Boston-Logan International Airport





2010 EDR Environmental Data Report

EOEA #3247
October 2011

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

SUBMITTED BY:
Massachusetts Port Authority Economic Planning & Development

PREPARED BY:
Vanasse Hangen Brustlin, Inc.

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

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October 15, 2011

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 2010 Environmental Data Report* (*2010 EDR*) - 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 2010 Environmental Data Report* (*2010 EDR*). Logan Airport continued to show improvements in a number of environmental areas in calendar year 2010 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. *Chapter 1, Introduction/Executive Summary* of this EDR expands the discussion of airport sustainability initiatives.

In 2010, passenger levels recovered from 2009 levels, but did not exceed the all-time peak of 28.1 million experienced in 2007. Total aircraft operations at Boston-Logan International Airport (Logan Airport) also increased although by a slightly smaller percentage than the number of passengers. This *2010 EDR* considers the continuing effects of airlines operating much more efficiently with cleaner and quieter fleets and flying more passengers per aircraft operation, and the associated reduction in ground access activities. While these changes continue to yield environmental benefits, as the economy and aviation industry recover, Massport anticipates increases in activity levels and some increases in environmental effect. As described throughout the *2010 EDR*, Massport remains fully committed to minimizing those effects. The *2010 EDR* is outlined below.

Content and Structure

The *2010 EDR* responds fully to the Secretary's Certificate on the *Boston-Logan International Airport 2009 EDR* and reports on the status of airport operations, environmental conditions, and Massport milestones achieved in 2010. The document also provides updates on more recent significant Logan activities. The document incorporates comments made on the *2009 EDR* and consists of a single volume reporting on the following 2010 categories:

- Highlights for 2010, 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 2009 EDR* and other comment letters received on the *2009 EDR*;
- Secretary's Certificates issued for Logan Airport projects during 2010;
- Individual responses to comments received on the *2009 EDR;*
- Proposed scope for the *2011 Environmental Status and Planning Report (ESPR);*
- Distribution list; and
- Supporting technical appendices.

Review Period, Distribution, and Consultation

A 30-day public comment period for the *2010 EDR* will begin on November 9, 2011, the publication date of the next Environmental Monitor, and will end on December 9, 2011. The distribution list included as Appendix D indicates that all parties on the distribution list will be sent an electronic copy of the *2010 EDR* on CD. A smaller number of reviewers will be sent hard copies of the *2010 EDR*. The full *2010 EDR* will also be available on Massport's website (www.massport.com).

A MEPA consultation session on the *2010 EDR* is scheduled for 4:00 PM on November 16, 2011, at the Logan Office Center, One Harborside Drive, East Boston (Logan Airport). Additional copies of the *2010 EDR* may be obtained by contacting Christina Bocchino at (617) 568-3507 during the 30-day public comment period.

Future Filings and Timing

Starting in 1997, Massport 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 approval from the Secretary, the next ESPR has been deferred to report on 2011 conditions. A proposed scope for the *2011 ESPR* is included as Attachment C. As previously described, the timing of the next ESPR is directly tied to the ongoing global economic downturn, and reduced activity levels at Logan Airport. The reduced activity levels have similarly translated to environmental impact levels that remain well below historic levels and recent peaks. In 2010, near-term activity levels and associated environmental effects continue to remain well below levels previously analyzed for Logan Airport. Thus, the forecasted aviation growth presented in the *2004 ESPR*—the basis upon which the ESPR schedule was initially established —has not occurred.

As indicated in the *2009 EDR*, several factors influenced Massport's request to defer the next Logan Airport ESPR to reflect analysis of calendar year 2011. The primary factor is the continued downturn in worldwide aviation activity, which has led Massport to develop updated passenger and operations forecasts. The new forecasts look, for the first time, at the three Massport airports (Logan, Hanscom and Worcester) as a system of airports as well as on an individual basis. The new forecasts use 2010 as the base year and develop and project aviation activity forward for calendar year 2030. The new forecasts will provide the basis of the ESPR's modeled assessment of air quality, noise and other factors out to 2030.

Another key element of Logan's long-range planning is ground access, and in particular how our passengers and employees get to the Airport. In addition to the *2010 Logan Airport Air Passenger Survey*, Massport recently began work on a *Sustainable Ground Access Strategy and Service Plan* for Logan Airport. This Plan is expected to inform Massport's long-range ground access and parking plans, including our future high occupancy vehicle (HOV) strategies. Over the past one to two years, Massport has also conducted a number of focused surveys to gather information on economy commercial parking, and Logan Express passenger and employee user trends. Together with the new system-wide forecasts, the surveys provide a new and superior foundation for longer-range ground access planning and overall updated Logan Airport facility planning. As the proposed ESPR scope (Appendix C) indicates, the *2011 ESPR* is an excellent tool to present the revised forecasts, updated ground access planning and a broader vision of how the three Massport airports are likely to function moving forward.

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 substantial. Accordingly, Massport requests an extended schedule for filing the *2011 ESPR*; specifically, Massport requests the Secretary's approval to file the *2011 Logan ESPR* in Spring 2013.

Massport hopes that you and other reviewers of the *2010 EDR* 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, if you have any questions.

Very truly yours,

Stewart Dalzell
Deputy Director, Environmental Planning and Permitting

cc: *2010 EDR* Distribution List (Appendix D in the *2010 EDR*)
Janeen Hansen/Massport

Table of Contents

List of Appendices

List of Tables

List of Figures

Figure No.	Description	Page

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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 *Boston-Logan International Airport 2010 Environmental Data Report (2010 EDR)* 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. EDRs provide a review of environmental conditions for the reporting year compared to the previous year. Approximately every five years, Massport also prepares Environmental Status and Planning Reports (ESPR), which provide a historical and prospective view of Logan Airport. For over 20 years, Massport has, through its EDRs and ESPRs, and the MEPA process, provided an annual update on Logan Airport's environmental achievements for public and agency review and comment.

The scope for this *2010 EDR* was established by the Secretary of the Executive Office of Energy and Environmental Affairs' (EEA) Certificate dated November 12, 2010, which is included in *Appendix A, MEPA Certificates and Responses to Comments*. This *2010 EDR* updates and compares the data presented in the *2009 EDR*, and presents activity levels (including aircraft operations and passenger activity) and environmental conditions at Logan Airport for calendar year 2010. To enhance the usefulness of the *2010 EDR* as a reference document for reviewers, this *2010 EDR* 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 generally included in the technical appendices. In *Chapter 1, Introduction/Executive Summary*, an overview of Massport's sustainability initiatives is provided. *Chapter 3, Airport Planning*, provides an update on the projects underway or being considered by Massport at Logan Airport in 2010. *Chapter 9, Project Mitigation Tracking,* describes the status of project mitigation measures.

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

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Logan Airport Environmental Review Process

This *2010 EDR* 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.

Logan Airport-Wide Review

In 1979, the Secretary of the Executive Office of Environmental Affairs (EOEA) (now EEA) 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.

EOEA 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. As a result, Massport has evaluated the cumulative impacts associated with Logan Airport activities through preparation of an ESPR every five years and provides data updates annually through the EDRs. As described in the *2009 and 2010 EDRs*, aircraft operations and passenger activity levels and associated environmental effects remain 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. The next ESPR will report on calendar year 2011 and will be filed in early 2013 to accommodate incorporating the most recently available information from the updated operations and passenger forecasts and key airport planning efforts. The *2011 ESPR* will report on updated passenger activity level and aircraft operations forecasts. Where appropriate, Massport will continue to identify and address longer-term aviation and environmental trends in each annual filing whether that is in the form of an EDR or ESPR.

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.

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 2010, Logan Airport employed over 17,000 people, including approximately 950 Massport jobs, while activities associated with the Airport contributed an average of over $24 million a day into the local economy. A preliminary draft of the Massachusetts Department of Transportation (MassDOT) Economic Impact Study finds that in 2010, Logan Airport supported over 94,000 jobs in Massachusetts and the total economic impact is now estimated at $8.9 billion per year. The total economic impact includes on-airport, visitor-related, construction, and all associated multiplier impacts.[4] In 2010, Logan Airport was the 21st busiest commercial aviation facility in North America ranked by aircraft operations, and the 20th busiest in North America ranked by number of passengers.[5]

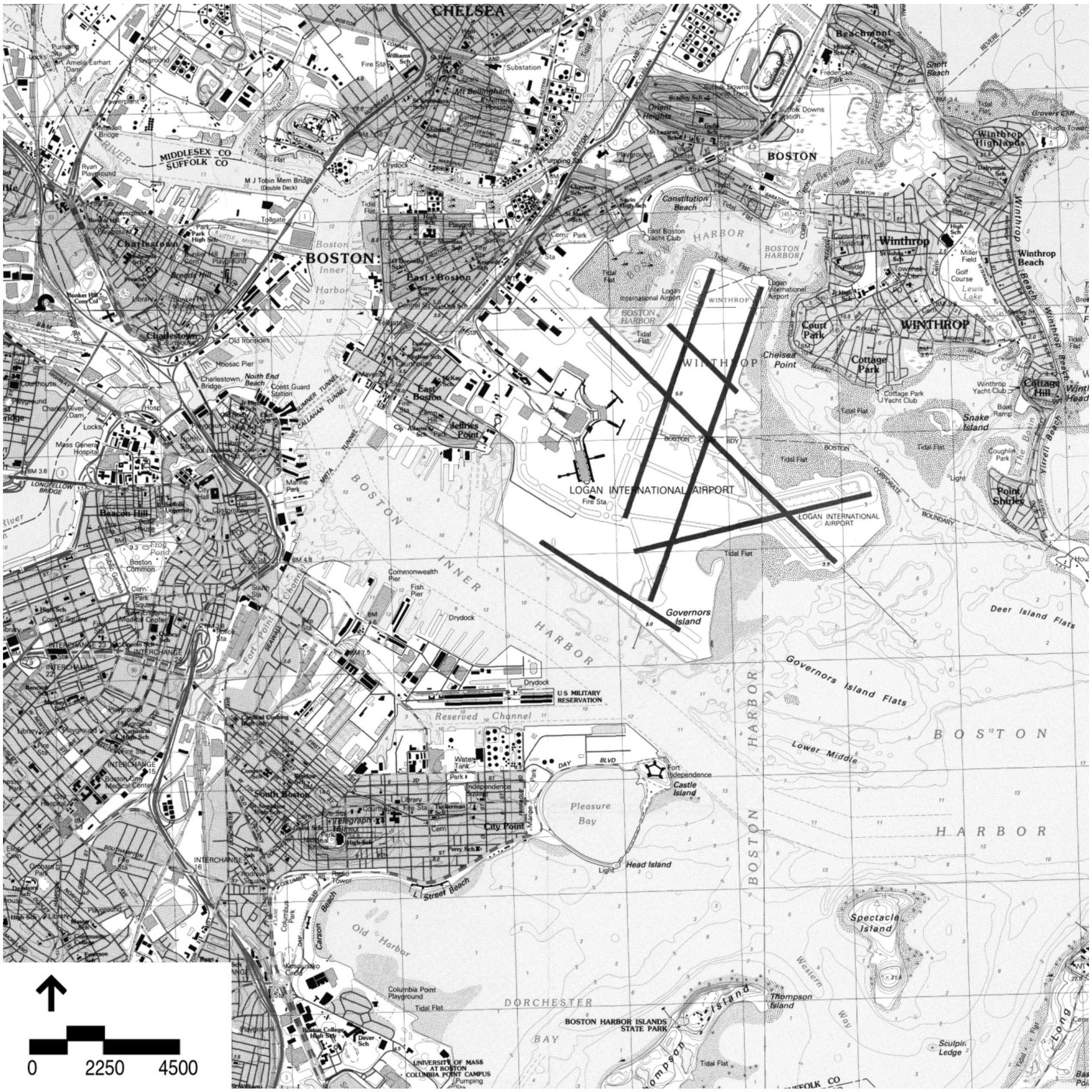
The Airport boundary encompasses approximately 2,400 acres in East Boston and Winthrop, including 700 acres underwater in Boston Harbor. Logan Airport, shown in Figures 1-1 and 1-2, is one of the most land-constrained airports in the nation and is surrounded on three sides by Boston Harbor.

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.

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.
4 MassDOT Statewide Economic Impact Study – Draft Updated Economic Impacts for Logan International Airport, May 9, 2011.
5 *ACI-NA Airport Traffic Reports 2010 at www.aci-na.org/stats/stats_traffic accessed June 2011.*

Figure 1-1 Aerial View of Logan Airport

Figure 1-2 Logan Airport and Environs



Source: U.S. Geological Service.

2010 Highlights and Accomplishments

This section provides a brief overview of key events and accomplishments at Logan Airport in 2010. Additional information concerning all aspects of Airport activities is provided in subsequent chapters.

Activity Levels

Significant changes in activity at Logan Airport in 2010 include the following:

- The total number of air passengers at Logan Airport increased by 7.5 percent to 27.4 million, compared to 25.5 million in 2009. In comparison, between 2008 and 2009 the number of air passengers using Logan Airport declined by 2.3 percent. This is below the historic peak reached in 2007.
- The total number of aircraft operations[6] grew from approximately 345,310 in 2009 to 352,640, an increase of 2.1 percent. This is also below the historic peak achieved in 1998. Passenger aircraft operations decreased by 1.6 percent compared to 2009 levels. Compared to a decline of 48.6 percent in 2009, general aviation[7] (GA) operations increased 19.9 percent in 2010, particularly as businesses increased their travel and use of GA transportation as the economy transitioned. GA accounted for 4.2 percent of aircraft activity at Logan Airport in 2010. Dedicated air cargo operations decreased by 5.8 percent compared to the previous year.
- The number of air passengers per aircraft operation continued to increase, climbing from an average of 73.9 passengers per aircraft operation in 2009 to an average of 77.8 passengers per aircraft operation in 2010, reflecting great efficiency.
- While legacy air carriers continued to reduce the number of aircraft operations at Logan Airport, low-cost carrier (LCC) operations increased by approximately 40 percent in 2010. The increase in operations by LCCs, primarily JetBlue Airways and Southwest Airlines, accounted for nearly all of this growth.
- Even though the number of dedicated air cargo aircraft operations decreased in 2010, air cargo volumes increased from 546 million pounds in 2009 to 572 million pounds in 2010, an increase of 4.7 percent.

Table 1-1 provides a snapshot of the changes in air passengers, aircraft operations, and cargo and mail volume levels from 2005 to 2010.

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 1-1 Air Passengers, Aircraft Operations, and Cargo and Mail Volume, 2005 to 2010							
	2005	2006	2007	2008	2009	2010	Percent Change (2009-2010)
				Air Passengers by Market Segment			
Domestic	22,728,788	23,556,382	23,837,727	22,032,246	21,767,086	23,688,471	8.83%
International	4,237,105	4,049,595	4,153,442	3,977,297	3,696,336	3,681,739	(0.39%)
General Aviation	122,012	119,466	111,286	93,108	48,664	58,752	20.73%
Total Passengers	27,087,905	27,725,443	28,102,455	26,102,651	25,512,086	27,428,962	7.51%
				Aircraft Operations by Market Segment			
Total Aircraft Operations	409,067	406,119	399,537	371,604	345,306	352,643	2.12%
Total Passenger Operations	367,502	365,684	362,298	339,115	326,406	331,687	1.62%
Total GA Operations	32,652	31,444	28,632	23,820	12,242	14,682	19.93%
Total Cargo Operations	8,913	8,991	8,607	8,669	6,658	6,274	(5.77%)
				Cargo and Mail Volume (lbs.)			
Total Volume	785,245,722	716,337,833	658,293,141	621,283,399	546,359,548	572,283,608	4.74%

Source: Massport.

Planning

- **Southwest Service Area (SWSA) Redevelopment Program.** Massport completed the permitting process 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. A Notice of Project Change (NPC) was filed with the EEA for the SWSA Redevelopment Program on October 15, 2009. The primary program change involved elimination of the initially proposed commercial parking element of the project. This resulted in a downsizing of the structure and its siting farther from the community. A Final Environmental Impact Report/Environmental Assessment (EIR/EA) for the project was filed in March 2010, and on May 28, 2010, the EEA Secretary issued a Certificate that determined that the project adequately and properly complies with MEPA. Construction of this project began in July 2010, starting with various enabling phases of construction.
- **Logan Runway Safety Area (RSA) Improvements Project at Runway Ends 33L and 22R.** An ENF was filed on June 30, 2009 for the Logan RSA Improvements Project, and the Secretary of EEA determined that the preparation of a Draft EIR was required. On July 15, 2010, a combined federal/state Draft EA/EIR was filed. The Final EA/EIR was filed January 31, 2011; the EEA Secretary issued a Certificate that determined that the project adequately and properly complies with MEPA. The FAA issued a Finding of No Significant Impact (FONSI) for the project on April 4, 2011. Construction of the Runway 33L RSA improvements commenced in June 2011.
- **Green Bus Depot.** Preliminary 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 will be used to maintain the expanded shuttle bus fleet that will replace the Airport's aging compressed natural gas (CNG) bus fleet as well as all of the rental car company diesel shuttle buses. An expanded ENF for the Green Bus Depot was filed on July 15, 2010. After an extended comment period, the EEA Secretary issued

a Certificate on the ENF on September 17, 2010 stating no further MEPA review is required. Construction is underway as of the date of this filing.

