	**Implemented.** Massport continues to reflect service changes on its website.
Massport and the MBTA will offer, on a trial basis, the sale of MBTA tokens via a vending machine in the baggage claim area of Terminal C.	**Implemented.** The MBTA Charlie Card machines (which replaced tokens) are located at the MBTA's Blue Line Airport Station and in each of the Logan Airport passenger terminals. Massport continues to offer free service to Airport Station and the water shuttle dock with its new fleet of CNG and clean diesel/electric hybrid buses. Since the summer of 2012, Massport has also sponsored a pilot program offering free rides on the Silver Line from Logan Airport to downtown Boston. This program will continue through June 1, 2013.

Note: Text in italics detailing the mitigation measures is excerpted from the Section 61 Findings submitted to the EOEEA, June 26, 1997.

Replacement Terminal A Project – EOEA #12096

Permitting History

- Certificate on the Final EIR issued on November 16, 2000
- Section 61 Findings submitted to EOEEA on August 31, 2001

Project Status

The Replacement Terminal A Project (Figure 9-3) involved the complete demolition of the pre-existing Terminal A and construction of a new facility by Delta Air Lines, consisting of a main terminal linked to a satellite concourse. The old Terminal A was closed in May 2002 and demolition commenced shortly thereafter. The project was designed to be constructed in five phases. However, as a result of September 11, 2001, air traffic at Logan Airport reduced dramatically allowing Massport to relocate the airlines at Terminal A to other terminals with minimal impact, and to shut down Terminal A entirely rather than having to phase construction concurrent with passenger activity. As a result, construction progressed ahead of schedule in 2003 and 2004. Terminal A opened on March 16, 2005.

In the spring of 2006, Delta Air Lines and Massport submitted an application for certification of Terminal A under the U.S. Green Building Council Leadership in Energy and Environmental Design® (LEED) Green Building Rating System™. LEED certification was awarded in June 2006, making Terminal A the first airport terminal in the world to be awarded LEED certification.

The following sustainable elements were incorporated into the design of Terminal A:

- Water conservation — low-flow toilets, waterless urinals, and drip rather than spray irrigation.
- Atmosphere protection — zero use of chlorofluorocarbon (CFC)-based, hydrochlorofluorocarbon (HCFC) based, or halon refrigerants.
- Energy conservation — special roofing and paving materials that reflect solar radiation. Solar panels were installed on the roof of Terminal A in 2012.
- Materials and resources conservation — more than 10 percent of all the building materials used to construct the terminal were from recycled materials.
- Enhanced indoor environmental air quality — low and volatile organic compound (VOC) free adhesives, sealants, paints, and carpets were used, and smoking is prohibited inside the terminal building.
- Sustainable sites — bicycle racks were installed in proximity to bus and subway systems.

Figure 9-3 Replacement Terminal A Project

Note: Runway 14-32 construction completed in November, 2006.

Table 9-4 lists each mitigation measure in the Section 61 Findings along with Massport's progress in achieving these measures through the end of 2011.

Table 9-4 Replacement Terminal A Project Status Report (EOEA #12096) Section 61 Mitigation Measures (as of December 31, 2011)

Mitigation Measure	Status
Project Design Mitigation	
Logan TMA Participation	
Delta Air Lines, Inc. has joined Massport's Logan TMA. Delta Air Lines will designate an Employee Transportation Advisor at Terminal A to be the conduit between the Logan TMA Coordinator and Delta Air Lines employees.	**Implemented.** Delta Air Lines joined the Logan Transportation Management Association (TMA) and designated an Employee Transportation Advisor.
Additionally, Delta Air Lines will provide the following services as part of their Transportation Demand Management Program through the Logan TMA Transportation subsidy for full-time Delta Air Lines employees at Logan Airport; ride matching/carpooling; vanpooling; guaranteed ride home; preferential parking for HOVs; shuttle to and from employee parking.	**Implemented.** Transportation Demand Management (TDM) services are provided through the Logan TMA.
Recycling Program	
The Replacement Terminal A will be included in within Massport's terminal recycling program.	**Implemented.** Paper, plastic, aluminum, glass, and cardboard are recycled at Terminal A.
High Occupancy Vehicle (HOV) Promotion	
HOV access can be accommodated on the departures level and will be designated near main entrances to the terminal building to ensure efficient and convenient unloading by air passengers who use these mode-types to access the Airport. *The inner-most curb of [the arrivals level] will be designated exclusively for HOVs and taxis, similar to the departures level.*	**Implemented.** HOV access has been incorporated into the final design. HOV lanes give HOV modes preferential access to Terminal A for passenger convenience at both the arrival and departure levels. The Silver Line service has a dedicated stop at Terminal A on the inner-most curb. New digital next bus signage was installed at the curb in 2012.
Ground Service Equipment (GSE) Conversion	
In conjunction with the Project, Delta Air Lines will implement a program for conversion of its entire GSE fleet at Terminal A as soon as viable alternative fueled fleet vehicles become available and can be effectively integrated into Delta Air Lines' operations at Terminal A. Delta Air Lines will introduce battery powered baggage tugs and belt loaders with the replacement terminal and convert this portion of the GSE fleet by the end of 2008. This represents over 40 percent of Delta Air Lines' current GSE fleet.	**Implemented.** The Terminal A design incorporates infrastructure for GSE charging. In September 2009, Massport approved a $3 million dollar loan to Delta Air Lines for the purchase of battery-powered baggage tugs and battery powered-baggage conveyor belt vehicles. Delta Air Lines purchased 50 electric baggage cart tugs, 25 electric baggage conveyor belt vehicles, and charging stations for each vehicle. Thirty-two GSE charger installations have been completed, and are currently serving electric GSE.
Delta Air Lines will also examine the feasibility of locating a Compressed Natural Gas (CNG) fill station at Terminal A. The availability of a CNG fueling station would facilitate conventionally-fueled vehicles to be replaced with CNG-fueled vehicles where this vehicle option is offered. Delta Air Lines will introduce these vehicles into its GSE fleet as soon as they become available and are determined to be feasible and practicable for use at Terminal A.	**Implemented.** Delta Air Lines examined the feasibility of locating the CNG fill station at Terminal A and determined it to be infeasible given that the GSE conversions are trending toward electric vehicles. A CNG fuel facility is available on the Airport at 81 North Service Road.
Where new AFVs are developed and determined to be cost effective and in available supplies, Delta Air Lines will integrate their use into its Terminal A GSE fleet operations.	**Implemented.** As described earlier, Delta Air Lines has purchased electric baggage tugs and belt loaders and will continue to determine the feasibility of integrating other alternative fuel GSE, as available.