- **East Boston-Chelsea Bypass Project.** Planning for the East Boston-Chelsea Bypass project commenced to develop a limited access roadway between Logan Airport and the new Chelsea Street Bridge. The Bypass roadway is expected 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. An ENF was filed on October 15, 2010; on December 1, 2010, the EEA Secretary, in his Certificate, determined that no further MEPA review was required. Construction is underway as of the date of this filing.
- **Logan Airport Parking Deck Project.** Planning for the Logan Airport Parking Deck Project (Economy Garage) along Prescott Street in the North Cargo Area (NCA) was initiated in 2010. In response to a Massport request, the MEPA Office confirmed that the project was not subject to MEPA review. Construction of the economy garage began in summer of 2010 and was completed and fully opened to the public in early 2011. Solar panel "trees" were installed on the roof of the parking deck, and energy-efficient lighting was also installed throughout. Reporting required by the EEA Secretary is provided in *Chapter 5, Ground Access to and from Logan Airport*, and further details of its energy-saving features are provided in this chapter.
- **North Service Area (NSA) Roadway Corridor Project.** Massport anticipates completing the project with final landscaping in 2011. The NSA Roadway Corridor Project is not a new roadway but a corridor improvement project. This 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. The project will coordinate with other projects including the Logan Airport Parking Deck Project, entrance to the East Boston-Chelsea Bypass Project, and interface with the Neptune Road Buffer Project. The NSA Roadway Corridor extends approximately from Building 11 up to and including Neptune Road. Construction of the NSA Roadway Corridor Project began in 2010. Most of the project's infrastructure, including curbing, sidewalks, lighting and fencing have been installed.
- **Hangar Upgrade Projects.** Architectural design commenced in December 2010 for two hangar upgrades in the NCA.
- **Terminal B Garage Improvement Project.** Terminal B Garage repair and rehabilitation continued in 2010. In addition to overall upgrades, 32 solar panel trees (200 kilowatt (kW)) were installed on the top floor and the entire garage was fitted with high efficiency Light-Emitting-Diode (LED) lighting.
- **Taxiway G Realignment Project.** Taxiway G realignment construction was completed in 2010.

Regional Transportation

- The total number of air passengers utilizing New England's commercial service airports, including Logan Airport, increased from 42.0 million in 2009 to 43.1 million annual air passengers. This represents an increase of 2.5 percent, which is in line with an overall increase of 2.4 percent in the U.S. passenger market in 2010.[8] New England's commercial service airports include Logan Airport; Bradley International Airport, Connecticut (CT); T.F. Green Airport, Rhode Island (RI); Manchester-Boston Regional Airport, New Hampshire (NH); Portland International Jetport, Maine (ME); Burlington International Airport, Vermont (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).
- The challenging airline operating environment affected smaller communities disproportionately. Within the region, Logan Airport passenger traffic grew, while air passenger levels continued to decline at the other regional airports. Of the 43.1 million air passengers using New England's commercial service

8 Airports Council International, 2010 North American Air Traffic Report

airports in 2010, 63.6 percent of air passengers used Logan Airport compared to 56.4 percent in 2005. Passenger levels at the regional airports declined by 5.2 percent in 2010, compared to an increase of 7.5 percent at Logan Airport. This was largely due to legacy carriers withdrawing from smaller secondary markets and reducing their use of small regional jets, and LCCs, such as Southwest Airlines and JetBlue Airways, focusing on expansion in larger air service markets with a strong business travel portfolio like Logan Airport.

- Aircraft operations in the New England region remained largely flat, increasing slightly by 0.7 percent, from 1.03 million operations in 2009 to 1.04 million operations in 2010. Commercial airline operations declined by 0.25 percent, while GA and military operations increased by 1.9 percent and 4.7 percent respectively.
- Massport continued to engage in cooperative metropolitan planning efforts including GreenDOT and the Healthy Transportation Compact, and the Boston Metropolitan Planning Organization (Boston MPO), also known as the Metropolitan Area Planning Council (MAPC).[9,10]

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 7.5 percent to 27.4 million, compared to 25.5 million in 2009. During the same period, average daily traffic on airport roadways increased by 5.1 percent from 2009 to 2010, while VMT on the Airport increased by 4.8 percent.
- The number of vehicles parked on-Airport (measured by the revenue parking exits) increased by 4 percent in 2010 compared to 2009.
- Massport began construction of the Logan Airport Parking Deck Project, located on the 1,000-space Economy Lot in the NCA. It consolidates an additional 2,000 commercial parking spaces from various on-airport temporary commercial parking lots into a single structured parking facility containing approximately 3,000 commercial parking spaces. The garage maintains on-airport parking capacity in compliance with the limits imposed by the Logan Airport Parking Freeze. The garage was fully opened in March 2011.

Key findings for Ground Access Activity include:

- Ground access activity to Logan Airport generally increased for all modes from 2009 to 2010 as a result of a 7.5 percent growth in the number of annual air passengers, as described in *Chapter 2, Activity Levels*.
- In 2010, Massport administered the periodic *Logan Airport Air Passenger Ground Access Survey*. This is Massport's primary tool for understanding the changes in ground access patterns and the effectiveness of its policies and services. Passenger origins remain similar to those identified in the *2007 Air Passenger Ground Access Survey*, while weekday market share of business trips decreased.
- The *2010 Logan Airport Air Passenger Ground Access Survey* indicates that shares of high-occupancy vehicles (HOV) modes to the Airport have returned to 2004 levels (30 percent HOV mode share) after having decreased by 2 percent in the *2007 Air Passenger Ground Access Survey*.
- Metropolitan Bay Transportation Authority (MBTA) Silver Line boardings at the Airport continued to grow, increasing by 5 percent in 2010, while Blue Line boardings at Airport Station decreased slightly compared to 2009.
- In 2010, ridership on water transportation to the Airport increased by about 1 percent in comparison to the previous year.

9 Massachusetts Department of Transportation, www.eot.state.ma.us/default.asp?pgid=content/releases/pr060210_GreenDOT&sid=release, June 2, 2010.
10 Massachusetts Department of Transportation, www.massdot.state.ma.us/main/healthytransportationcompact.aspx.

- Limousine ridership increased by an estimated 16 percent, and taxi dispatches increased 12 percent in 2010 compared to 2009. Despite the increase in dispatches, the relative share in the use of these modes did not increase, according to the *2010 Logan Airport Air Passenger Ground Access Survey.*
- Over the past several years, transit services, including Logan Express bus service, have experienced increases in employee use. In 2010, Logan Express air passenger ridership increased by about 1 percent compared to 2009 levels, whereas employee use of Logan Express increased by 4 percent, and accounts for 42 percent of the service's ridership.

Noise Abatement

- The 2010 Day-Night Sound Level (DNL) contours are similar in size compared to 2009. The DNL 65 decibel (dB) contour remained the same in Revere and in most of Winthrop. The extent of the DNL 65 dB contour decreased slightly in the Point Shirley section of Winthrop due to the reduced number of departures from Runway 9 and due to the reduced number of aircraft arrivals over South Boston and East Boston. The geographic extent of the DNL 65 dB contour increased in East Boston near the Airport and out over Boston Harbor due to an increase in departures from Runway 15R.

- This *2010 EDR* reports on the findings of the Integrated Noise Model's (INM) results of the population impacted by airport related noise and used both the 2010[11] and 2000 Census data as a basis for comparison.

  - Using the 2000 Census, the overall number of people exposed to values greater than DNL 65 dB decreased by 11 percent in 2010, compared to 2009. An estimated 3,870 people were exposed to levels greater than DNL 65 dB as depicted in the 2010 contour, compared to 4,335 in 2009. This is the first time that the number of people exposed to the DNL 65 dB noise level has been fewer than 4,000 and that the number of people within the DNL 65 dB in Boston has dropped below 1,000 to 711 people.
  - Using the 2000 Census, the total population exposed to noise levels greater than DNL 70 dB decreased in 2010 compared to 2009. In 2009, the total population greater than DNL 70 dB was 243, and in 2010 the number dropped to 198. There was a reduction of 40 people in Winthrop and a decrease of 5 people exposed to greater than DNL 70 dB in Boston, resulting in the drop in the total impacted population.
  - Using the 2010 Census, the overall number of people exposed to DNL values greater than 65 dB decreased to 3,830 people, 40 people fewer than with the 2000 Census. Within the DNL 70 dB contour the number of people has dropped to 130, 68 fewer than with the 2000 Census. Due to the updated population and Census block boundaries of the 2010 Census, there were no people within the DNL 70 dB contour in the City of Boston.
- In 2010, Massport provided sound insulation to 83 homes, nearly half of which were in Chelsea. The focus of this 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 Sound Insulation program, 11,219 homes have been received sound insulation treatment in East Boston, South Boston, Winthrop, Revere, and Chelsea.

Air Quality/Emissions Reduction

- Total emissions of volatile organic compounds (VOC) were 1,019 kilograms per day (kg/day), or 4 percent higher than 2009 levels, but still follow a long-term, downward trend decreasing by almost 78 percent since 1990. This increase is primarily due to the increase in landing and takeoff operations (LTOs) when compared to 2009.

11 The 2010 US Census Public Law 94-171 data (PL94-171) was released in March of 2011. The data was downloaded from the US Census web site on April 7, 2011, www.census.gov/.

- Total emissions of oxides of nitrogen (NO_X) were 3,989 kg/day, or less than 1 percent higher than 2009 levels. In 2010, total NO_x emissions at Logan Airport (net total with reductions) were approximately 742 tons per year (tpy) lower than Massport's 1999 Air Quality Initiative (AQI) benchmark. This represents a 32 percent decrease in NO_x emissions since 1999.
- Total emissions of carbon monoxide (CO) were 7,160 kg/day, or 10 percent lower than 2009 levels.
- Mostly due to the decreased use of No. 6 fuel oil, total emissions of particulate matter (PM) $PM_{10}/PM_{2.5}$ associated with Logan Airport heating and cooling decreased in 2010 by approximately 10 percent to 64 kg/day compared to 2009 levels.
- 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 2010 continued to be well within the National Ambient Air Quality Standards (NAAQS) for NO_2.
- Massport's two-phased Air Quality Monitoring Study is collecting data on a variety of ambient air pollutants over a two year period and assessing air quality changes attributable to the operation of the new centerfield taxiway. The second phase of the Study concluded in 2011; after the centerfield taxiway became fully operational. The findings from this Study will be submitted to MassDEP in late 2011/early 2012 and also will be reported in the *2011 ESPR*.
- 2010 marks the fourth consecutive year in which Massport has voluntarily prepared a MEPA greenhouse gas (GHG) emissions inventory for the EDR. The 2010 GHG emission inventory was updated incorporating guidance developed by the Transportation Research Board's (TRB) Airport Cooperative Research Program (ACRP). The ACRP guidance was published in April 2009 for airport operators developing an airport-specific GHG emissions inventory.[12] The 2010 inventory 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 owned or controlled by the airlines, airport tenants, and the general public (through emissions from motor vehicles). Massport sources contribute 12 percent of the total GHG emissions for the Airport. Total Logan Airport GHG emissions in 2010 were slightly lower (0.4 percent) than 2009 levels.

Water Quality/Environmental Compliance and Management

- In 2010, there were 15 oil and hazardous material spills that required reporting to MassDEP, five of which involved a storm drainage system.[13]
- 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 Elimination System (NPDES) Permit for the North, West, and Maverick Street Outfalls. These exceedances were reported during April and November of 2010, respectively, as required.
- Massport's Stormwater Pollution Prevention Program (SWPPP) addresses stormwater pollutants in general, and also addresses deicing and anti-icing chemical, potential bacteria, fuel and oil, and other sources of stormwater pollutants. The 2010 Annual Certificates of Compliance were submitted to the U.S. Environmental Protection Agency (EPA) and MassDEP on December 21, 2010, for Massport and each tenant co-permittee.

12 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.
13 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."[14] 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 triple bottom line has since become a widely accepted concept for sustainability management around the world. The triple bottom line states that success is measured 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 *2010 EDR* where appropriate, and are listed in Table 1-6.

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.[15]

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 1-2). 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.

14 Brundtland_Report, United Nations. "Report of the World Commission on Environment and Development." General Assembly Resolution 42/187, December 11. 1987.

15 The Environmental Management Policy can be viewed on Massport's website at: www.massport.com/environment/Pages/EnvironmentalManagementPolicy.aspx

Table 1-2 Sustainability Goals

Massport Wide 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.[16] 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 2007 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. Massport received 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 Leadership in Energy and Environmental Design (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.

International Goals

Massport is a national and international leader in airport environmental sustainability programs and policies. Massport was one of 21 U.S. airport authorities to endorse the Aviation Industry Commitment to Action on Climate Change signed in Geneva in 2008.[17] The 2008 Aviation and Environment Summit in Geneva provided the opportunity for the entire industry, as well as regulators and representatives of non-governmental organizations (NGOs), to develop further a vision and strategy, to assess progress, and to agree on future

16 Deval Patrick, Executive Order 484: April 18, 2007.
17 Aviation Industry Commitment to Action on Climate Change, www.enviro.aero/Aviationindustryenvironmentaldeclaration.aspx.

action related to climate change. This was expressed in the signing of the industry-wide declaration. The vision expressed in the declaration is supported by a basic four-pillar strategy based on technological progress, infrastructure enhancements, operational improvements, and suitable economic instruments.

Sustainability in Planning, Design and Construction

Massport reduces its long-term environmental impact by approaching each planning, design and construction project consciously and incorporating sustainable techniques across the Airport. The following section outlines Massport sustainability achievements in these areas.

Sustainable Design Standards and Guidelines (SDSG)
In 2009, Massport developed the SDSG for use by architects, engineers, and planners working on capital improvement projects for Massport. The SDSG applies to both new construction and rehabilitation projects (building and non-building) of any square footage or monetary value. 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.

Certified Green Buildings at Logan Airport
Table 1-3 provides a listing of certified green buildings at Logan Airport. During initial planning in 1999, Massport required the new Terminal A, opened in 2005, to incorporate green building practices into its design, construction and operation. In 2006, the U.S. Green Building Council awarded the new Terminal A LEED Certification, becoming the first LEED certified airport terminal in the world. 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. Figure 1-3 illustrates the common elements that all LEED certified buildings at Logan Airport share. Terminal A included elements of sustainable design such as alternative transportation options, priority curb locations for high occupancy vehicles including bicycles, storm water filtration, a reflective roof, mechanisms to reduce water use, extensive use of natural daylighting paired with advanced lighting technologies for energy efficiency, use of recycled and regionally sourced materials, and measures to enhance indoor air quality. As a result of these strategies, energy and water use in Terminal A is reduced when compared to a conventional building, and the facility is more welcoming for passengers and healthier for employees.

Table 1-3 Certified Green Buildings at Logan Airport

LEED Certified Buildings at Logan Airport	Terminal A	2005/2006
	Signature Flight Support General Aviation (GA) Facility	2007/2008
	Future Consolidated Rental Car Facility (ConRAC)	Anticipated by 2015
	Future Green Bus Depot	Anticipated by 2015
ISO 14001 Logan Airport Certified Facilities	Facilities II	2006; 2009
	Facilities I and III	2011

The Signature Flight Support GA Facility in the NCA, which opened in June 2007, incorporates sustainable design, construction, and operational elements. It was the first LEED certified GA facility in the United States (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.

Another certification standard employed at Logan Airport is a systematic process that is utilized globally to work toward environmental sustainability: the International Standards Organization (ISO) 14001 standard. The ISO 14001 standard is an international standard for environmental management systems that is used to minimize harmful effects on the environment caused by building activities, and to achieve continual improvement of a building's environmental performance. ISO 14001 certification for Massport's Logan Airport Facilities II (vehicle maintenance, landscaping, and snow removal) was completed in December 2006 and was recertified in December 2009. ISO Certification for Facilities I (Central Heating and Cooling Plant) and Facilities III (Electrical and Structural) was completed in 2011.