**Table 9-4 Replacement Terminal A Project Status Report (EOEA #12096)
Section 61 Mitigation Measures (as of December 31, 2011) (Continued)**

Mitigation Measure	Status
Finally, Delta Air Lines will provide Massport with an annual status report/update on the GSE conversion program at Terminal A, for inclusion in Massport's annual EDR.	**Implemented.** Terminal A includes 32 electric charging stations for Delta Air Lines' electric ramp vehicles. Delta Air Lines continues to study which AFVs and infrastructure are best suited for its future GSE operations.
Operational Mitigation Measures	
Minimizing nighttime movement of aircraft to and from hardstand positions.	**Implemented.** In accordance with the Noise Rules, Massport continues to restrict nighttime movement of aircraft under their own power between 10:00 PM and 7:00 AM, and Massport also requires towing during this time period.
Using single engine taxiing and pushback to the extent feasible and practicable, recognizing that such use always at the discretion of the pilot in charge of the aircraft based upon his or her experience and safety and operational considerations.	**Implemented.** Massport has conducted two surveys of Logan Airport air carriers (2006 and 2009) to understand the extent single engine taxiing is used at Logan Airport. Massport also issued a letter to air carriers in support of single engine taxiing when consistent with safety procedures in 2006. Massport is an active member of the Federal Aviation Administration (FAA) Partnership for Air Transportation Noise and Emissions Reduction (PARTNER) program on reducing noise and emissions. In 2009, Massport offered to facilitate the undertaking by the Massachusetts Institute of Technology (MIT) of a more detailed survey of pilots at Boston Logan Airport to better understand the use of single engine taxiing. MIT completed its survey and issued a paper in March 2010 (as provided in the *2010 Environmental Data Report [2010 EDR]*) The MIT survey confirms earlier Massport survey findings that single engine taxiing is an important operational measure used by airlines to conserve fuel and is extensively used at Logan Airport. Based on the more detailed survey results, Massport will tailor future communication to airlines to further encourage the use of single engine taxiing, when safe to do so, within the Logan Airport operational context. In January 2011, Massport sent letters to the Boston Airline Community and the Logan Airport user community encouraging them to consider the use of single engine taxiing when safe to do so. This is provided in *Appendix M* of this *2011 ESPR.*
Testing alternative de-icing methods to reduce the amount of glycol usage.	**Ongoing.** Delta Air Lines is currently using sodium formate, an environmentally friendly deicing material, for pavement deicing. Delta Air Lines will continue to investigate additional de-icing alternatives.

Source: Massport
Note: Text in italics detailing the mitigation measures is excerpted from the Section 61 Findings submitted to the EOEEA, August 31, 2001.
1 Details are available in the Section 61 Findings.

Logan Airside Improvements Planning Project – EOEA #10458

Permitting History

- Certificate on the Final EIR issued on June 15, 2001.
- Section 61 Findings dated June 8, 2001 on the Final EIR.
- In June 2002, the Federal Aviation Administration (FAA) filed a Final Environmental Impact Statement (FEIS) and issued the Record of Decision (ROD) in August 2002 approving a unidirectional runway and other improvements, but deferred a decision on the centerfield taxiway pending additional review by the FAA.
- In November 2003, the Superior Court of the Commonwealth modified a 1976 injunction prohibiting construction of a new runway at Logan Airport, pending further environmental review. The injunction modification allowed construction of the runway in accordance with the MEPA Certificate on the Final EIR and the FAA's ROD on the Final EIS.
- In accordance with the Secretary of EOEEA's Certificate on the Final EIR, Massport amended its final Section 61 Findings issued in 2001 to incorporate mitigation measures added or refined through the federal environmental review process. As a result, Massport amended its initial Section 61 Findings on October 21, 2004, to include mitigation measures required of it in the FAA's ROD.
- In April 2007, the FAA issued a ROD on the centerfield taxiway improvements based on its review of supplemental information.

Project Status

- Project construction commenced in 2004. Runway 14-32 opened on November 23, 2006. 2007 was the first full year of operation of Runway 14-32.
- Realignment of the southwest corner taxiway system was completed in 2007.
- Taxiway D extension was completed in 2010.
- Taxiway N realignment is anticipated to commence after 2015.
- Reduction in approach minimums on Runway 15R and 33L will be implemented in early 2013 following completion of the 33L Light Pier replacement and FAA testing of new Instrument Landing System (ILS) equipment.

The Logan Airside Improvements Planning Project (Figure 9-4) involved the construction of a new unidirectional Runway 14-32 and centerfield taxiway, extension of Taxiway D, realignment of Taxiway N, improvements to the southwest corner taxiway system, and reduction in approach minimums on Runways 22L, 27, 15R, and 33L. Reduction in approach minimums on Runway 15R and 33L were approved in the EIS. However, implementation for approach minimum reductions depends upon realignment of the ILS. The construction impacts of relocating the ILS localizer and new CAT III ILS equipment were addressed in the environmental review of the RSA enhancements for Runway 33L (EOEA #14442). CAT III ILS is planned to begin operations in 2013.

Table 9-5 summarizes the mitigation measures contained in the amended Section 61 Findings issued on October 21, 2004 and reports on the status of implementation. Table 9-5 addresses only ongoing requirements, and it is noted when there are recent updates. Documentation on design and construction measures is contained in previous EDRs.