The new ConRAC in the SWSA began construction in 2010. It will meet the Commonwealth of Massachusetts "LEED Plus" requirements and strive for LEED Silver level certification or better. The ConRAC will include the infrastructure necessary to accommodate future plug-in stations for electric vehicles and other alternative fuel sources such as E-85 (ethanol). The ConRAC could accommodate car sharing services, such as ZipCar®, at a later date. The ConRAC design features pedestrian and bicycle accommodations including pedestrian pathway connections to most of the Airport and surrounding neighborhoods, secure bicycle storage for passengers and employees, and shower/changing facilities for employees. The facility will feature efficient water systems including water reclamation for vehicle wash water, and use of stormwater for non-potable uses such as vehicle washing and landscaping irrigation. These features will help the ConRAC achieve or exceed a 20 percent reduction in water use demand as require by Massachusetts LEED Plus. Energy efficiency is another key component of the Massachusetts LEED Plus system, which requires a building to exceed the current Massachusetts Building Energy Code by at least 20 percent. 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. Rental car companies have pledged to maintain rental car fleets which include hybrid or alternative fuel/low-emitting vehicles.

The Green Bus Depot in the NSA to be constructed beginning in 2011 will 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*.

Figure 1-3 Common Elements of LEED Certified Buildings at Logan Airport

Maximize Daylighting with extensive windows, skylights, and advanced lighting	High Performance Glazing (windows)	Highly Efficient mechanical, electrical and HVAC systems	Use recycled and regionally sourced materials
Deploy alternative fuel Ground Service Equipment	Water efficient landscaping	Recycling of construction and demolition material	Use of low VOC products

Terminal B Garage Renovations

In 2009, Massport began a four-year rehabilitation of the Terminal B parking garage, which includes structural repairs, the installation of solar panels on the top parking deck and high efficiency LED lighting throughout the structure. During 2010, the energy-related upgrades were completed. The use of motion-detecting LED fixtures use approximately 50 percent less electricity than the existing lighting, reducing existing usage by 2,261,218 killowatt-hours (kWhs) of electricity per year. This, along with other energy conservation measures, will avoid approximately 1,300 metric tons of carbon dioxide (CO_2), which is the equivalent of not using 3,040 barrels of oil or 148,385 gallons of gasoline annually. Massport expects a savings of $3.8 million in electrical usage over the next 20 years based on costs of $0.12 per kWh.

Table 1-4 Terminal B Solar Photovoltaic (PV) Panel Lifetime Data*

Energy Produced	369,814	kWh
CO_2 avoided	638,300	lbs
NO_x avoided	928	lbs
SO_2 avoided	2,795	lbs

* Recorded as of July 27, 2011

Note: 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).

Additionally, the installation of 16 solar panel trees is expected to produce 83,980 kWhs of electricity, or 2.5 percent of the total garage annual consumption. This is equal to the reduction of 50 metric tons of CO_2 the equivalent of not using 115 barrels of oil or 5,637 gallons of gasoline annually. Each solar panel is a single structure design with a stem and steel frame that uses solar panels as a roof over parked cars. Each solar array is mounted on an air ventilation unit on the roof of the garage and does not affect parking operations or the number or spaces available to travelers. As shown in Table 1-4, lifetime data shows that the Terminal B solar installation has produced about 370,000 kWh of electricity which is the equivalent of powering 2,838 computers for a year. During 2010, the months of highest energy production were May and July.

New Cell Phone Waiting Lot
During 2010, a new, larger Cell Phone Waiting Lot was constructed nearby the Gulf Station. This is the first Massport project to use porous pavement, a permeable pavement surface over a stone reservoir, which allows water to penetrate through the pavement and filter the runoff before it seeps to the subsoil and recharges the groundwater. The lot is landscaped with trees and shrubs and their root systems will use the water in the subsoil. In addition to reducing runoff from pavements, the Cell Phone Waiting lot is also beneficial in reducing emissions and roadway congestion from drivers circling the roadway system or idling curbside waiting for arriving passengers.

Warm Mix Asphalt
In 2008, Logan Airport became 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 new 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 carbon dioxide, 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 NO_x 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.

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. Massport also encourages its tenants to do the same. Some notable sustainability programs and initiatives include:

Energy
Massport continues to make strides in reducing energy use at the Airport. In 2009, Massport began developing a comprehensive Energy Master Plan for all Massport facilities. In 2010, the Massport Board approved the Energy Master Plan. 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*. Additional details on the Energy Master Plan are included in *Chapter 7, Air Quality/Emissions Reduction*.

Solar panels at on the roof of the new Logan Airport Parking Deck (Economy Parking).

About 18 percent of energy used at Logan Airport is attributable to Massport, and the remainder to tenants. In 2010, on-airport renewable energy installations produced approximately 1 percent of the Airport's electricity needs. This is expected to increase as new on-airport solar installations come online. Massport has been exploring the purchase of renewable energy certificates (RECs) for some of its electricity needs to supplement its on-airport renewable generation. In addition, Massport 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. Massport commissioned a study evaluating options for upgrading the CHP for cogeneration of both heating/cooling and electricity. Further details on the cogeneration study are available in *Chapter 7, Air Quality/Emissions Reduction*.

Renewable Energy

In March 2008, as a demonstration project, Massport installed twenty 10-foot-tall wind turbines on the roof of Logan Office Center. 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. Combined, the Logan Office Center Wind installation and the Terminal B Garage Solar Trees produced 238,903 kWh in 2010. Also during 2010, the new Logan Airport Parking Deck in the NCA was outfitted with solar trees similar to those on the Terminal B garage. These solar trees will provide 12 percent of the energy needs for the new facility, which also uses energy efficient LED lighting throughout.

Table 1-5 shows the rated capacity of actual and planned renewable energy installations.

Table 1-5 Rated Capacity of Renewable Energy Installations

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

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.
- Logan Airport is testing several locations for a new type of grass seed which is very slow growing, drought tolerant, and does not need chemical fertilizer. This will reduce water use, fertilizer use, and emissions associated with mowing. If successful, use of this product will be expanded at Logan Airport and other Massport facilities.
- Massport is testing an innovative automated system to retrieve hazardous foreign object debris. While this is primarily a safety measure, it saves 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.

Alternative Fuel Vehicles

As part of its environmental management policy, Massport purchases, on an as-needed basis, new alternative fuel or hybrid power vehicles to replace conventional vehicles. Massport encourages programs and projects that promote the use of electric and alternative fuel vehicles by planning for and constructing the necessary infrastructure to support current and future generations of electric and alternative fuel vehicles. The following projects and programs support alternative fuel vehicles:

- As part of the replacement of Terminal A, Delta Air Lines agreed to introduce battery powered tugs and belt loaders for its ground service fleet at Terminal A. In 2009, Massport approved a $3 million loan to Delta Air Lines to purchase 50 electric baggage cart tugs, 25 electric baggage conveyor belt vehicles, and charging stations for each vehicle. Given the financial state of the industry and lack of access to capital markets, Massport agreed to partner with Delta Air Lines to support this important environmental commitment.
- When constructed, the new ConRAC in the SWSA 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.

An example of the new ConRAC articulated hybrid buses. Courtesy of the manufacturer, North American Bus Industries (NABI)

- 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 expects to spend $35 million for a fleet of 50 alternative fuel buses. This includes 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 94 rental car buses currently being used and Massport's older CNG buses which have logged more than 13 million clean air miles. Massport expects this new unified bus system to reduce CO_2 emissions by 1,840 tons, NOx by 50 tons, and VOCs by 25 tons during the new buses' estimated 12 years lifecycle.

The E85 pump at the Gulf Station.

- 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 burns cleaner than other vehicle fuels, producing significantly lower amounts of harmful emissions.[18]
- Massport's "CleanAir Cab" incentive program for alternative fuel vehicles (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 also provides a a 50 percent reduction in ground access fees for alternative fueled limos and hotel shuttles, and reserved parking spaces for hybrid and alternative fuel vehicles in Logan Airport's garages.

18 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 continues to expand its waste reduction and recycling programs and policies and fully supports tenants and airlines to achieve these same goals:

- 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.
- For Massport operated facilities, Massport contracts with a cleaning contractor which uses products which are environmentally friendly, such as natural or biodegradable soaps and detergents instead of harsh chemicals.
- Massport's construction contracts include a requirement for contractors to recycle construction and demolition debris and other materials.
- Massport implemented a terminal area recycling program at Logan Airport constisting of all interior public areas of all of the terminals, both post-security and pre-security. This includes collection of mixed paper (newspaper, cardboard and magazines), plastics, aluminum, and glass. Logan Airport recycling program also covers Massport's administrative building, the Logan Office Center.
- Logan Airport uses single-stream recycling dumpsters: paper cardboard, plastic, aluminum, and glass are deposited all in one container. This encourages recycling by simplifying collection.
- 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. Recycling is required by tenant leases, and all concessionaires have access to recycling.
- 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.
- 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. 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.

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.

Additional Sustainability Programs and Initiatives

The following sustainability programs and initiatives found in Table 1-6 are further described in individual chapters of this *2010 EDR*. They are highlighted in each chapter with a sustainability leaf.

Table 1-6 Additional Sustainability Projects and Initiatives Documented in the EDR

Sustainability Program or Initiative	Description	Reference in *2010 EDR*
Southwest Service Area (SWSA) Redevelopment Program	LEED Certification will be pursued for the facility. Design will accommodate electric vehicles, bicycle parking and car sharing.	Chapter 3 – Planning
Green Bus Depot	LEED certified bus maintenance facility on-airport to service Massport's new fleet of clean-fuel shuttle buses.	Chapter 3 – Planning
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
Cell Phone Waiting Lot	Temporary parking for vehicles waiting to pick up passengers from an arriving flight; reduces auto circulation/emissions.	Chapter 5 – Ground Access to and from Logan Airport
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.	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
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, and is 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 commissioned a study to examine the potential for a Combined Cooling, Heating and Power plant, and has engaged in an Energy Master Planning process during 2009-2010.	Chapter 7 – Air Quality/Emissions Reduction
Clean State Initiative and Leading by Example Program	The Governor's Leading by Example program works with agencies to improve energy efficiency and increase renewable energy use in state buildings and fleets.	Chapter 8 – Water Quality

Note: This is a list of key sustainability achievements included in later chapters of this *2010 EDR*, and it is not a complete list of all achievements.

Sustainability Awards

Table 1-7 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 1-7 Sustainability Awards

Year	Awarding Organization	Name of Award	Subject
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 (across the harbor), 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 *2010 EDR*

The remainder of this *2010 EDR* is organized as follows:

- ***Chapter 2, Activity Levels***, presents aviation activity statistics for Logan Airport in 2010 and compares activity levels to the prior year. The specific activity measures discussed include air passengers, aircraft operations, fleet mix, and cargo/mail volumes.
- ***Chapter 3, Airport Planning***, provides an overview of planning, construction, and permitting activities that occurred at Logan Airport in 2010. 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 2010 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 2010.
- ***Chapter 6, Noise Abatement***, updates the status of the noise environment at Logan Airport in 2010, and describes Massport's efforts to reduce noise levels.
- ***Chapter 7, Air Quality/Emissions Reduction***, provides an overview of airport-related air quality issues in 2010 and efforts to reduce emissions.

- ***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[19] mitigation commitments for specific Airport projects.

Supporting appendices include the following:

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

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

2

Activity Levels

Introduction

This chapter reports on annual activity at Logan Airport in 2010, including air passengers, aircraft operations, aircraft fleet mix, and cargo volumes. The 2010 activity levels are compared to 2009 levels, and changes in activity over the past year are discussed. Air traffic activity levels at Logan Airport form the basis for the evaluation of noise and air quality impacts associated with the Airport.

A more detailed operations and passenger activity level trends analysis will be conducted in the Logan Airport *2011 Environmental Status and Planning Report* (ESPR) which will report on 2011 conditions, review historic trends, and present an updated long-term forecast of aviation activity levels at Logan Airport.

The chapter specifically describes activity level changes in 2010 compared to 2009 for:

- Airport passengers and aircraft operations at Logan Airport
- Cargo and mail volumes at Logan Airport
- Changes in airline service at Logan Airport

Key Findings

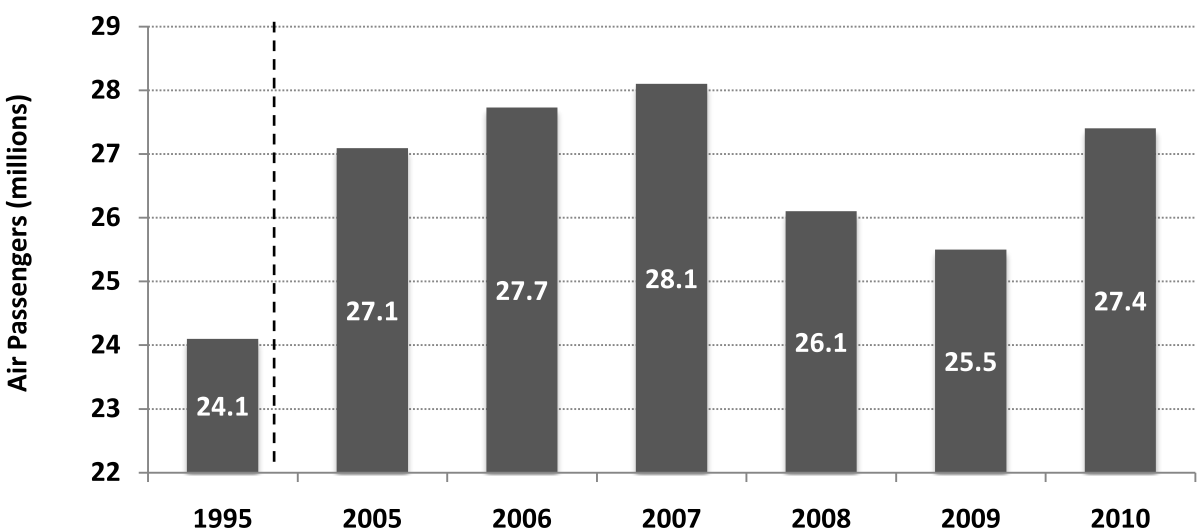
In 2010, improvements in economic conditions led to a modest recovery in passenger levels at airports across the country. While passenger demand began to strengthen, U.S. air carriers continued to implement careful capacity management strategies. Carriers introduced service reductions through the year, eliminating less profitable routes and cutting frequencies in smaller markets. Logan Airport saw an overall increase in passengers and aircraft operations in 2010; this was due to the aggressive expansion of the low-cost carriers (LCCs), JetBlue Airways and Southwest Airlines, which increased the number of operations while many legacy carriers reduced services at Logan Airport.[1]

1 LCCs serving Logan Airport in 2010 included AirTran, Frontier, JetBlue, Southwest, Spirit Airlines, Sun Country Airlines, and Virgin America.

Significant changes in activity at Logan Airport in 2010 include the following:

- The total number of air passengers at Logan Airport increased by 7.5 percent to 27.4 million, compared to 25.5 million in 2009 (see Figure 2-1). In comparison, between 2008 and 2009 the number of air passengers using Logan Airport declined by 2.3 percent. This is below the historic peak reached in 2007.
- The total number of aircraft operations[2] grew from approximately 345,310 in 2009 to 352,640, an increase of 2.1 percent. This is also below the historic peak achieved in 1998. Passenger aircraft operations decreased by 1.6 percent compared to 2009 levels. Compared to a decline of 48.6 percent in 2009, general aviation[3] (GA) operations increased 19.9 percent in 2010, particularly as businesses increased their travel and use of GA transportation as the economy transitioned. GA accounted for 4.2 percent of aircraft activity at Logan Airport in 2010. Dedicated air cargo operations decreased by 5.8 percent compared to the previous year.
- The number of air passengers per aircraft operation continued to increase, climbing from an average of 73.9 passengers per aircraft operation in 2009 to an average of 77.8 passengers per aircraft operation in 2010, reflecting great efficiency.
- While legacy air carriers continued to reduce the number of aircraft operations at Logan Airport, LCC operations increased by approximately 40 percent in 2010. The increase in operations by LCCs, primarily JetBlue Airways and Southwest Airlines, accounted for nearly all of this growth.
- Even though the number of dedicated air cargo aircraft operations decreased in 2010, air cargo volumes increased from 546 million pounds in 2009 to 572 million pounds in 2010, an increase of 4.7 percent. As shown in Table 2-6, the largest volume increase occurred in the freight segment.

Figure 2-1 Passenger Activity Levels at Logan Airport



Source Massport and individual airport data reports.