Figure 9-4 Logan Airside Improvements

Note: Runway 14-32 construction completed in November, 2006.

Table 9-5 Logan Airside Improvements Planning Project (EOEA #10458) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011)

Project Design and Mitigation Measures	Status
Runway 14-32 Operations and Construction Mitigation	
Operational procedures for unidirectional Runway 14-32 will include over water flight operations only, arrival operations in east-to-west direction from Runway 32 approach end, and departure operations from west-to-east direction from the Runway 14 departure end. Massport will enter into contract with appropriate government body and/or community group(s) to enforce intended unidirectional runway, if requested. Lighting, marking, and instrumental components of Runway 14-32 will be designed for a unidirectional runway. No parallel or other type taxiway facility will be constructed to allow east-to-west direction departures from the Runway 32 end.	**Implemented.** Runway 14-32 was constructed for unidirectional operation. All lighting, marking and navigational instrumentation was constructed and is operated for unidirectional use only. There is no parallel or other type of taxiway facility that would facilitate east-to-west direction departures from the Runway 32 end. The construction mitigation measures were incorporated into the final design specifications and were implemented during construction. Runway 14-32 opened on November 23, 2006.

Table 9-5 Logan Airside Improvements Planning Project (EOEA #10458)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)

Mitigation Measure	Status
FAA endorsed the unidirectional limitations on Runway 14-32 and has agreed to develop air traffic control procedures to ensure safe and efficient operation of the unidirectional limitation, subject to variances that may be required to accommodate particular aircraft emergencies.	
Wind-Restricted Use of Runway 14-32	
Restrict the use of Runway 14-32 to those times when winds are equal to or greater than 10 knots from the northwest or southeast (between 275 degrees and 005 degrees, or 095 degrees and 185 degrees, respectively).	**Implemented.** Massport provided initial data to support Federal Aviation Administration's (FAA) effort. The FAA implements the wind restriction in compliance with the federal Record of Decision (ROD).
Mitigation Policies/Programs	
Regional Transportation Policy	
Engage in promoting increased utilization of regional airports *Cooperative transportation planning with the various transportation agencies to ensure an integrated regional transportation infrastructure, i.e., improved highways, public transportation, high-speed rail, private transportation services to improve regional airport access.*	**Implemented.** During 2001, Massport, together with the FAA and the six New England Regional State Aviation Directors developed a scope of work and selected a technical team to undertake the New England Regional Aviation System Plan (NERASP) Update study. In 2002, the Massport Board approved 10 percent funding with a 90 percent federal match toward the $1.6 million study. Please refer to *Chapter 4, Regional Transportation,* for additional information on Massport's cooperation on regional transportation efforts.
Massport will continue to exercise operational control over Worcester Regional Airport.	**Implemented.** The Authority exercised operational control over Worcester Regional Airport as part of Massport's agreement with the City of Worcester which went into effect on January 15, 2000. In April 2004, Massport and the City of Worcester agreed to a three-year extension of the Operating Agreement, extending Massport's operation of the Airport through June 2007. Subsequently, both parties agreed to a further extension. Legislation was passed in 2009 requiring Massport to assume ownership of Worcester Regional Airport. Massport's ownership of Worcester Regional Airport commenced on July 1, 2010.
Massport will continue to attract new air service to Worcester Regional Airport.	**Implemented.** Following the events of September 11, 2001, the last commercial operator, US Airways Express, ceased operations out of Worcester in early 2003. In 2003 and 2004, Massport continued to work with the City to attract passenger service for the Worcester Regional Airport. Service by Allegiant Airways commenced in December 2005 but ceased in September 2006. Commercial passenger service was regained when Direct Air began scheduled charter services in November 2008, but commercial passenger services ceased again in 2012. Massport continues to work with carriers and make other facility improvements to develop and sustain commercial service from Worcester.

Table 9-5 Logan Airside Improvements Planning Project (EOEA #10458) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)

Mitigation Measure	Status
Traveler and air service awareness will be provided to Worcester Regional Airport via marketing campaigns.	**Implemented.** In 2011, Massport continued marketing of Worcester Regional Airport following the beginning of Direct Air commercial service at the airport in November 2008. Direct Air ceased operations at Worcester Airport in 2012. Massport continues to aggressively market the Airport to potential commercial air service carriers.
Develop and maintain an aviation information database to include: aviation trend tracking reports for distribution to interested parties; statistical summaries of passenger levels, aircraft operations and airline schedule data at major New England regional airports; include a summary of regional airport trends and service developments an Annual Report.	**Implemented.** Massport collects regional airport data. A summary of individual airport activity is published annually in the Environmental Data Reports (EDR), and in the Environmental Status and Planning Reports (ESPR).
Participate in other regional/state aviation forums.	**Implemented.** The NERASP study was completed in the fall of 2006. Massport continues to participate in regional and state aviation forums as they exist. Please refer to *Chapter 4, Regional Transportation,* for additional information on Massport's cooperation on regional transportation efforts.
Continue to work with FAA/regional airport directors to complete a New England Airports System Study to evaluate regional airports performance. FAA committed to work with other participants in the preparation of the study.	**Implemented.** The NERASP Study was published in October 2006.
Encourage transportation initiatives (i.e., commuter rail, rail or other links between regional airports) by relevant agencies or other governmental bodies through Transportation Bond Bill or other legislative initiatives to implement an improved effective regional transportation system.	**Implemented.** Massport continues to provide support for regional transportation legislation and funding for other modes of transportation including the MBTA Silver Line and water transportation. Massport's support was instrumental in the opening of the Anderson Regional Transportation Center (RTC) in Woburn which provides a station building for ticketing, baggage and passenger services, approximately 2,400 parking spaces for daily and overnight parking, loading platforms for Logan Express and local buses, improved access from Interstate 93 via a new interchange constructed and opened by the Massachusetts Department of Transportation (MassDOT, formerly the Massachusetts Highway Department) and a new high-level platform commuter rail station.
Continue to support inter-city rail planning through the Boston Metropolitan Planning Organization (MPO).	**Implemented.** Massport continues to actively participate in the Boston MPO and contributes to the policy discussions in all modes of transportation.
Allow Massport's Logan Express satellite parking lots and stations available for third-party bus and park-and-ride connections to other regional airports, including Worcester, Manchester, and Providence.	**Implemented.** Upon request and review, Massport will continue to allow third party bus operators to provide service to regional airports from Logan Express facilities. In 2007, Massport enacted an agreement with Manchester-Boston Regional Airport to allow operation of a shuttle service between Manchester-Boston Regional Airport and the RTC in Woburn. That pilot program was replaced by hourly van service in 2008.

Table 9-5 Logan Airside Improvements Planning Project (EOEA #10458)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)

Mitigation Measure	Status
Sound Insulation: *Sound insulation is being provided within the Boston Logan Airside Improvements Planning Project Mitigation Contour including the affected residences of Chelsea, East Boston, Winthrop and Revere. Through special project mitigations, FAA funding will be provided for residences with building code considerations to allow for the necessary upgrades thereby ensuring eligibility and participation in the sound insulation program. If FAA funding is unavailable to complete sound insulation to residences within the DNL 65 dB contour as a result of project implementation, Massport will provide the funding." See Chapter 6, Noise Abatement for additional details on Sound Insulation.*	**Implemented.** Sound insulation is being implemented in full compliance with state and federal regulatory requirements and mitigation commitments. Since 1986, Massport has sound insulated over 6,000 homes totaling over 11,000 dwelling units within several day-night sound level (DNL) 65 decibel (dB) Noise Exposure Contours.
Preferential Runway Advisory System (PRAS) *Massport will develop and implement a PRAS monitoring system and a new distribution system for reporting that will expand the contents of Massport's Quarterly Noise Reports and will involve the expansion of the distribution list to include the Logan Airport Citizens Advisory Committee (CAC). Runway utilization, dwell and persistence reports will be included in the ESPR filings with MEPA. Massport will continue to work with FAA to design additional reports to enhance the attainment of PRAS and Massport will begin to work with CAC to update PRAS. The current PRAS system will remain in place until superseded.*	**Implemented.** Massport, FAA, and the CAC initiated a noise study of Logan Airport. PRAS review and reporting are incorporated into the noise study. During Phase 2 of the on-going Boston Logan Airport Noise Study (BLANS) the Logan Airport Community Advisory Committee (CAC) voted to abandon PRAS because it had not achieved the intended noise abatement. For additional information, refer to *Chapter 6, Noise Abatement.* Runway utilization, dwell and persistence reports continue to be included in the annual ESPR and EDR filings.
Noise Abatement Study *FAA has committed to undertake a noise abatement study that will include enhancing existing or developing new noise abatement measures applicable to aircraft overflight impacts, which will take into account environmental benefit, operational impact, aviation safety and efficiency, and consistency with applicable legal requirements. The scope of this study has been completed through the joint efforts of FAA, the CAC, and Massport as required by the ROD. Massport will work with the CAC and FAA to assess the existing PRAS at Logan Airport in accordance with Section 10.0 of the Section 61 Findings and will continue to participate in the noise study as contemplated in the ROD.*	**Implemented.** The FAA, in conjunction with Massport and the Logan Airport CAC, initiated the Boston Overflight Noise Study (BONS). Phase 1 of the study, completed in early 2007, defined and will seek to implement changes to flight tracks to minimize impacts from aircraft overflights which do not require a detailed Environmental Assessment (EA). Federal funding for Phase 2 was requested early to ensure seamless continuation of the study and transition. Phase 2, of the BLANS, was completed in 2012. It addressed additional noise abatement alternatives that will require detailed analysis to meet FAA environmental requirements. FAA has begun implementing new aRea NAVigation (RNAV) procedures that were designed in Phase 1. Please refer to website www.bostonoverflight.com for more details.

Table 9-5 Logan Airside Improvements Planning Project (EOEA #10458) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)

Mitigation Measure	Status
Peak Period Monitoring and Demand Management Program (DMP)	
Massport will develop and implement a Peak Period Pricing (PPP) program or an alternative DMP. Massport will identify standards to allow airlines to accurately predict scheduling costs and modify accordingly. Massport will establish and maintain a monitoring system. *Massport will comply with its commitments with respect to PPP or alternate DMP. FAA has indicated in the ROD that it stands ready to assist Massport in this endeavor.*	**Implemented.** In July 2004, Massport filed a proposed rule with the Office of the Massachusetts Secretary of State to formally initiate the state rulemaking process and public review of a proposed rule to establish a peak period surcharge during designated peak delay periods at Logan Airport. The filing was followed by a public comment period that lasted through November 15, 2004. During the comment period, Massport conducted two public hearings to receive comments on the proposed regulation. The Massport Board voted to establish the peak period surcharge program on January 16, 2005. The program has been in place since that date. Please refer to *Appendix K, 2011 Peak Period Pricing Monitoring Report.*
Single Engine Taxi Procedures	
Develop and implement a program designed to maximize the use of single engine procedures by all tenant airlines, consistent with safety requirements, pilot judgment and Federal law requirements.	**Implemented.** Massport supports the use of single engine taxiing when it can be done safely, voluntarily and at the discretion of the pilot. Massport has conducted two surveys of Logan Airport air carriers (2006 and 2009) to understand the extent single engine taxiing is used at Logan Airport. Massport also issued a letter to air carriers in support of single engine taxiing when consistent with safety procedures in 2006. Massport is an active member of the FAA Partnership for Air Transportation Noise and Emissions Reduction (PARTNER) program on reducing noise and emissions. In 2009, Massport offered to facilitate the undertaking by MIT of a more detailed survey of pilots at Boston Logan Airport to better understand the use of single engine taxiing. MIT completed its survey and issued a paper in March 2010 (as provided in *Appendix M* of this *2011 ESPR*). The MIT survey confirms earlier Massport survey findings that single engine taxiing is an important operational measure used by airlines to conserve fuel and is extensively used at Logan Airport. Based on the more detailed survey results, in January 2011, Massport issued a new letter to air carriers in support of single engine taxiing when consistent with safety procedures. A copy of that letter is included in *Appendix M of this 2011 ESPR.*
Report on Progress of Logan Transportation Management Association (TMA)	**Implemented.** *Chapter 5, Ground Access to and from Logan Airport* of the *2011 ESPR* discusses the status of the Logan TMA and efforts to increase Logan TMA membership and overall high occupancy vehicle (HOV) access to Logan Airport. Since MassRIDES began management of the Logan TMA in January 2006, the joint focus has been on expanding Logan TMA services, broadening HOV options, and supporting all major Logan Airport tenants to become members and actively participate in the Logan TMA. In 2007, the Logan TMA implemented three new programs: Sunrise Shuttles; Logan TMA Preferential Carpooling; and Commuter Cash program.