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

Air Passenger Levels

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

Logan Airport Passengers

Passenger traffic at Logan Airport totaled 27.4 million in 2010, compared to 25.5 million in 2009. This represents an increase of 1.9 million passengers or 7.5 percent in 2010, compared to a decline of 2.3 percent in 2009. Total scheduled passenger traffic in the U.S. increased by 2.1 percent in 2010 compared to 2009 levels.[4] Passenger growth was strong at Logan Airport. Factors that positively influenced passenger levels at Logan Airport in 2010 included:

- The strengthening of the U.S. economy in 2010, with air travel beginning to recover across the nation, and
- The aggressive expansion of Logan Airport's LCCs – specifically JetBlue and Southwest Airlines.[5]

As shown in Table 2-1, domestic air passengers, Logan Airport's largest market segment at 86.4 percent of total passengers, increased by 8.8 percent. JetBlue and Southwest operations were the main contributors to this growth. JetBlue's domestic passengers increased from 3.7 million in 2009 to 4.9 million, growing by 1.2 million or 31.5 percent. Southwest, which started serving Logan Airport in August 2009, saw an increase of 1.1 million passengers in 2010 to a total of 1.4 million. Figure 2-2 shows the annual passenger numbers for the five dominant airlines at Logan Airport. This highlights the continued expansion of JetBlue and reductions in service by legacy carriers.

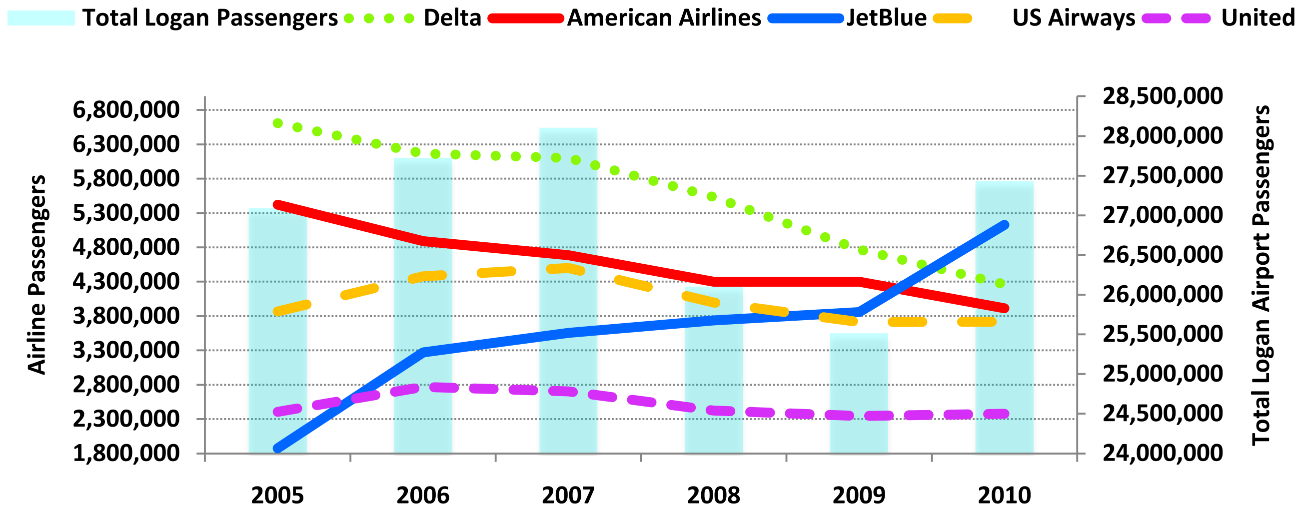
Table 2-1 Air Passengers by Market Segment

	2005	2006	2007	2008	2009	2010	Percent Change (2009-2010)
Domestic	**22,728,788**	**23,556,382**	**23,837,727**	**22,032,246**	**21,767,086**	**23,688,471**	**8.83%**
International	**4,237,105**	**4,049,595**	**4,153,442**	**3,977,297**	**3,696,336**	**3,681,739**	**(0.39%)**
Europe/ Middle East	2,629,823	2,599,382	2,754,427	2,687,693	2,605,825	2,672,635	2.56%
Canada	682,904	621,185	581,178	552,745	453,430	518,088	14.26%
Bermuda/ Caribbean	845,863	784,477	807,094	731,946	636,719	486,911	(23.53%)
Asia/Pacific	0	0	0	392	0	0	0.00%
Central/South America	78,515	44,551	10,743	4,521	362	4,105	1033.98%
General Aviation	**122,012**	**119,466**	**111,286**	**93,108**	**48,664**	**58,752**	**20.73%**
Total Passengers	**27,087,905**	**27,725,443**	**28,102,455**	**26,102,651**	**25,512,086**	**27,428,962**	**7.51%**

Source: Massport.

4 Bureau of Transportation Statistics, 2010.
5 LCCs serving Logan in 2010 included AirTran, Frontier, JetBlue, Southwest, Spirit Airlines, Sun Country Airlines, and Virgin America.

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

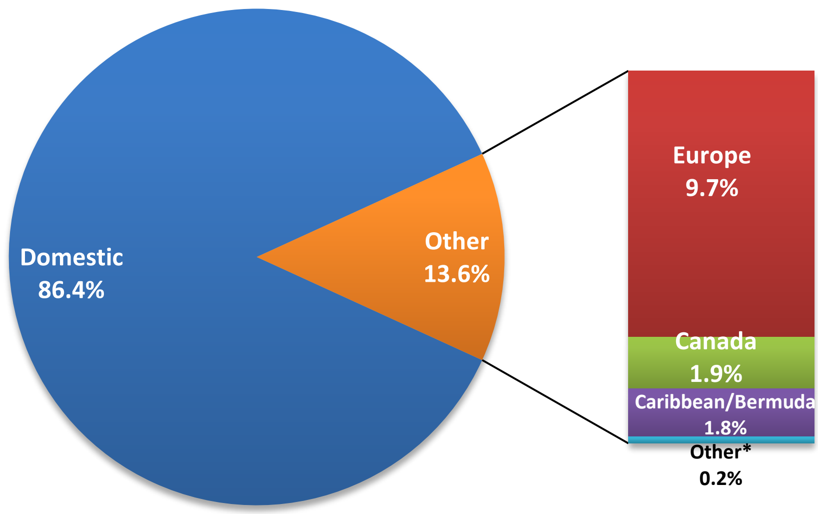


Source: Massport.
Note: For comparison purposes, Delta Air Lines figures in this chart include Northwest Airlines, which merged into Delta Air Lines in 2009, US Airways include America West Airlines which merged with US Airways in 2005. Totals for Delta Air Lines, American Airlines, United Airlines and US Airways include Delta Shuttle and US Airways Shuttle and contract carriers doing business as Delta Connection, United Express, US Airways Express, American Eagle, or American Connection.

While the number of Logan Airport's domestic passengers increased in 2010, international passengers declined slightly. International passenger traffic at Logan Airport decreased by 0.4 percent in 2010, compared to a much sharper decrease of 7.1 percent in 2009. International demand, which had decreased substantially during the global recession, also began to modestly recover in 2010. However, continued reductions in scheduled international services by some airlines offset service increases by others.

Figure 2-3 shows the distribution of Logan Airport passengers by market segment. Europe was the dominant international destination market, accounting for 72.6 percent of international traffic and 9.7 percent of total traffic at Logan Airport. Passenger traffic to Europe was up 2.6 percent from 2009 levels, compared to a decline of 3.0 percent between 2008 and 2009. However, the Bermuda/ Caribbean market, Logan Airport's second largest region for international passengers in previous years, dropped by 23.5 percent compared to 2009 levels. This was the result of Caribbean service cuts and passenger reductions on American Airlines and US Airways. Travel to and from Canada increased by 14.3 percent compared to a decline of 18.0 percent in 2009 as a result of new airline entry, Porter Airlines, and by the reinstatement of prior service cuts by Air Canada. The Bermuda/Caribbean and Canada regions accounted for 13.2 percent and 14.1 percent of international passengers respectively in 2010.

Figure 2-3 Distribution of Logan Airport Passengers by Market Segment, 2010



Source: Massport.
* Other includes Central/South America and General Aviation (GA)

Aircraft Operation Levels

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

Logan Airport Aircraft Operations

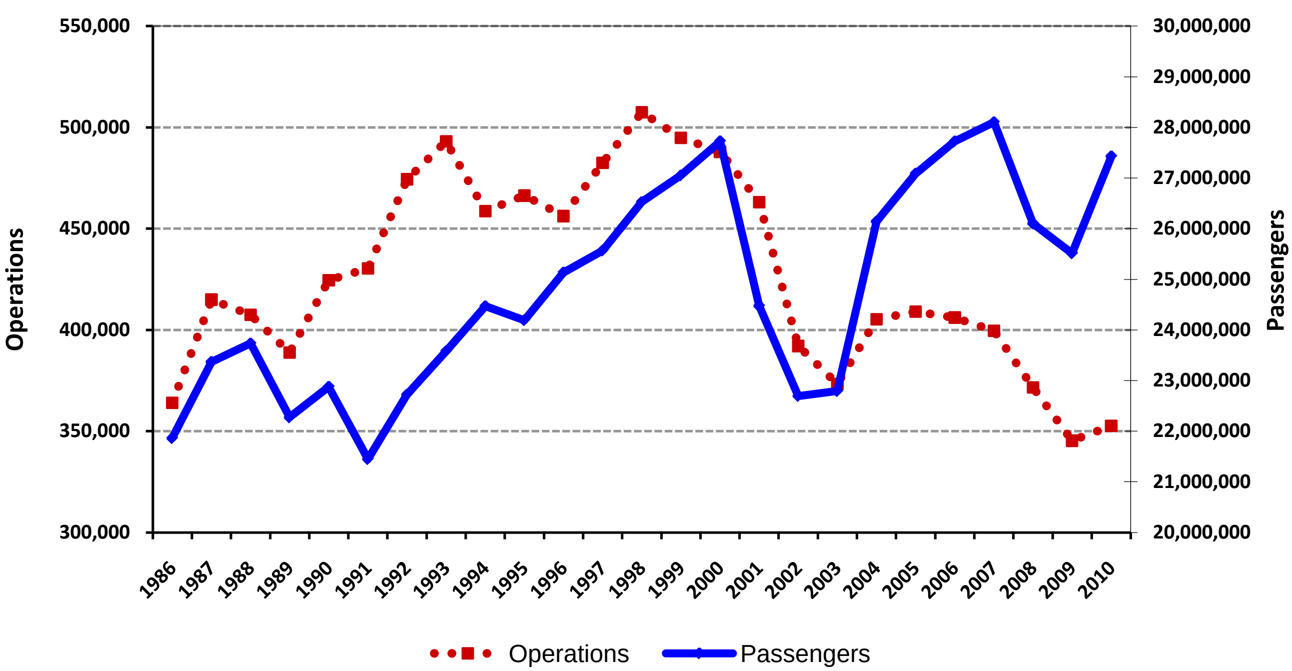
The total number of aircraft operations at Logan Airport (including passenger, GA and all-cargo) increased from approximately 345,310 operations in 2009 to 352,640 operations in 2010, an increase of 2.1 percent (Table 2-2). Aircraft operations increased at a slower rate than passenger levels, as airlines continued to monitor the recovering demand and tightly control capacity. As a result, passenger load factors continued to increase. Figure 2-4 depicts operations and operations data since 1986, and shows how passenger levels have grown at Logan Airport while overall aircraft operations have decreased over time.

Table 2-2 Logan Airport Aircraft Operations

Category	2005	2006	2007	2008	2009	2010	Percent Change (2009-2010)
Total Aircraft Operations	**409,067**	**406,119**	**399,537**	**371,604**	**345,306**	**352,643**	**2.12%**
Operations by Type and Aircraft Class							
Passenger Jet	201,502	206,467	220,135	209,931	205,341	214,307	4.37%
Passenger Regional Jet	113,886	110,554	88,500	80,589	70,198	66,498	(5.27%)
Passenger Non-Jet	52,114	48,663	53,663	48,595	50,867	50,882	0.03%
Total Passenger Operations	**367,502**	**365,684**	**362,298**	**339,115**	**326,406**	**331,687**	**1.62%**
GA Jet Operations	25,806	26,566	22,925	17,750	8,988	11,430	27.18%
GA Non-Jet Operations	6,846	4,878	5,707	6,070	3,254	3,252	(0.07%)
Total GA Operations	**32,652**	**31,444**	**28,632**	**23,820**	**12,242**	**14,682**	**19.93%**
Cargo Jet	8,913	8,493	8,084	8,149	5,431	5,332	(1.81%)
Cargo Non-Jet	0	498	523	520	1,227	942	(23.26%)
Total Cargo Operations	**8,913**	**8,991**	**8,607**	**8,669**	**6,658**	**6,274**	**(5.77%)**

Source: Massport
Note: 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.

Figure 2-4 Logan Airport Historical Air Passenger and Operations Data

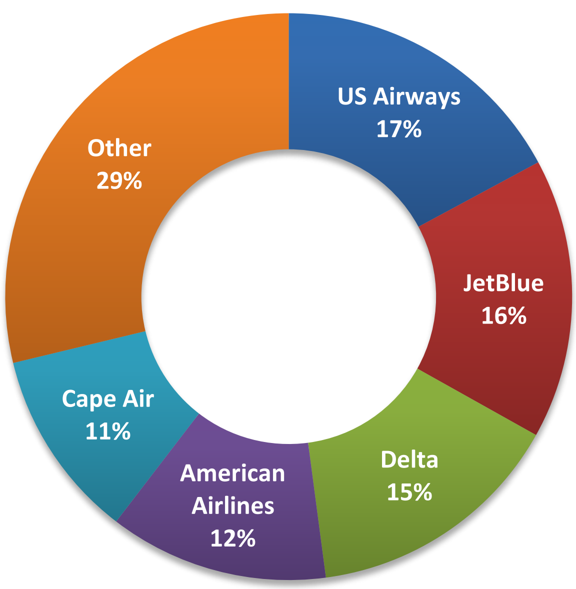


Passenger aircraft operations, which represented 94.1 percent of total aircraft operations at Logan Airport, increased by 1.6 percent in 2010 compared to 2009. The dominant carriers at Logan Airport according to the number of aircraft operation are shown in Figure 2-5. Growth was mainly in jet aircraft operations (jet aircraft with 90 or more seats). Passenger jet operations increased 4.4 percent from 205,340 operations in 2009 to 214,310 operations in 2010. Regional jet[6] (RJ) operations, which have declined annually since 2006, dropped another 5.3 percent in 2010. Passenger operations in non-jet aircraft (turboprop or piston aircraft) remained flat at 50,880 operations, compared to 50,870 operations in 2009. The change in the aircraft mix of passenger flights at Logan Airport over the past five years is shown in Figure 2-6. RJs accounted for 20 percent of total passenger operations in 2010, compared to 31 percent at the peak level in 2005.

The decrease in RJ 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 and Southwest's service expansion.

Within 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 regional jets with 70 to 80 seats. In recent years, the use of larger RJs with 70 to 80 seats has increased steadily at Logan Airport from 0.5 percent share of total RJ operations in 2005 to 41.7 percent in 2010.

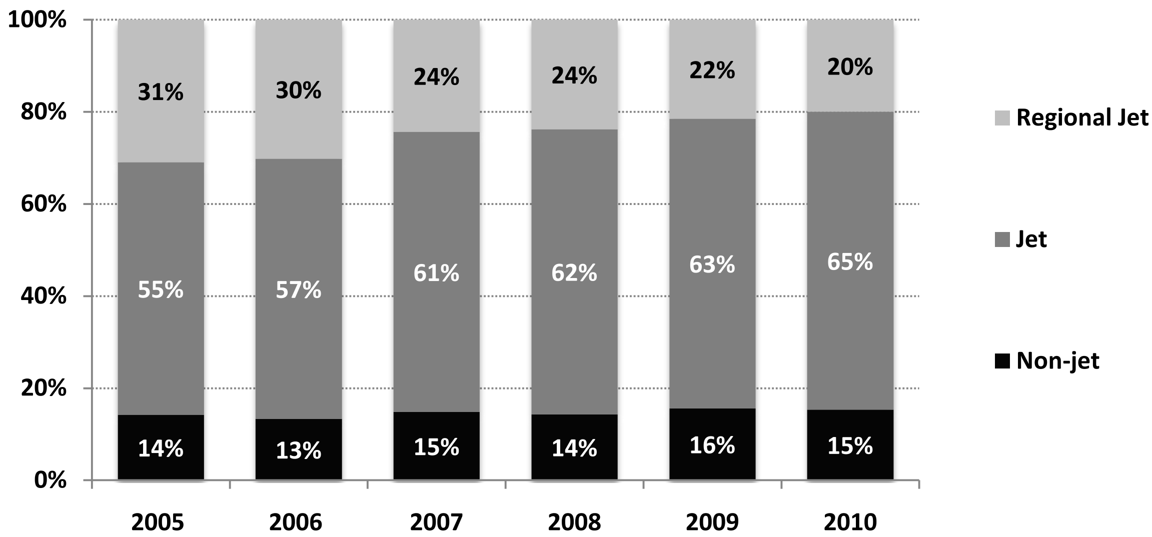
Figure 2-5 Dominant Passenger Carriers at Logan Airport by Aircraft Operations, 2010



Note: For comparison purposes, totals for Delta Air Lines, American Airlines, United Airlines and US Airways include Delta Shuttle and US Airways Shuttle and contract carriers doing business as Delta Connection, United Express, US Airways Express, American Eagle, or American Connection.
"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 Lufthansa, Virgin America, Porter, SWISS, Aer Lingus, Air Canada, AirTran, Southwest, and Alaska, which provide year-round and seasonal service to Logan Airport.

6 In this report, the term regional jet refers to small jet aircraft with up to 80 seats. The Embraer-190, operated by JetBlue and US Airways at Logan Airport, carries up to 100 passengers and is considered a jet.

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



Source: Massport

US Airways, JetBlue, Delta Air Lines, American Airlines, and Cape Air were the dominant carriers at Logan Airport in 2010 based on the number of passenger aircraft operations.[7] US Airways and its affiliates accounted for approximately 53,850 operations, closely followed by JetBlue with 52,240 operations. Delta Air Lines ranked third with 49,240 operations, while American Airlines and Cape Air ranked 4th and 5th, with 41,500 operations and 35,900 operations respectively.

General Aviation Operations

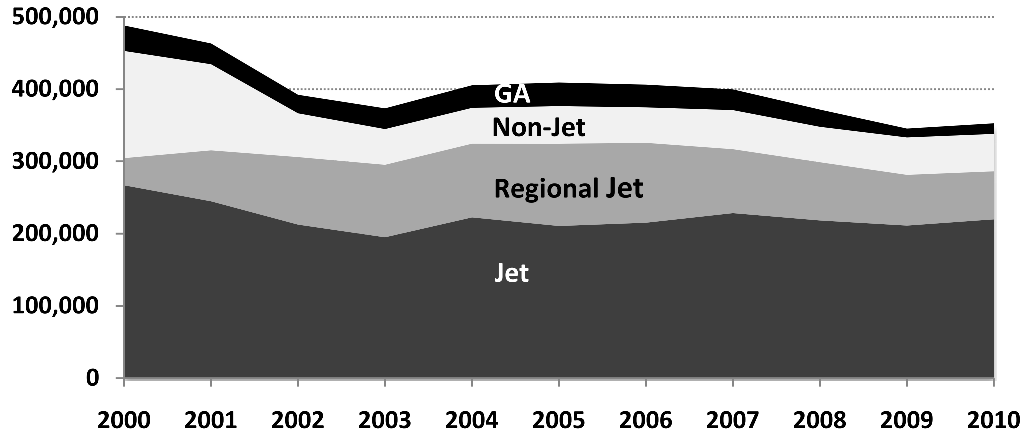
GA is defined as all aviation activity other than commercial airline and military operations. It encompasses a wide variety of aviation activities including private/recreational flying, flight instruction, corporate/business aviation, law-enforcement, emergency medical/air ambulance services, banner towing, and aerial vegetation management. 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 rebounded at Logan Airport in 2010 following a steep decline during the recent economic recession. Compared to a decline of 48.6 percent in 2009, GA operations increased 19.9 percent in 2010, particularly as businesses increased their travel and use of GA transportation as the economy improved. In 2010, GA operations totaled 14,700 operations, accounting for 4.2 percent of aircraft activity at the Airport. Figure 2-7 depicts changes in Logan Airport aircraft operations by category since 2000.

All-Cargo Operations

All-cargo operations, which are also strongly linked to the economy, decreased 5.8 percent from 2009 levels. This compares to a decline of 23.3 percent in 2009 and marks a gradual movement towards recovery. The all-cargo segment represents less than 2 percent of aircraft activity at Logan Airport with approximately 6,270 operations in 2010.

7 Airline rank is based on total number of operations for carrier “families,” including activity for all code share partners and regional subsidiaries.

Figure 2-7 Aircraft Operations at Logan Airport by Aircraft Class



Source: Massport.
Notes: Jet, regional jet, and non-jet operations are associated with commercial passenger and all-cargo airlines.
General aviation operations also include jet and non-jet aircraft, but are associated with private, corporate, and on-demand charters.

Passengers Per Aircraft and Load Factors

The average number of passengers per aircraft operation increased in 2010, continuing the trend seen over the past five years. 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 load factor. In 2010, Logan Airport operations accommodated an average of 77.8 passengers per flight compared to 73.9 passengers in 2009 (Table 2-3). The average number of passengers per flight has risen by 17.5 percent since 2005. This is a reflection of the airlines' continued emphasis on capacity rationalization, a shift away from smaller aircraft, and increasing passenger load factors. Load factors are the percentage of seats occupied by revenue passengers, and is 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. The national average load factor also increased, rising to 78.1 percent in 2010, compared to 76.1 percent in 2009.[8] In 2010, Logan Airport's average domestic load factor increased to 76.8 percent, up from 72.9 percent in 2009. Changes in passengers per operation and load factor are shown in Figure 2-8. Historical aircraft operations from 2005 to 2010 are provided in *Appendix E, Activity Levels*.

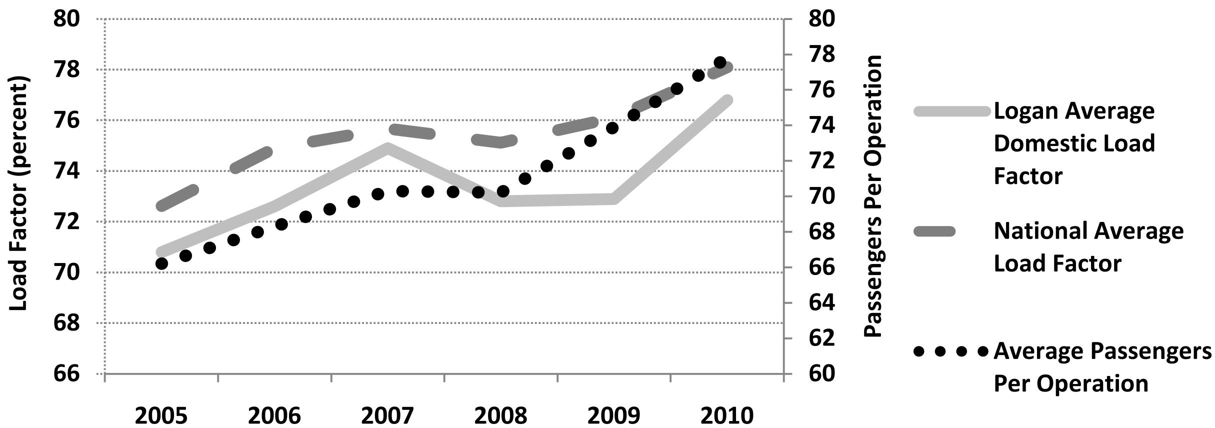
Table 2-3 Air Passengers and Aircraft Operations

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
2005	27,087,905	3.62%	409,066	(0.9%)	66.2	1.7	70.8%	3.2
2006	27,725,443	2.35%	406,119	(0.7%)	68.3	2.1	72.6%	1.6
2007	28,102,455	1.36%	399,537	(1.6%)	70.3	2.1	74.9%	2.3
2008	26,102,651	(7.12%)	371,604	(7.0%)	70.2	(0.1)	72.8%	(2.1)
2009	25,512,086	(2.26%)	345,306	(7.1%)	73.9	3.6	72.9%	0.1
2010	27,428,962	7.51%	352,643	2.1%	77.8	3.9	76.8%	3.9

Source: Massport ; U.S. DOT, T100 Database

8 U.S. DOT, T100 Database.

Figure 2-8 Passengers Per Aircraft Operation and Load Factor



The average non-stop stage length (the average length of nonstop flights) of scheduled domestic flights from Logan Airport increased slightly in 2010 to 752 miles from 747 miles in 2009.

Airline Passenger Service in 2010

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.[9] This section examines changes in airline departures and seat capacity at Logan Airport in 2010 and provides an overview of new and discontinued routes.

Service Developments at Logan Airport

In 2010, 29 airlines provided scheduled passenger service from Logan Airport to 102 nonstop destinations. This section describes the major changes in Logan Airport's scheduled passenger services in 2010. The average non-stop stage length (the average length of nonstop flights) of scheduled domestic flights from Logan Airport increased slightly in 2010 to 752 miles from 747 miles in 2009.

Changes in Domestic Passenger Service

As shown in Table 2-4, total domestic flights at Logan Airport increased by 2.0 percent in 2010. Scheduled domestic jet carrier flights increased 10.3 percent from 2009, while regional/commuter flights fell by 12.2 percent. Domestic charter flights increased 21.6 percent, but represent less than 0.5 percent of Logan Airport's domestic flights.

LCC operations at Logan Airport grew by 41.9 percent in 2010, increasing from 60,030 operations in 2009 to 85,200 operations in 2010. LCCs now account for 42.0 percent of scheduled domestic jet operations and 28.6 percent of total domestic operations. JetBlue, the dominant LCC at Logan Airport, continued its aggressive expansion,

9 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.

increasing its domestic operations by 31.0 percent from 38,150 operations in 2009 to 49,980 operations in 2010. Southwest Airlines also expanded rapidly, growing from 2,600 operations in 2009 to 13,730 operations in 2010.[10]

Table 2-4 Domestic Air Passenger Operations by Airline Category

Category	2005	2006	2007	2008	2009	2010	Percent Change (2009-2010)
Total Jet Operations	**190,991**	**199,281**	**198,879**	**189,739**	**184,181**	**203,081**	**10.26%**
Legacy Carriers	137,422	141,704	143,465	136,285	124,147	117,877	(5.05%)
Low-Cost Carriers	53,569	57,577	55,414	53,454	60,034	85,204	41.93%
Regional/Commuter	**137,203**	**130,298**	**124,014**	**112,881**	**107,615**	**94,535**	**(12.15%)**
Charter Carriers	**324**	**369**	**570**	**582**	**412**	**501**	**21.60%**
Total Domestic	**328,519**	**329,948**	**323,463**	**303,202**	**292,208**	**298,117**	**2.02%**

Source: Massport.
Note: LCCs serving Logan in 2010 included AirTran, Frontier, JetBlue, Southwest, Spirit Airlines, Sun Country Airlines, and Virgin America.

New nonstop service from Logan Airport to a number of domestic markets was introduced in 2010:

- JetBlue introduced Airbus A320 service to Phoenix and San Jose Airports, as well as Embraer E-190 service to Sarasota/Bradenton and Washington National Airports. The new Washington National service was enabled by a slot swap agreement between JetBlue and American Airlines in March 2010. American transferred eight slot pairs at Washington National and one slot pair at Westchester County/White Plains, NY to JetBlue in exchange for 12 of JetBlue's slot pairs at New York JFK Airport.[11]
- Southwest introduced eight daily nonstop flights to Philadelphia, two daily nonstop flights to Denver and St. Louis, and daily service to Phoenix.

Other domestic service increases at Logan Airport that contributed to a rise in passenger levels in 2010 compared to the previous year included the following:

- JetBlue increased scheduled services to several markets including Baltimore, Charlotte, Chicago, Los Angeles, Pittsburgh, Raleigh/Durham, San Francisco, and Florida markets of Fort Lauderdale, Tampa, and West Palm Beach.
- Logan Airport continued to benefit from Southwest's high-frequency services to Baltimore and Chicago Midway launched earlier in third quarter 2009.
- AirTran increased operations frequencies to Milwaukee, a market introduced in 2009.
- Spirit Airlines increased operations frequencies to Atlantic City and Fort Lauderdale.

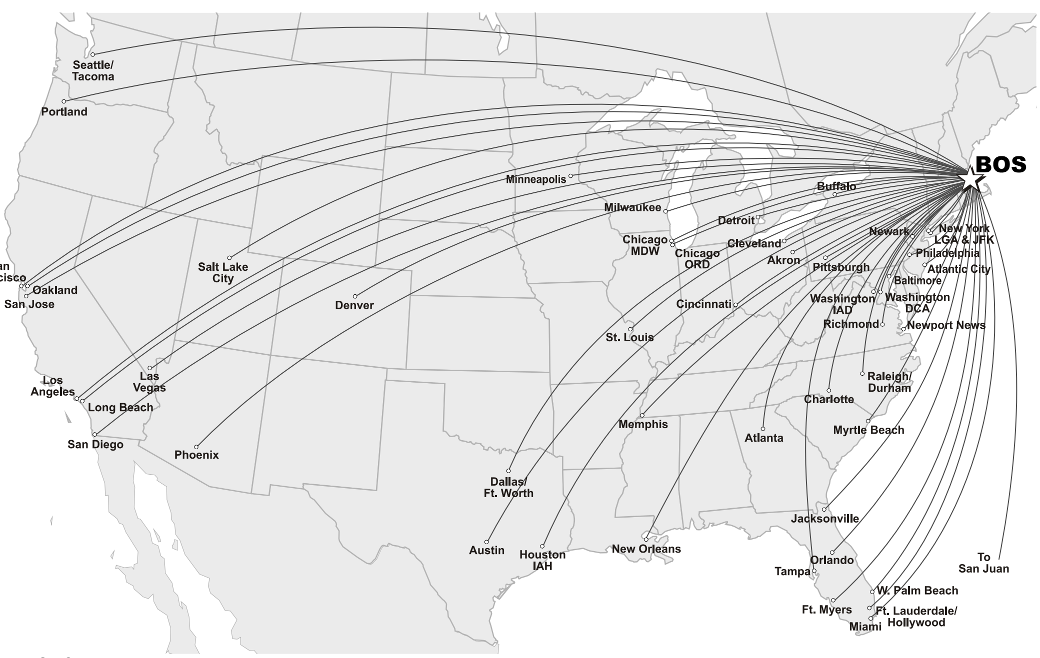
10 Southwest began service at Logan Airport in August 2009.
11 A slot pair is the authority to operate a takeoff and landing.

While the LCCs expanded service at Logan Airport, many legacy carriers continued to implement cutbacks in 2010:

- Following its merger with Northwest Airlines, Delta Air Lines continued to consolidate operations and engage in service rationalization by eliminating excess capacity at major airports across the U.S. in 2010. Delta Air Lines had already made significant cutbacks in scheduled services at Logan Airport in 2009, discontinuing service to RJ markets such as Baltimore, Bangor, Charleston, Myrtle Beach and Philadelphia, as well as jet service to Fort Lauderdale and Sarasota/Bradenton. In 2010, Delta Air Lines discontinued service to three additional Florida destinations: Fort Myers, Tampa, and West Palm Beach. The carrier also reduced frequencies and/or down-gauged aircraft on a number of routes including Cincinnati, New York JFK, New York La Guardia, and Washington National.
- American Airlines discontinued service to four markets: Columbus, Raleigh/Durham, St. Louis, and Washington National. Three of these markets – Columbus, Raleigh/Durham and Washington National – were RJ markets, contributing to the trend of declining RJ operations at Logan Airport. American's Washington National slots were transferred to JetBlue in 2010 as part of the slot swap agreement between the two carriers.
- US Airways cut capacity to New York La Guardia Airport and also decreased frequencies to Las Vegas.

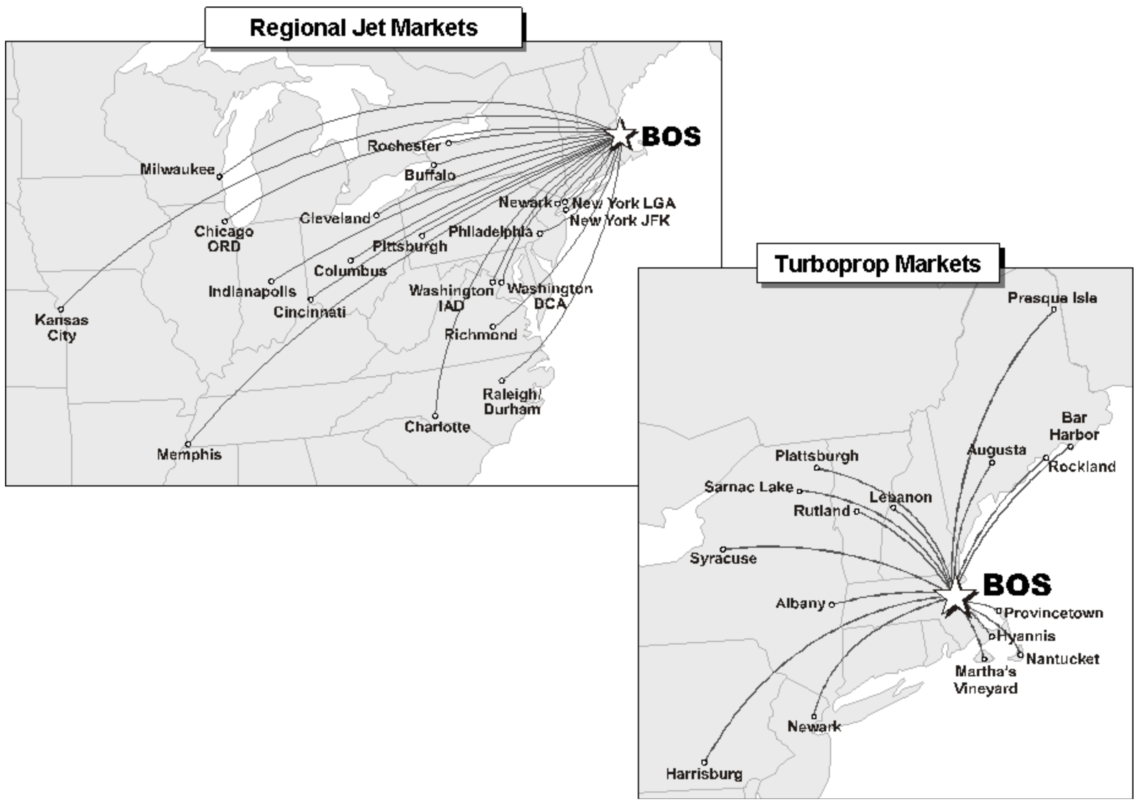
A complete listing of all changes in scheduled departures by domestic destination is in *Appendix E, Activity Levels*. Logan Airport's scheduled domestic large jet and domestic regional services in 2010 are illustrated in Figure 2-9 and Figure 2-10.