Source: Massport

Note: The mitigation measures in italics are those that were referenced in the FAA's ROD and later incorporated into the October 21, 2004 amended Section 61 Findings.

Southwest Service Area (SWSA) Redevelopment Program, EOEA # 14137

Permitting History

- Certificate on the Final EIR issued on May 28, 2010
- Section 61 Findings submitted to EOEEA on June 29, 2010

Project Status

Massport is redeveloping the SWSA and constructing a new consolidated rental car facility (ConRAC). Consolidation of the rental car operations and their shuttle buses into one coordinated operation will result in reduced vehicle miles traveled and associated air emissions.

Construction of enabling projects commenced in late summer 2010 as final design of the facility continued through 2011. All ConRAC facilities (the Garage Structure, Customer Service Center (CSC), permanent Quick Turnaround Areas (QTAs) 1 and 2, and temporary QTAs 3 and 4) would be constructed first. The first rental car companies are expected to move into the QTA 1 in mid-2013 and the remaining companies by early 2014. By 2014, the entire project will be completed and operational. Table 9-6 outlines the SWSA Redevelopment Program Section 61 commitments which Massport, the construction contractors, and the rental car companies will implement as part of the design, construction and operation of the facility. This project is currently under construction, and there is updated progress for each mitigation measure.

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011)

Mitigation Measure	Status
Site Design	
Stormwater Management	
Improve quality of runoff by upgrading stormwater management facilities site-wide, reducing the volume of flow to the Maverick Street Outfall by increasing pervious area site-wide, utilization of Low Impact Design elements, and replacing uncovered parking areas with buildings.	**To be implemented.** These stormwater design features are included in the final project design and will be part of the completed project now under construction. The stormwater features include 27 stormceptors that will be constructed as part of this project. Stormceptors are prefabricated, underground units that separate oils, grease, and sediment from stormwater runoff when installed as part of a pipe conveyance system.
Design new sanitary and drainage systems to result in an overall reduction in combined sewer overflow volumes at the Porter Street Outfall and eliminate discharge to Maverick Street Outfall and Bird Island Flats/West Outfall.	**Implemented.** The sanitary sewer system designed for the ConRAC project adds new connections at Gove Street and Harborside Drive. Sanitary flows to the Maverick Street sewer will be significantly reduced once the connection is completed. Massport submitted a pre- and post-development stormwater analysis with the Notice of Intent (NOI) for the ConRAC project, as required by MassDEP's Stormwater Management Regulations. The stormwater analysis shows an overall reduction in the post-development stormwater flows for the project, as well as reductions in flows to the Porter Street and West Outfalls and elimination of stormwater flow to the Maverick Street Combined Sewer. Both the sanitary sewer system and stormwater drainage system are now under construction.

**Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011)**

Mitigation Measure	Status
Remediation and Underground Fuel Storage Systems	
Remove all existing car rental fueling systems and associated tanks and replace with current, state-of-the-art vehicle fueling and washing facilities.	**To be implemented.** This element will be implemented as part of the quick turnaround facilities.
Develop a Soil Management Plan and submit to the MassDEP prior to construction for the Activity and Use Limitations (AUL) areas.	**Implemented.** As required by the ConRAC project specifications, the Project Contractor submitted an Excavated Materials Management & Disposal Plan prepared by a Licensed Site Professional (LSP) and submitted it on March 25, 2011 for Massport review and approval. Two Release Abatement Measure (RAM) Plans for work within AUL areas were submitted by the Contractor's LSP to the DEP in accordance with the MCP. Construction occurred within two AUL areas, associated with MCP sites identified by Release Tracking Number (RTNs) 3-00956 and 3-2690, and submittal of the RAM Plans were required to detail procedures for managing contaminated soil. RAM Status Reports have been submitted on a 6-month schedule documenting soil management activities, and electronic files of these reports can be accessed by searching the RTNs on the DEP website.
During construction, the soil and groundwater environmental issues surrounding the existing rental car operations would be addressed in compliance with the Massachusetts Contingency Plan (MCP).	**Implemented.** During construction, any soil and groundwater issues surrounding the existing rental car operations are being addressed in compliance with the MCP.
Noise Reduction Measures	
Eliminate individual rental car shuttle buses and combine Massport Airport Station buses (routes 22/33/55) through the Unified Bus System; thereby, reducing the overall number of rental car-related buses circulating on-airport and associated noise.	**To be implemented.** Massport purchased a new Bus Fleet which was put into operation in 2012. The bus fleet is comprised of 18 compressed natural gas (CNG) buses and 32 clean diesel/electric buses that have already replaced Massport's older fleet of 26 CNG buses and will ultimately replace the entire fleet of diesel rental car shuttle buses once the ConRAC is fully operational in 2014.
Incorporate noise reduction strategies into site design, such as solid fences/walls, gateway signs/walls, and landscaped berms.	**To be implemented.** This element is included in the final design and is under construction.

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)

Mitigation Measure	Status
Phase 2 SWSA Airport Edge Buffer and Other Site Landscaping	
Construct other site landscaping that encourages walking/biking by providing safe and welcoming corridors, reduces environmental impact (water efficient; reduce and filter runoff), and screens the SWSA from neighboring properties.	**To be implemented.** This element is included in the final design and will be part of the completed project.
Building Design	
Energy Efficiency	
Optimize daylight and natural ventilation within the Garage Structure (a Code classification for an "open parking structure") to eliminate the need for substantial mechanical ventilation systems.	**To be implemented.** This element is included in the final design and is under construction.
Reduce energy consumption by a minimum of 20 percent (as required by MA LEED Plus) by properly sizing building mechanical systems and incorporating high performance/energy efficient mechanical and electrical building systems, such as highly-reflective (high-albedo) roofing materials, reduced lighting intensities, high-efficient heating and cooling systems, and daylighting techniques with window and skylight glazing.	**To be implemented.** This element is included in the final design and is under construction.
Reduce overall electricity consumption by 2.5 percent through the use of on-site renewable energy (which contributes to the overall 20 percent energy efficiency performance criteria above).	**To be implemented.** This element is included in the final design and is under construction.
Conduct a third-party commissioning process to ensure the effectiveness of building systems (as required by MA LEED Plus).	**To be implemented.** Third party commissioning will occur upon building completion.
Water Efficiency and Wastewater Reduction	
Reduce water use demand by a minimum of 20 percent (as required by MA LEED Plus) and to strive for a 30 percent reduction through utilization of high-efficient/ low-flow plumbing fixtures and car wash water reclamation systems.	**To be implemented.** This element is included in the final design and is under construction.
Reduce water use demand and wastewater generation by reclaiming and reusing car washing water.	**To be implemented.** This element is included in the final design and is under construction.
Potential collection of and reuse of stormwater runoff for irrigation of landscaped areas.	**To be implemented.** This element is being considered as part of the final design. A rain garden has been included in the final design as a method to control stormwater runoff, and will be implemented as part of the project.

**Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)**

Mitigation Measure	Status
Noise Reduction Measures	
Improve the Quick Turnaround Areas (QTAs), including the elimination of outdoor loudspeakers, elimination of car drying blowers through state-of-the-art equipment, enclosed vacuum compressors, and incorporation of six to eight-foot high solid walls/fences designed to further reduce noise from activities at the QTA facilities, including car washing and vehicle movements.	**To be implemented.** This element is included in the final design and is under construction.
Transportation and Parking	
Roadway Improvements	
Reconstruct Porter Street, including turnaround for exiting taxis.	**To be implemented.** This element is included in the final design and is under construction.
Reconfigure SR-14 and new alignment of Ramp 1A-S.	**To be implemented.** This element is included in the final design and is under construction.
Construct new dedicated Unified Bus System access and ramp off of SR-14.	**To be implemented.** This element is included in the final design and is under construction.
Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Porter Street intersection.	**To be implemented.** This element is included in the final design and is under construction.
Reconstruct, widen and convert Jeffries Street to one-way northbound, between Harborside Drive and Tomahawk Drive.	**To be implemented.** This reconfiguration is underway.
Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Jeffries Street intersection.	**To be implemented.** This element is included in the final design and is under construction.
Construct the extension of Tomahawk Drive –a one-way westbound roadway connecting Harborside Drive with the Maverick Street Gate and Garage Structure.	**To be implemented.** This element is included in the final design and is under construction.
Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Hotel Drive intersection.	**To be implemented.** This element is included in the final design and is under construction.
Reconfigure inbound lane of the Maverick Street Gate to provide additional queue storage.	**To be implemented.** This element is included in the final design and is under construction.
Airport Transportation System Improvements	
Reduce the rental car shuttle bus fleet by approximately 70 percent through the creation of the Unified Bus System when compared to the 2007 Existing Condition and future No-Build/No-Action Conditions.	**To be implemented.** Massport purchased a new Unified Bus Fleet of diesel/electric hybrid and CNG buses. The initial buses were put into operation in 2012. Full implementation of the new bus fleet will occur when the ConRAC opens.

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)

Mitigation Measure	Status
Reduce rental car shuttle bus terminal curbside congestion through the creation of the Unified Bus System resulting in reduced emissions.	**To be implemented** upon project opening. Massport purchased a new Unified Bus Fleet which was put into initial operation in 2012.
Utilize clean- and low-emission fuel for the Unified Bus System to further reduce emissions.	**To be implemented** upon project opening. Massport has purchased a new Unified Bus Fleet. The new fleet is comprised of diesel/electric hybrid and CNG buses.
Install Intelligent Transportation System features, as part of the Unified Bus System to further reduce emissions and improve operational efficiency.	**To be implemented** upon project opening. Massport purchased a new Unified Bus Fleet which was put into initial operation in 2012.
Implement new wayfinding signage to increase the efficiency of the circulating vehicles within and around the SWSA.	**To be implemented** upon project opening. This element is included in the final design and is under construction
Pedestrian and Bicycle Facilities	
Provide new pedestrian and bicycle facilities, including secure and covered bicycle storage at the Customer Service Center (CSC) and QTA buildings for employees, customers and the general public, as well as shower/changing facilities within the QTA buildings for employees.	**To be implemented.** This element is included in the final design and is under construction
Provide enhanced pedestrian connections to and from the SWSA, airport terminals, the Logan Office Center, Memorial Stadium Park, Bremen Street Park, the Harborwalk, on-airport buses, public transit (MBTA Airport Station), along Porter Street, and surrounding East Boston neighborhoods.	**To be implemented.** This element is included in the final design and is under construction
Provide street and pedestrian-level lighting and advanced warning signals and/or systems at crosswalks.	**To be implemented.** This element is included in the final design and is under construction
Transportation Demand Management (TDM) Plan	
Provide limited SWSA employee parking on-site.	**To be implemented.** Limited on-site employee parking is included in the final design.
Provide new access to public transit through the Unified Bus System (direct connection to MBTA Blue Line at Airport Station) and new/enhanced pedestrian facilities at the station.	**To be implemented.** This element is included in the final design and is under construction.
Require rental car companies to participate in the Logan Transportation Management Association (TMA).	**Implemented.** This requirement is included in new consolidated car rental facility (ConRAC) tenant leases.
Alternative-Fuel Vehicles	
The rental car companies would provide fuel-efficient and/or alternative-fueled rental vehicles (quantity to be determined by the rental car companies).	**Implemented.** This requirement is included in new ConRAC tenant leases.