Figure 2-9 Domestic Nonstop Large Jet Markets Served from Logan Airport, August 2010



Source: OAG Market Files.

Figure 2-10 Domestic Nonstop Regional Markets Served from Logan Airport, August 2010



Source: Official Airline Guide Market Files.

Changes in International Passenger Service

Total international passenger operations fell 1.8 percent in 2010, as summarized in Table 2-5. (For details on the changes in operations by carrier, see *Appendix E, Activity Levels.*) The Canadian market, Logan Airport's largest international destination region in terms of aircraft operations, increased by 10.7 percent. The Europe/Middle East market, the second largest international market in terms of operations and the largest in passengers, experienced a 1.6 percent decrease in aircraft operations. Operations to the Bermuda/Caribbean market declined by 32.6 percent.

Table 2-5 International Passenger Operations by Market Segment

Category	2005	2006	2007	2008	2009	2010	Percent Change (2009-2010)
Scheduled	**37,575**	**35,003**	**38,308**	**35,538**	**33,878**	**33,266**	**(1.81%)**
Europe/Middle East	12,206	11,954	13,127	13,366	12,960	12,750	(1.62%)
Canada	18,914	16,893	18,859	15,996	14,815	16,399	10.69%
Bermuda/Caribbean[1]	5,594	5,710	6,191	6,176	6,103	4,116	(32.56%)
Central/South America	861	446	131	0	0	0	–
Non-Scheduled	**1,068**	**727**	**527**	**375**	**320**	**305**	**(4.69%)**
Total	**38,643**	**35,730**	**38,835**	**35,913**	**34,198**	**33,570**	**(1.84%)**

Source: Massport.

1 Includes Puerto Rico and U.S. Virgin Islands.

New and expanded international services at Logan Airport in 2010 include the following:

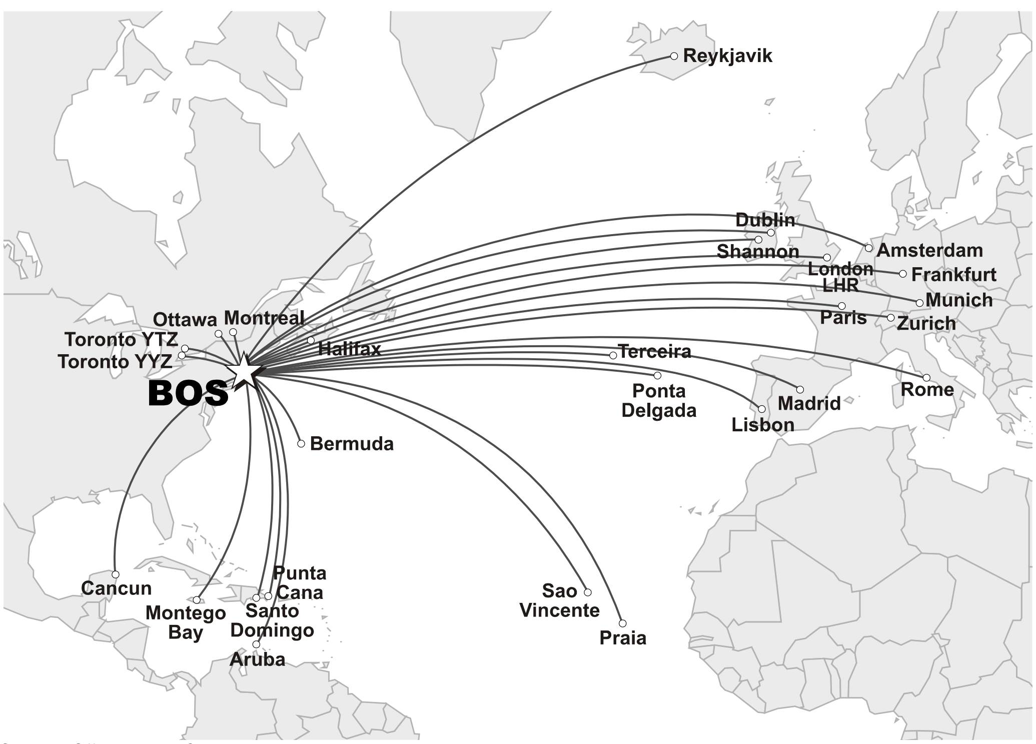
- Porter Airlines, which introduced service to Toronto Island Airport in 2009, increased frequencies on the route to 5 times daily in 2010. Air Canada also increased seat capacity to Montreal Dorval and Toronto Airports in Canada.
- JetBlue initiated service to two more Caribbean markets, Montego Bay, Jamaica and Punta Cana, Dominican Republic.
- European carriers Lufthansa, British Airways, Aer Lingus and Swiss International Air Lines added additional capacity on European routes. American Airlines also increased frequencies to London Heathrow in the summer season.

International service reductions at Logan Airport in 2010 include the following:

- Service cuts in the Caribbean markets led to an overall decline in aircraft operations to the Caribbean. US Airways cut all of its international service from Logan Airport in 2010, discontinuing service to Aruba, Grand Cayman, Montego Bay, Nassau, Providenciales, and Punta Cana. American Airlines also discontinued service to Aruba and Providenciales in the Turks and Caicos Islands.
- Aer Lingus reduced operations frequencies to Shannon in 2010.
- Finnair discontinued seasonal service to Helsinki.
- Delta Air Lines discontinued services to Halifax.

Logan Airport's scheduled international air service markets are shown in Figure 2-11.

Figure 2-11 International Nonstop Markets Served from Logan Airport, August 2010



Source: Official Airline Guide Market Files.

Cargo Activity Levels

In 2010, Logan Airport ranked 21st among U.S. airports in total cargo volume.[12] Air cargo is carried in the belly compartments of passenger aircraft or by dedicated all-cargo carriers, such as FedEx, United Parcel Service (UPS), and DHL in all-cargo aircraft. The express/small package segment dominates Logan Airport cargo activity, accounting for 62.1 percent of the total non-mail cargo volume. Table 2-6 shows all-cargo aircraft operations and cargo volumes at Logan Airport since 2005.

In 2010 the number of all-cargo operations at Logan Airport decreased by 5.8 percent from 2009, while total cargo volume, including mail, increased by 4.7 percent in 2010 (Table 2-6). This marks a slight recovery after the steep decline in 2009 caused by the global recession and reduced consumer spending. Overall, cargo volume at Logan Airport has declined by approximately 6.1 percent per year since 2005. 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 44.5 percent of the total cargo volume through Logan Airport in 2010 and was the 13th largest air carrier at the Airport in terms of total flights. UPS was the next largest cargo operator and accounted for 13.7 percent of Logan Airport's cargo volume in 2010. Passenger airlines carried 38.8 percent, or 222 million pounds, of Logan Airport's cargo as belly cargo in 2010, compared to 350 million pounds that was shipped on all-cargo carriers. These numbers are presented in Figure 2-12.

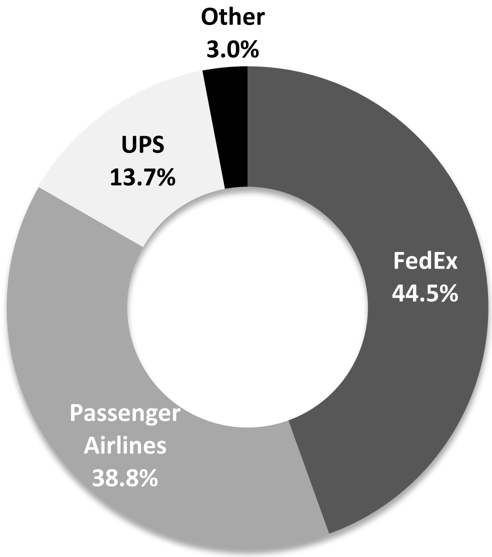
Table 2-6 Cargo and Mail Operations and Volume

	2005	2006	2007	2008	2009	2010	Percent Change (2009-2010)
All-Cargo Aircraft Operations	8,913	8,991	8,607	8,669	6,658	6,274	(5.77%)
Volume (lbs.)							
Express/Small Packages	472,605,966	422,173,699	403,051,494	384,170,303	326,475,030	339,485,424	3.99%
Freight	268,911,342	256,894,390	229,398,281	203,601,999	191,082,152	206,893,979	8.27%
Mail	43,728,414	37,269,744	25,843,366	33,511,097	28,802,366	25,904,205	(10.06%)
Total	**785,245,722**	**716,337,833**	**658,293,141**	**621,283,399**	**546,359,548**	**572,283,608**	**4.74%**

Source: Massport.

12 Airports Council International, 2010 North American Air Traffic Report.

Figure 2-12 Cargo Carriers - Share of Logan Airport Cargo, 2010



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

3
Airport Planning

Introduction

This chapter describes the status of projects underway or completed at Logan Airport in 2010, and outlines plans for future projects and planning concepts that are under consideration by the Massachusetts Port Authority (Massport) or its tenants through 2020.

As discussed in *Chapter 1, Introduction/Executive Summary* of this *2010 Environmental Data Report (2010 EDR)*, 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.

2010 Planning Highlights

Recent progress on individual projects during 2010 included:

- **Southwest Service Area (SWSA) Redevelopment Program.** Massport completed the permitting process 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. A Notice of Project Change (NPC) was filed with the Executive Office of Energy and Environmental Affairs (EEA) for the SWSA Redevelopment Program on October 15, 2009. The primary program change involved elimination of the initially proposed commercial parking element of the project. This resulted in a downsizing of the structure and its siting farther from the community. A Final Environmental Impact Report/Environmental Assessment (EIR/EA) for the project was filed in March 2010, and on May 28, 2010, the EEA Secretary issued a Certificate that determined that the project adequately and properly complies with MEPA. Construction of this project began in July 2010, starting with various enabling phases of construction.
- **Logan Runway Safety Area (RSA) Improvements Project at Runway Ends 33L and 22R.** An Environmental Notification Form (ENF) was filed on June 30, 2009, for the Logan RSA Improvements Project, and the EEA Secretary determined that the preparation of a Draft EIR was required. On July 15, 2010, a combined federal/state Draft EA/EIR was filed. The Final EA/EIR was filed January 31, 2011; the EEA Secretary issued a Certificate that determined that the project adequately and properly complies with MEPA. The Federal Aviation Administration (FAA) issued a Finding of No Significant Impact (FONSI) for the project on April 4, 2011. Construction of the Runway 33L RSA improvements commenced in June 2011.

- **Green Bus Depot.** Preliminary 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 will be used to maintain the expanded shuttle bus fleet that will replace Logan's aging compressed natural gas (CNG) bus fleet as well as all of the rental car company diesel shuttle buses. An expanded ENF for the Green Bus Depot was filed on July 15, 2010. After an extended comment period, the EEA Secretary issued a Certificate on the ENF on September 17, 2010 stating no further MEPA review is required. Construction is underway as of the date of this filing.
- **East Boston-Chelsea Bypass Project.** Planning for the East Boston-Chelsea Bypass project commenced to develop a limited access roadway between Logan Airport and the new Chelsea Street Bridge. The Bypass roadway is expected 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. An ENF was filed on October 15, 2010; on December 1, 2010, the EEA Secretary, in his Certificate, determined that no further MEPA review was required. Construction is underway as of the date of this filing.
- **Logan Airport Parking Deck Project.** Planning for the Logan Airport Parking Deck Project (Economy Garage) along Prescott Street in the North Cargo Area (NCA) was initiated in 2010. In response to a Massport request, the MEPA Office confirmed that the project was not subject to MEPA review. Construction of the economy garage began in summer of 2010 and was completed and fully opened to the public in early 2011. Solar panel "trees" were installed on the roof of the parking deck, and energy-efficient lighting was also installed throughout. Reporting required by the EEA Secretary is provided in *Chapter 5, Ground Access to and From Logan Airport*, and further details of its energy-saving features are provided in *Chapter 1, Introduction/Executive Summary.*
- **North Service Area Roadway Corridor Project.** Massport anticipates completing the project with final landscaping in 2011. The NSA Roadway Corridor Project is not a new roadway but a corridor improvement project. This 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. The project will coordinate with other projects including the Logan Airport Parking Deck Project, entrance to the East Boston-Chelsea Bypass Project, and interface with the Neptune Road Buffer Project. The NSA Roadway Corridor extends approximately from Building 11 up to and including Neptune Road. Construction of the NSA Roadway Corridor Project began in 2010. Most of the project's infrastructure, including curbing, sidewalks, lighting and fencing have been installed.
- **Hangar Upgrade Projects.** Architectural design commenced in December 2010 for two hangar upgrades in the NCA.
- **Terminal B Garage Improvement Project.** Terminal B Garage repair and rehabilitation continued in 2010. In addition to overall upgrades, 32 solar panel trees (200 kilowatt (Kw)) were installed on the top floor and the entire garage was fitted with high efficiency LED lighting.
- **Taxiway G Realignment Project.** Taxiway G realignment construction was completed in 2010.
- **Operating Improvements.** The Secretary's Certificate on the *2009 EDR* suggested that the cumulative impacts of several recent and pending projects should be a priority in future EDR/Environmental Status and Planning Report (ESPR) filings. Once completed and fully operational, the ConRAC, Green Bus Depot, East Boston-Chelsea Bypass Road, and the Logan Airport Parking Deck Project 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. While none of these projects were complete in 2010, these four projects will each provide improvements to the operating characteristics of the Airport roadways or surrounding East Boston neighborhood, as documented below:

- The ConRAC project will reduce Airport VMT as well as improve roadway and intersection operations through:
  - Consolidation of the rental car shuttle bus fleet and some Massport shuttle buses into a unified shuttle route system with the elimination of 8 rental car bus fleets (a net total of 66 buses would be eliminated);
  - Intersection and roadway infrastructure improvements including signal coordination and dedicated ramp connections; and
  - Creation of a Ground Transportation Operations Center (GTOC) enabling efficient planning and operation of Airport-wide transit activities.

- When complete, the new Green Bus Depot will create an on-Airport maintenance facility for Massport's new clean-fuel bus fleet. This facility will reduce on-Airport bus VMT as well as bus traffic in East Boston by eliminating the need for the current maintenance yard in Chelsea.
- Once constructed, the East Boston Chelsea Bypass will reduce commercial traffic through East Boston by providing a direct link from the NSA to the Chelsea River Bridge for airport-related commercial vehicle trips.
- The recently completed Logan Airport Parking Deck Project is already helping to simplify and reduce 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.

As these facilities come on-line, future ESPR and EDR filings will report on the effects of more efficient operations and the predicted environmental benefits.


Navy Fuel Pier Buffer in the foreground. Source: Massport.

Table 3-1 provides a summary of the status of each project and planning concept, as of December 31, 2010. Descriptions are provided in subsequent sections of this chapter.