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2011) (Continued)

Mitigation Measure	Status
Off-Airport Improvements/Benefits	
Reconstruct Frankfort Street/Lovell Street intersection to provide a new traffic signal control and pedestrian-related improvements (for temporary impacts of the relocation of the Bus and Limousine Pools to the North Service Area (NSA) during construction).	**Implemented.** This element is completed.
Reduce the amount of off-airport car shuttling to and from off-airport locations, further reducing traffic on Route 1A and local roadways surrounding the airport due to the consolidated and expanded rental car "ready/return" parking spaces and QTA areas at the SWSA.	**To be implemented** upon project opening.
Construction Management	
Aim to divert/reduce construction waste to landfills.	**Implemented,** construction underway.
Implement Erosion and Sedimentation Control Program.	**Implemented,** construction underway.
Retrofit certain diesel construction equipment types with diesel oxidation catalyst and/or particulate filters (in accordance with the DEP Clean Air Construction Initiative).	**Implemented,** construction underway.
Require the use of ultra-low sulfur diesel fuel for off-road construction vehicles and/or equipment.	**Implemented,** construction underway.
Construction worker vehicle coordination and trip limitation, including requiring contractors to provide off-airport parking and use of high-occupancy vehicle transportation modes for employees.	**Implemented,** construction underway.
To ensure no changes in the conditions of abutting homes due to pile driving, Massport will require the Contractor to inspect the conditions of the abutting homes prior to and following pile driving activities.	**Implemented.** Preconstruction residential survey completed. Construction underway.

Source: Massport

Recently Approved Projects with Upcoming Mitigation Requirements

Logan Airport RSA Project – EEA #14442

Permitting History

- Certificate on the Final EA/EIR issued on March 18, 2011.
- The FAA issued a Finding of No Significant Impact (FONSI) on April 4, 2011, which documents that the proposed Federal action is consistent with the National Environmental Policy Act of 1969 (NEPA) and other applicable environmental requirements and will not significantly affect the quality of the human environment with the mitigation requirements referenced in Table 9-7.
- Section 61 Findings were submitted to EOEEA on May 27, 2011, and published in the *Environmental Monitor* on June 8, 2011.

- Certificate on the Notice of Project Change (NPC) for the replacement of the Runway 33L approach light pier issued on March 9, 2012.
- On April 12, 2012 the FAA found that the replacement of the Runway 33L approach light pier was a Categorical Exclusion and thus exempt from further consideration under NEPA.

Project Status

- The first construction season for the Runway 33L RSA commenced in June 2011 and ended in November 2011. The second construction season started again in June 2012 and the project was completed in November 2012.
- Replacement of the Runway 33L approach light pier commenced in July 2012 and was completed in November 2012. The upgraded CAT III system is expected to be in service in 2013.

As described in previous EDRs/ESPRs, Massport has periodically undertaken RSA improvement projects at other Logan Airport runways. Massport has completed safety improvements for Runways 22L, 4L/4R, and 27 under EOEA #5122. In 2005, Massport began undertaking safety improvements at Runway 22R with the construction of an Engineered Materials Arresting System (EMAS) bed at the end of the runway in compliance with FAA directives, although no MEPA review was needed. In 2006, as part of a separate project, Massport installed an EMAS bed at the Runway 33L End. The current project, the Logan Airport RSA Project, considered further enhancements to the Runway 33L and Runway 22R RSAs. Massport prepared a combined EA in accordance with NEPA and an EIR in accordance with MEPA for the proposed enhancements at the Runway 33L and Runway 22R RSAs. The ENF was filed with MEPA on June 30, 2009, and the Draft EA/EIR was submitted to FAA and EOEEA on July 15, 2010. The Final EA/EIR was submitted to FAA and EOEEA on January 30, 2011. Figure 9-5 indicates the status of RSA projects at Logan Airport.

The Runway 33L RSA improvements include a 600-foot long RSA with an EMAS bed, portions of which are on a 460-foot long by 303-foot wide pile-supported deck extending over Boston Harbor. Additional elements of the RSA improvements include two emergency access ramps located on either side of the deck and relocation of the perimeter access road. Construction of the pile-supported deck was completed in November, 2012.

The current Runway 33L RSA project replaced the inner 500 feet of the light pier. As construction progressed on the Runway 33L RSA improvements, Massport determined that it would be feasible to replace the remaining Runway 33L approach light pier. In summer of 2012, Massport began replacing the outer approximately 1,900 feet of the existing timber light pier that extends approximately 2,400 feet southeast of Runway End 33L. The existing timber pier was replaced with a new concrete structure along the runway centerline, approximately 10 feet south of the old pier, using concrete pilings. The in-kind replacement reduced the total number of pilings significantly (from over 500 to approximately 150). As part of the reconstruction, the new light pier was also constructed to accommodate upgraded navigational aids. The pier improvements provide the infrastructure necessary to support navigational aids that will facilitate implementation of the reduced aircraft approach minimums previously reviewed and approved by the FAA in a ROD dated August 2, 2002, for the *Logan Airside Improvements Planning Project (Airside Project)*. Massport filed a NPC with MEPA for the proposed light pier replacement on January 31, 2012. On March 9, 2012, the EOEEA Secretary issued an NPC Certificate determining that no further MEPA review was required for the light pier replacement. On April 12, 2012 the FAA found that the replacement of the Runway 33L approach light pier was eligible for a Categorical Exclusion and thus exempt from further review under NEPA.

The Runway 22R improvements will enhance the existing RSA at this location by constructing an ISA, similar to the ISA constructed at the Runway 22L end. Massport chose to construct an ISA because it would enhance the existing RSA and rescue access in the event of an emergency, at a feasible construction cost while minimizing impacts to environmental resources. Construction of the Runway 22R ISA is anticipated to begin after substantial completion of the Runway 33L RSA enhancements and be completed by 2015. Table 9-7 lists the Section 61 commitments for the Logan Airport RSA Project and Massport's progress in achieving these measures.

Figure 9-5 Runway End Safety Improvements

Table 9-7 Logan Airport Runway Safety Area Improvement Program (EEA # 14442) Section 61 Mitigation Commitments to be Implemented

Mitigation Measure	Status
Protected Resources	
Eelgrass	
Develop a mitigation program that will replace lost eelgrass area and functions by creation of new eelgrass, at a 3:1 replacement to loss ratio.	**Implemented.** Eelgrass was transplanted in 2011, but did not survive through 2012. In 2012, Massport continued to work with the Eelgrass Mitigation Working Group (comprised of federal, state, and local agencies) to identify alternative means of eelgrass mitigation.
Implement sediment control measures.	**Implemented.** Sedimentation control measures were installed and fully maintained.
Store construction barges outside of any eelgrass beds overnight.	**Implemented.** There was no overnight barge storage in or immediately adjacent to eelgrass beds.
Restrict barge movement to designated construction corridors outside of the eelgrass bed.	**Implemented.** There was no barge movement in or immediately adjacent to eelgrass beds.
Provide post-construction monitoring and restoration or any additional areas of eelgrass beds that are inadvertently damaged during construction.	**Implemented.** The post-construction monitoring was conducted in November, 2012.
Salt Marsh	
Restore new salt marsh at a 2:1 replacement to loss ratio.	**To be implemented** as part of future Runway 22R habitat mitigation at Rumney Marsh.
Monitor compensatory salt marsh for success and invasive plant species, and implement an invasive species control plan.	**To be implemented** as part of future Runway 22R habitat mitigation at Rumney Marsh.
Implement erosion and sedimentation control measures according to the Soil Erosion and Sediment Control Plan.	**To be implemented** as part of future Runway 22R habitat mitigation at Rumney Marsh.
Shellfish	
Monitor pilings and substrate at Runway 33L.	**To be implemented beginning 2013.**
Restore approximately 1.1 acres of habitat.	**To be implemented** as part of future Runway 22R habitat mitigation at Rumney Marsh.
Harvest and transplant shellfish from the footprint of the Runway 22R Inclined Safety Area (ISA).	The MA Division of Marine Fisheries (MassDMF) has identified a risk of shellfish disease in the Logan Airport flats, including 22R and has determined that the shellfish should not be relocated.
Execute Memorandum of Agreement with the Massachusetts Division of Marine Fisheries for resource enhancement.	**Implemented.** A Memorandum of Agreement (MOA) with MassDMF was executed on July 30, 2012 and the requirements of the MOA are being implemented.
State-Listed Rare Species	
Identify equivalent area of pavement for removal to maintain area of available habitat at Logan Airport for the upland sandpiper if required by the Massachusetts Natural Heritage and Endangered Species Program.	**To be implemented.** The Massachusetts Natural Heritage & Endangered Species Program (NHESP) has determined that construction time of year restrictions will avoid impacts to state-listed species. These seasonal restrictions will be implemented when construction of Taxiway C-1 is initiated in the future.
Cultural Resources	
Develop an Unanticipated Discovery Plan in accordance with the Board of Underwater Archaeological Resources' Policy Guidance	**Implemented.** An Unanticipated Discovery Plan was developed in accordance with the Board of Underwater Archaeological (BUA) Resources' Policy Guidance and approved by BUA. No resources were discovered during Runway 33L construction.

Table 9-7 Logan Airport Runway Safety Area Improvement Program (EEA # 14442) Section 61 Mitigation Commitments to be Implemented

Mitigation Measure	Status
Water Quality	
Develop and implement a comprehensive Soil Erosion and Sediment Control Plan in accordance with NPDES and MassDEP standards.	**Implemented.** A comprehensive Soil Erosion and Sediment Control Plan was developed and implemented at the outset of Runway 33L construction in June 2011 and maintained through the end of construction in 2012.
Apply water to dry soil to prevent dust production.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Stabilize any highly erosive soils with erosion control blankets and other stabilization methods, as necessary.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Use sediment control methods (such as silt fences and hay bales) during excavation to prevent silt and sediment entering the stormwater system and waterways.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Maintain equipment to prevent oil and fuel leaks.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Use silt curtains and semi-permanent (overnight) debris booms and other secondary booms and silt fencing around barges for additional containment.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Contain and pump slurry and/or silty water to a containment area on a construction barge in order to contain runoff	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Noise	
Maintain mufflers on construction equipment.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Keep truck idling to a minimum in accordance with Massachusetts anti-idling regulations.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Fit any air-powered equipment with pneumatic exhaust silencers.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Do not allow nighttime construction.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Air Quality	
Keep truck idling to a minimum in accordance with Massachusetts anti-idling regulations.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Retrofit appropriate diesel construction equipment with diesel oxidation catalyst and/or particulate filters.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Implement construction worker vehicle trip management, including requiring contractors to provide off-airport parking, use high-occupancy vehicle transportation modes for employees, and join the Logan TMA.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction. Contractors assemble offsite and access the airfield in shared vans. Contractors have access to Logan Airport Transportation Management Association (TMA) services through MassRides.
Traffic	
Limit construction traffic to federal or state highways, restricting the use of East Boston local roadways by construction vehicles.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction.
Implement construction worker vehicle trip management, including requiring contractors to provide off-airport parking, use high-occupancy vehicle transportation modes for employees, and join the Logan TMA.	**Implemented.** Completed for Runway 33L construction; pending for future Runway 22R construction. Contractors assemble offsite and access the airfield in shared vans. Contractors have access to Logan TMA services through MassRides.

This Page Intentionally Left Blank


CNG
524
ALL TERMINALS