Table 3-1 Logan Airport Projects and Planning Concepts, 2010

	Status as of 2010	Completion By 2015	Completion By 2020
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	E		✈
Terminal B Walkway Extension	H		
Terminal B Garage Repair and Rehabilitation	U	✈	
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	H		✈
Replacement American Airlines Hangar in the NCA	H		✈
Replacement Hangar Facilities in the NCA	H		✈
New/Replacement GSE Consolidated Facility in the NCA	H		✈
Green Bus Depot in the NSA	D	✈	
Flight Kitchen Consolidation in the NSA	D	✈	
SWSA Program (Consolidated Car Rental Facility)	U/D	✈	
Ground Transportation Operations Center	D	✈	
NSA Roadway Corridor Project	U	✈	

	Status as of 2010	Completion By 2015	Completion By 2020
Airport Parking Projects/ Planning Concepts			
NSA Economy Parking Consolidation (Project Canceled)			
Logan Airport Parking Deck Project in the NCA	U	✈	
Airside Area Projects/ Planning Concepts			
Runways 22R and 33L Runway Safety Area Improvements	R	✈	
Logan Airside Improvements Planning Project			
Runway 14-32 Construction	C		
Taxiway Improvements	C/U	✈	
Centerfield Taxiway	C		
Taxiway Delta Extension	C		
Taxiway G Realignment	C		
Governors Island Aircraft Parking	H		
Buffer Projects/ Planning Concepts			
SWSA Buffer	C (Phase 1)/ D (Phase 2)[1]	✈	
NSA Buffer	D	✈	
Bremen Street Park	C		
Airport-Wide Projects/ Planning Concepts			
Logan Airport Wayfinding System	U[2]		
East Boston-Chelsea Bypass	D	✈	

Notes: Anticipated completion dates and status as of December 31, 2010.
Details of each project or planning concept are provided in the sections that follow.
C – Completed prior to or during 2010
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, Federal Aviation Administration (FAA), or other review
U – Project under construction
1 – Phase 2 of the SWSA Buffer is included as part of the Southwest Service Area Redevelopment Program Final Environmental Impact Report/Environmental Assessment (EIR/EA)
2 – Design has been completed. At this time, the project is not funded and 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 at Logan Airport are proposing projects or exploring planning concepts to modernize and carry out future improvements to the existing terminal facilities. These potential future planning concepts are also detailed in Table 3-2. The location of the ongoing terminal area projects and the planning concepts that may be constructed in the future are shown on Figure 3-1.

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

Note: See Table 3-2 for numbered projects

Table 3-2 Description and Status of Projects/Planning Concepts in the Terminal Area (as of December 31, 2010)

Description	Status
Massport Projects/Planning Concepts	
1. International Gateway Project (Terminal E) The International Gateway Project expands and upgrades Terminal E to provide better service to international passengers. This project is being constructed in phases:	
Phase 1 – 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 from remotely parked aircraft that are unable to park at a gate because it is occupied by another aircraft.	Completed in 2004.
Phase 2 – This phase of the project enlarges Logan Airport's congested Federal Inspection Services (FIS) Facility, and improves the meeter/greeter lobby and the ticketing area of Terminal E to maximize passenger convenience and reduce processing times in the terminal. The project reconstructs and expands Terminal E in and around the existing terminal while keeping it operational and safe.	Completed in 2007.
Future Phase – This phase involves the construction of a new West Concourse, which will add three new gates to Terminal E to accommodate wide body aircraft.	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.
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.	Massport and American Airlines filed a joint Environmental Notification Form (ENF) on May 31, 2000 (EOEA #12235), a Draft Environmental Impact Report (EIR) on May 9, 2001, and a Final FEIR on June 23, 2001. On August 24, 2000, the Federal Aviation Administration (FAA) determined that the projects are categorically excluded from the need to prepare an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA), and that the projects meet the General Conformity requirements of the Clean Air Act, as amended.[1] This project is no longer being considered in this form.
3. Terminal B Improvements and Renovations The airline industry continues to react to financial and other operating pressures. This has led to a number of consolidations and realignments within the airlines. In an effort to address these changes and the need for airlines to relocate with new partners, Massport has initiated analysis of terminal changes that would better accommodate these ongoing airline partnerships and facilitate broader flexibility in terminal utilization. This is expected to include renovation of existing spaces as well as potentially some new spaces to better facilitate passenger processing.	For any improvements under this project meeting MEPA or NEPA thresholds, documentation would be filed as appropriate.

1 Letter from John Silva, Manager, Environmental Programs, Federal Aviation Administration, New England Region, to Ken Hietbrink, American Airlines, and Betty Desrosiers, Massport. Dated August 24, 2000.

Table 3-2 Description and Status of Projects/Planning Concepts in the Terminal Area (as of December 31, 2010) (Continued)	
Description	**Status**
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. The multi-year construction project is underway. While there are temporary reductions in garage capacity for construction, the project will not provide any additional capacity. The installed solar panels (200 kilowatts (Kw)) on the garage roof and new LED lighting have already begun to reduce energy consumption and improve air quality. Further details on these 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 situated adjacent to the airside area of Logan Airport, is Logan 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 flight kitchens, weather and navigation equipment, construction staging areas, and overflow economy parking. Portions of the NSA are being planned or in use for a bus maintenance facility, the temporary bus/limousine pool, and an airport edge buffer. Permitting has been completed for the proposed Green Bus Depot.
- **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. Current surface operations include the taxi pool, and rental car operations. The entire SWSA will be redeveloped to accommodate a new consolidated car rental facility and associated activities. As an interim measure during ConRAC construction, the bus and limousine pools have been temporarily relocated to the NSA. Relocation of a flight kitchen located in the SWSA to an existing vacant flight kitchen facility in the NSA is also expected.

- **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, 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.
- **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 is being considered as a location of remain over night (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 potential future 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.

Pedestrian walkway from Terminal C to Terminal E, 2010.

Figure 3-2 Logan Airport Service Areas

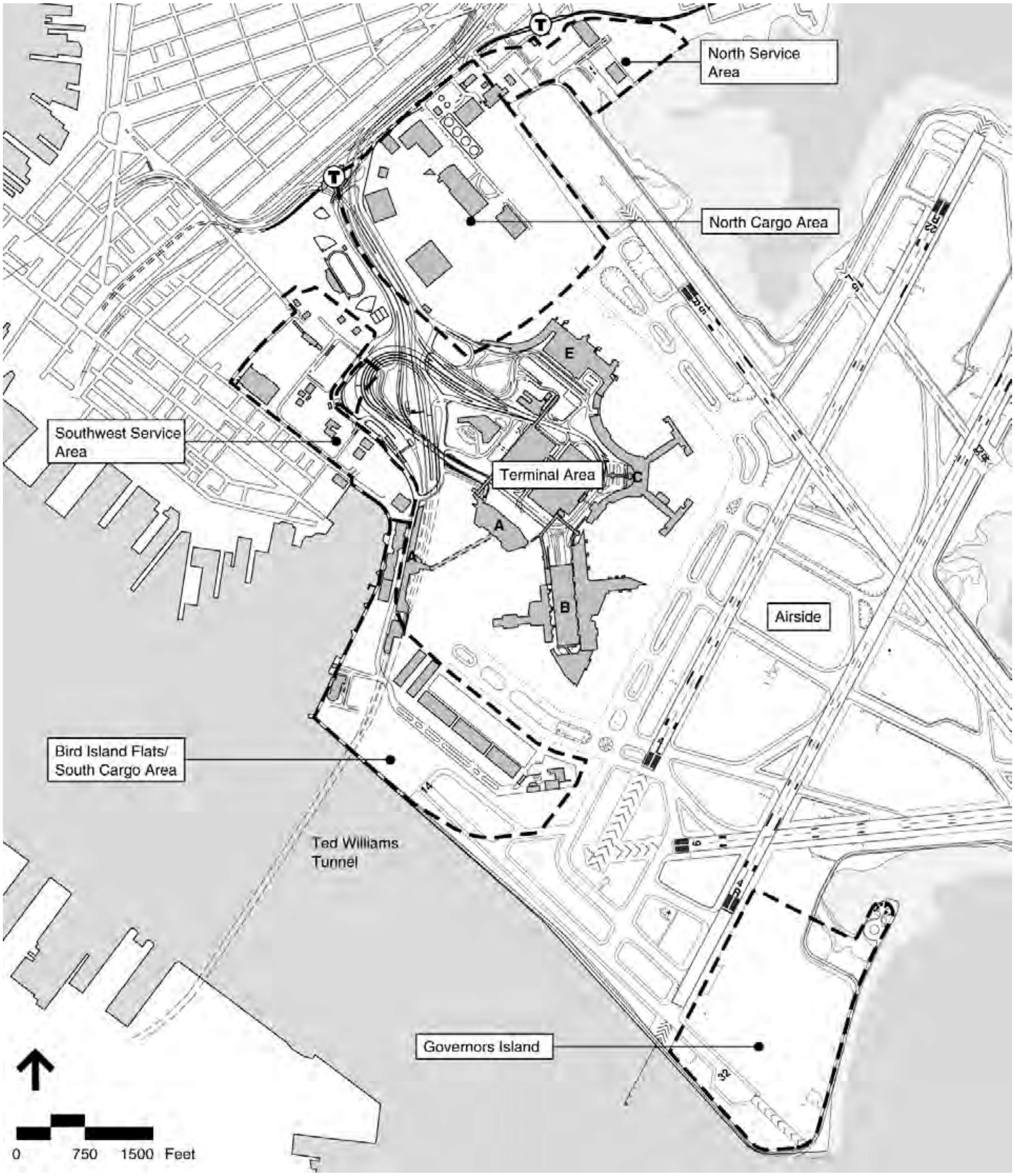
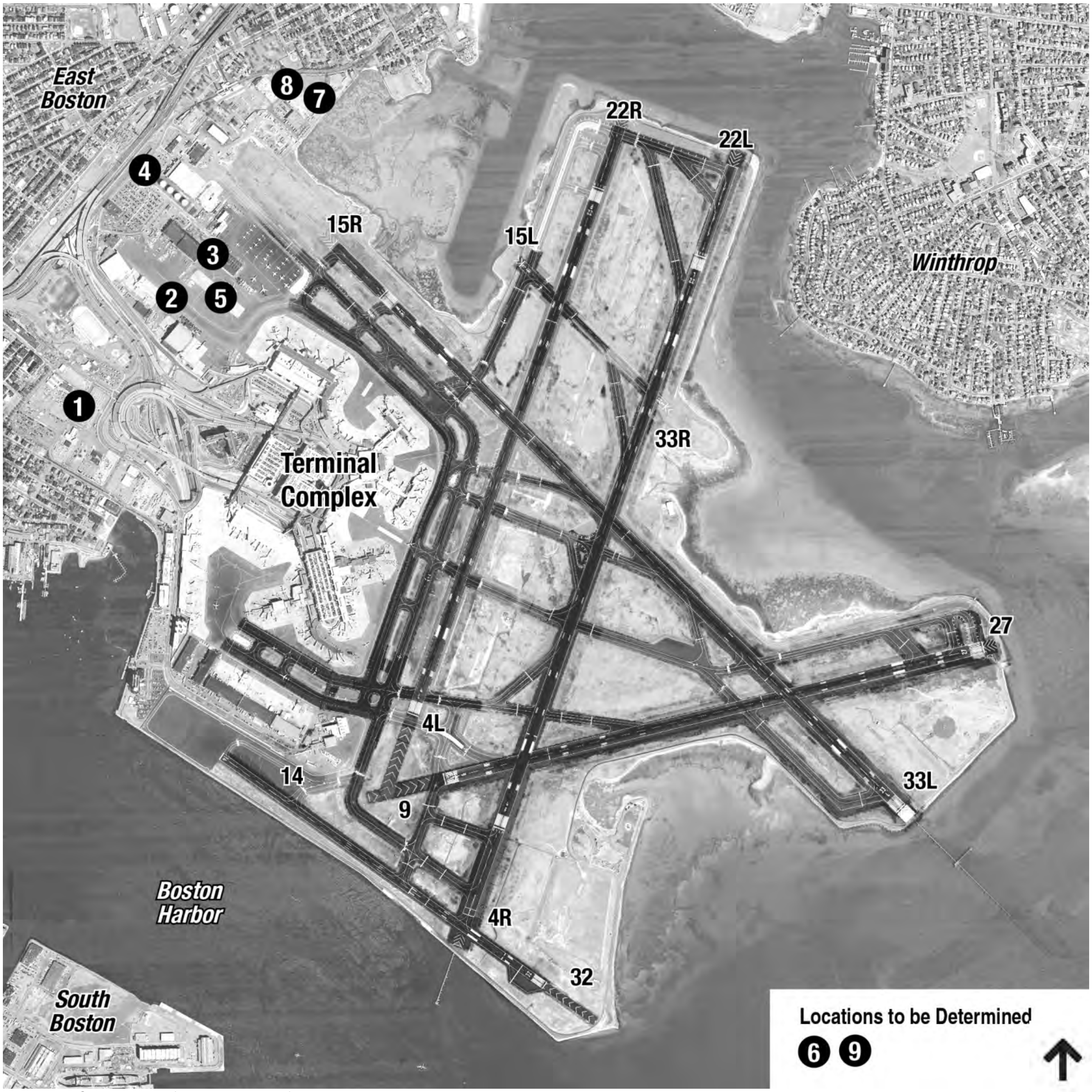


Figure 3-3 Location of Projects/Planning Concepts in the Service Areas



Note:	See Table 3-3 for a description of the numbered projects
1	Southwest Service Area Redevelopment Program 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	Fight 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 (as of December 31, 2010)

Description	Status
Massport Projects/Planning Concepts	
1. Southwest Service Area (SWSA) Redevelopment Program The SWSA Redevelopment Program will consolidate on-airport rental car operations and facilities into one integrated facility to better serve both the 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. Redevelopment of the SWSA is needed because the existing SWSA and rental car facilities are inefficient and are not adequate to meet Logan Airport's or the rental car companies' future needs. The SWSA Redevelopment Program will replace and upgrade existing uses within the SWSA. The development will include a consolidated car rental facility with a four-level garage to accommodate rental car retail operations and storage; four 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 will also include a customer service center and quick turn-around maintenance and service facilities. The commercial parking component of the garage has been eliminated (as per the Notice of Project Change filed with MEPA). Leadership in Energy and Environmental Design® (LEED) Silver certification will be pursued for the facility. Construction of the consolidated car rental facility (ConRAC) facilities will be preceded by numerous enabling activities that reorganize 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 NSA. New traffic signalization will also facilitate the construction of the SWSA including a new traffic signal at the intersection of Frankfort Street and Lovell Street and at the intersection of Harborside Drive and Hyatt Drive. Phase 2 of the SWSA Buffer (EEA #14137) (see Table 3-5) will be 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 MEPA was issued on May 28, 2010. The project is now in final design and a contractor has been selected. 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 maintenance and service facility is now under construction.

Table 3-3 Description and Status of Projects/Planning Concepts in the Service Areas (as of December 31, 2010) (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. It will be staffed by private contractors tasked specifically with managing the shuttle buses as well as by Massport employees. 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 facility is envisioned as a large room with workstations for Massport employees and the private contractors tasked specifically with managing Massport's shuttle bus fleets. 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.	Design of the GTOC was underway in 2011 as part of the ConRAC project. Project implementation will parallel the schedules for the new transit bus delivery (2012), Green Bus Depot completion (2012) and ConRAC facility completion (2013).
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.

Table 3-3 Description and Status of Projects/Planning Concepts in the Service Areas (as of December 31, 2010) (Continued)

Description	Status
Massport Projects/Planning Concepts	
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 Parking Deck Project, 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.	Evaluation of planning concepts underway in 2010 (see sample project renderings below). On a parallel track, Massport continues work with the City of Boston and community representatives and others in 2011 relative to design and construction of an East Boston Greenway connection between Bremen Street Park and Constitution Beach.
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 proposed Green Bus Depot will occupy a 7.7-acre site in the North Service Area and will be shielded from the community by an extensive landscape buffer. The new facility will 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 will be 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 is anticipated to be completed by 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 is being renovated and is expected to be reactivated by early 2012.
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.

North Service Area Roadway Corridor: Existing and Concept Renderings

Existing

Concept

East Boston / Chelsea Bypass Intersection

Existing

Concept

East Boston / Chelsea Bypass Road (toward Neptune Road)

Existing

Concept

Source: Massport

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 December 31, 2010.

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

Note: See Table 3-4 for numbered projects.

Table 3-4 Description and Status of Projects/Planning Concepts on the Airside (as of December 31, 2010)

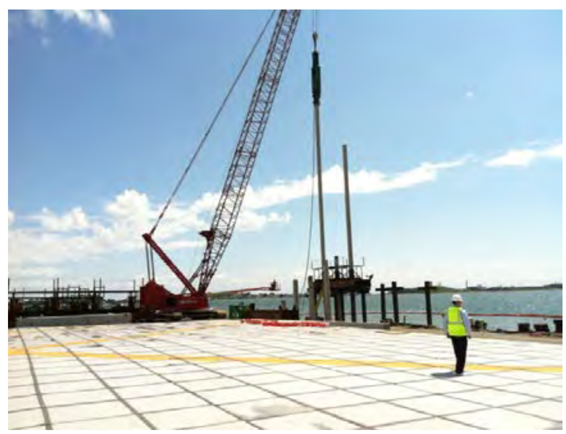
Description	Status
1. Runway 22R and 33L Runway Safety Area (RSA) Improvements The FAA requires RSAs to accommodate aircraft overruns, undershoots, and veer-offs in emergency situations. Consistent with FAA requirements, Massport is continuously looking for opportunities to increase the margin of safety 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.	Construction of an EMAS bed at Runway 22R was completed in 2005. An interim EMAS bed was installed at Runway 33L in 2006. Evaluation of additional safety enhancements for the RSAs at both runway ends were advanced as a separate project as described below. Massport filed an ENF with MEPA on June 30, 2009 that describes 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. The Secretary's Certificate was issued March 18, 2011. Remaining environmental permits were secured by May 2011 and construction of the Runway End 33L RSA improvements commenced in June 2011. Construction is scheduled to be completed by the end of 2012. The Runway End 22R enhancements will be completed by 2015.  **Construction on Runway End 33L RSA improvements, July 2011.**
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.

Table 3-4 Description and Status of Projects/Planning Concepts on the Airside (as of December 31, 2010) (Continued)

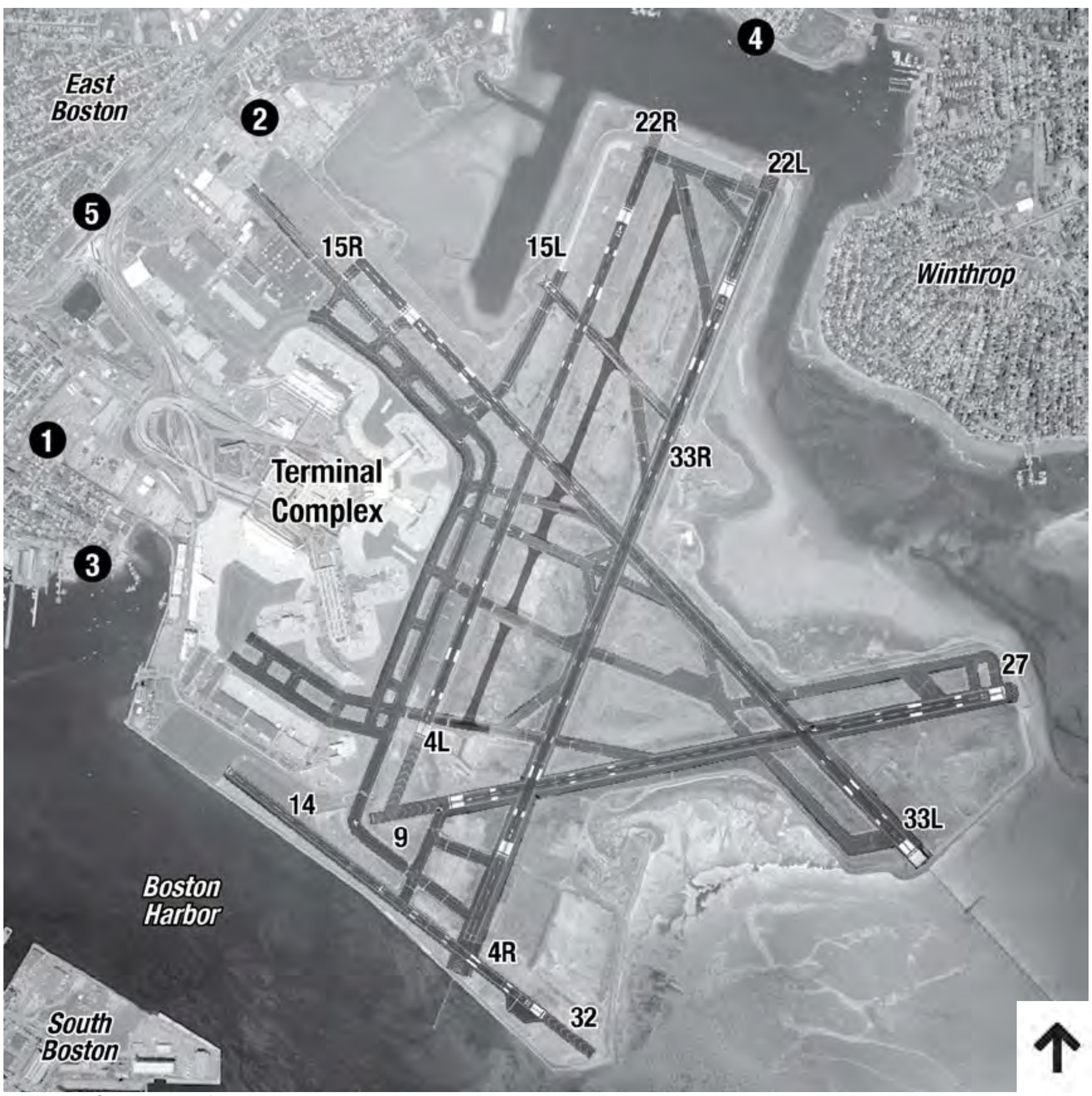
c. Construction of a Taxiway D straightening and realignment, and southwest corner taxiway realignment and the installation of lighting, marking, signage, and drainage.	The southwest corner taxiway realignment component of the project was completed in 2007. The Taxiway D extension was fully constructed in 2009.
d. Straightening and realignment of Taxiway N.	This project component is anticipated to commence after 2010.
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 Runway 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 33L RSA deck will be able to accommodate the future relocation of the localizer. Additional navigational equipment upgrades to implement the new minimums are pending.
3. Governors Island Aircraft Parking Massport has considered providing additional aircraft parking at Governors Island for the following: Remain over night (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

Massport has committed up to $15 million for the planning, construction, and maintenance of buffer areas around Logan Airport. Three buffers have been completed, including the Bayswater Buffer, Navy Fuel Pier Buffer, and SWSA Buffer Phase I. 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 December 31, 2010. Figure 3-5 shows the location of these buffer projects.

Figure 3-5 Location of Airport Edge Buffer Projects/Planning Concepts



Note: See Table 3-5 for numbered projects.

Table 3-5 Description and Status of Airport Edge Buffer Projects/Planning Concepts (as of December 31, 2010)

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 the fall of 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 and includes an extensive landscaping plan with trees, shrubs and flowering perennials and decorative fences. The Secretary's Certificate on the SWSA Redevelopment Project Final Environmental Impact Report (EIR) was issued on May 28, 2010. Construction is anticipated to be completed in 2013.
2. North Service Area (NSA) 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 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 2012. 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.

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). Historically, parking supply at Logan Airport has varied in terms of 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.

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

Note: See Table 3-6 for a description and status of numbered projects.
1 North Service Area (NSA) Economy Parking Consolidation
2 Logan Airport Parking Deck Project in the NCA (North Cargo Area)

Table 3-6 describes current commercial parking projects at Logan Airport. The locations of parking projects are shown on Figure 3-6.

Table 3-6 Description and Status of Airport Parking Projects/Planning Concepts (as of December 31, 2010)

Description	Status
1. North Service Area (NSA) Economy Parking Consolidation (EOEA#13456) As originally envisioned, the project would redevelop three parcels, totaling ±15.7 acres, into a combined economy parking lot with the capacity for up to 1,750 vehicles.	The NSA Economy Parking Consolidation project was cancelled. The site will be used for a bus maintenance facility (Green Bus Depot), which has completed MEPA review (see details in Table 3-3). Construction is underway as of this filing.
2. Logan Airport Parking Deck Project in the NCA (North Cargo Area) This involves construction of an interim two-level deck above the existing surface economy parking lot on the Robie Parcel in the NCA. The two decks 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, 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.

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

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 (as of December 31, 2010)

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.	Ongoing.
2. The East Boston-Chelsea Bypass (Dedicated Airport Access Road) This bypass is being 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 not for public access. The Bypass roadway will provide a means to remove airport traffic (trucks, cargo vehicles, parking shuttles, and 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 will also be used by MBTA transit vehicles and will serve as an initial link in the Commonwealth's planned Urban Ring.[2]	An Environmental Notification Form (ENF) was filed in October 2010, and project construction began in 2011.

2 Department of Transportation, Office of Transportation Planning, http://theurbanring.eot.state.ma.us/.

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4

Regional Transportation

Introduction

This chapter reports on the status of the New England regional airports in 2010 and describes the Massachusetts Port Authority's (Massport) ongoing efforts to support an efficient regional air transportation network. The chapter specifically describes:

- Comparison to activity levels and growth and airline service at the regional airports including: Bradley International Airport, Connecticut (CT); T.F. Green Airport, Rhode Island (RI); Manchester-Boston Regional Airport, New Hampshire (NH); Portland International Jetport, Maine (ME); Burlington International Airport, Vermont (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.
- Status of 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.

Key Findings

Key findings for New England regional airports and the regional transportation system in 2010 include the following:

- The total number of air passengers utilizing New England's commercial service airports, including Logan Airport, increased from 42.0 million in 2009 to 43.1 million annual air passengers. This represents an annual increase of 2.5 percent, which is in line with an overall increase of 2.4 percent in the U.S. passenger market in 2010.[1]
- The challenging airline operating environment affected smaller communities disproportionately. Within the region, Logan Airport passenger traffic grew, while air passenger levels continued to decline at the other regional airports. Of the 43.1 million air passengers using New England's commercial service airports in

1 Airports Council International, 2010 North American Air Traffic Report

2010, 63.6 percent of air passengers used Logan Airport compared to 56.4 percent in 2005. Passenger levels at the regional airports declined by 5.2 percent in 2010, compared to an increase of 7.5 percent at Logan Airport. This was largely due to legacy carriers withdrawing from smaller secondary markets and reducing their use of small regional jets, and low-cost carriers (LCCs), such as Southwest Airlines and JetBlue Airways, focusing on expansion in larger air service markets with a strong business travel portfolio like Logan Airport.

- Aircraft operations in the New England region remained largely flat, increasing slightly by 0.7 percent, from 1.03 million operations in 2009 to 1.04 million operations in 2010. Commercial airline operations declined by 0.25 percent, while general aviation (GA) and military operations increased by 1.9 percent and 4.7 percent respectively.
- Massport continued to engage in metropolitan cooperative planning efforts including GreenDOT, the Healthy Transportation Compact, and the Boston Metropolitan Planning Organization (Boston MPO) also known as the Metropolitan Area Planning Council (MAPC).[2,3]

New England Regional Airport System

As shown in Figure 4-1, the New England region is served by Logan Airport, the primary international hub and domestic destination, and a system of ten regional commercial service airports[4] (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 5.3 million commercial passengers in 2010, to Portsmouth International Airport which handled fewer than 5,000 charter passengers in 2010.[5]

Massport owns and operates two of the regional airports, Hanscom Field and Worcester Regional Airport. Hanscom Field and Worcester both play important roles in the regional transportation system, as briefly 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 2010, there were 161,940 aircraft operations at Hanscom Field, approximately eleven 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 all scheduled commercial service at the beginning of 2008 when Boston-Maine Airways discontinued services to Portsmouth and Trenton. Linear Air, an air taxi charter company, provides private air transportation from Hanscom Field to cities throughout the Northeast and eastern Canada. Streamline currently provides scheduled charter service between Hanscom Field and Trenton, New Jersey (NJ).

2 Massachusetts Department of Transportation, www.eot.state.ma.us/default.asp?pgid=content/releases/pr060210_GreenDOT&sid=release, June 2, 2010.
3 Massachusetts Department of Transportation, www.massdot.state.ma.us/main/healthytransportationcompact.aspx.
4 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.
5 Excluding through passengers.

- Worcester Regional Airport (ORH) is located in Central Massachusetts, approximately 40 miles west of Logan Airport. Worcester is recognized as an important aviation resource that can accommodate both corporate/GA activity and niche commercial airline services. In 1995, Massport began collaborating with the City of Worcester, the airport's then owner, to identify opportunities for increasing Worcester's utilization in order to accommodate some of the regional demand that would otherwise use Logan Airport. Massport assumed operation of Worcester in 2000 and acquired the airport in June 2010. In 2010, GA accounted for approximately 95 percent of aircraft activity at Worcester. The airport lost commercial airline services in 2006 when Allegiant discontinued service, but regained regularly scheduled charter service in late 2008 with the entry of Direct Air. Direct Air continues to serve the airport today; in 2010, Direct Air had 71,110 passengers and 637 operations.

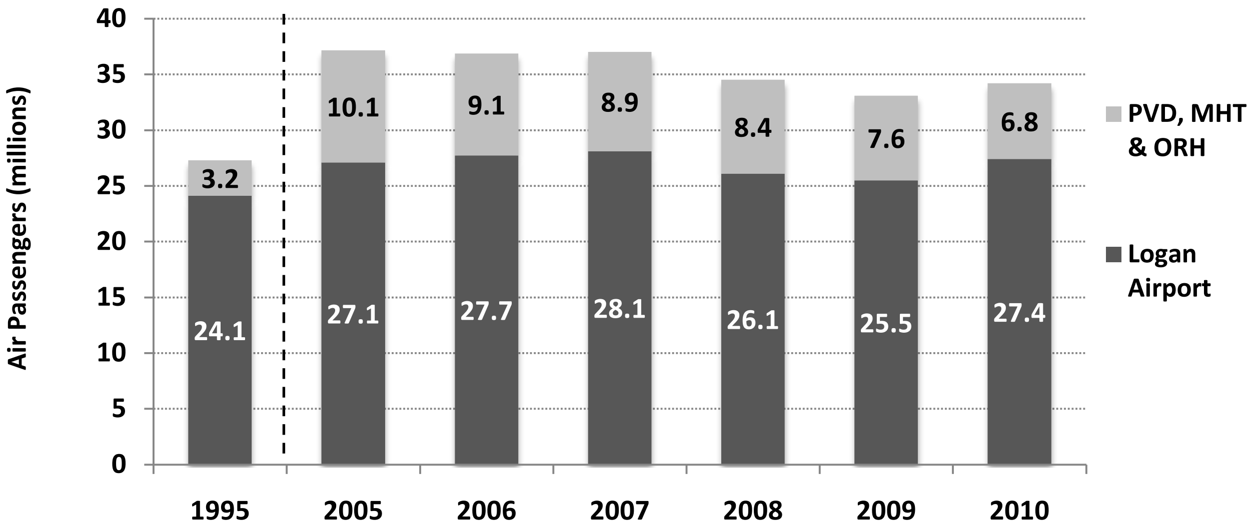
The regional airports that are closest to and have the greatest influence on passenger traffic and aircraft activity at Logan Airport are T.F. Green Airport in Warwick, RI and Manchester-Boston Regional Airport in Manchester, NH. These airports are in close proximity to Logan Airport, and have overlapping 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, T.F. Green, and Manchester-Boston Regional Airports. 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.[6] Worcester Regional Airport could also draw some traffic from the Greater Boston market area if it were to gain substantial commercial airline service. In 2010, T.F. Green, Manchester-Boston Regional, and Worcester Regional Airports served 19.9 percent of the combined passengers at the four Greater Boston market area airports, down from 22.8 percent in 2009. Despite the reduction in air service and passengers in recent years, these regional airports continue to serve a significant share of passengers in the combined Boston/Providence/Manchester system. In 1995, T.F. Green, Manchester-Boston Regional, and Worcester Regional served only 11 percent of the combined passengers at the four airports. Figure 4-2 depicts the historic distribution of air passengers for these three regional airports and Logan Airport.

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.

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

Figure 4-1 New England Regional Transportation System

Figure 4-2 Passenger Activity Levels at Logan Airport and Surrounding Airports



Source Massport and individual airport data reports.

Air Passenger Trends

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

Regional Airport Passengers

In 2010, New England's 11 commercial airports accommodated 43.1 million passengers. As shown in Table 4-1, total air passenger traffic at the New England airports increased slightly by 2.5 percent, up from 42.0 million in the prior year. The growth in air passenger traffic in the region was in line with overall growth in the U.S. passenger market, which increased by 2.4 percent in 2010.[7]

The increase in the region's air passengers was driven by growth at Logan Airport, where passenger traffic grew by 1.9 million or 7.5 percent. Passenger traffic at the other regional airports fell by 0.9 million or 5.2 percent in 2010. Consequently, the 11 regional airports' share of New England passengers decreased to 36.4 percent in 2010, compared to 39.3 percent in 2009 (Figure 4-3). As shown in 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. The current decline in passenger traffic at the regional airports is a reflection of the challenging operating environment facing U.S. airlines and reflects a 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. In 2010, airlines continued to eliminate less profitable routes, cut frequencies in smaller markets, and reduce flying with small regional jets which become uneconomical to operate as fuel prices rise.

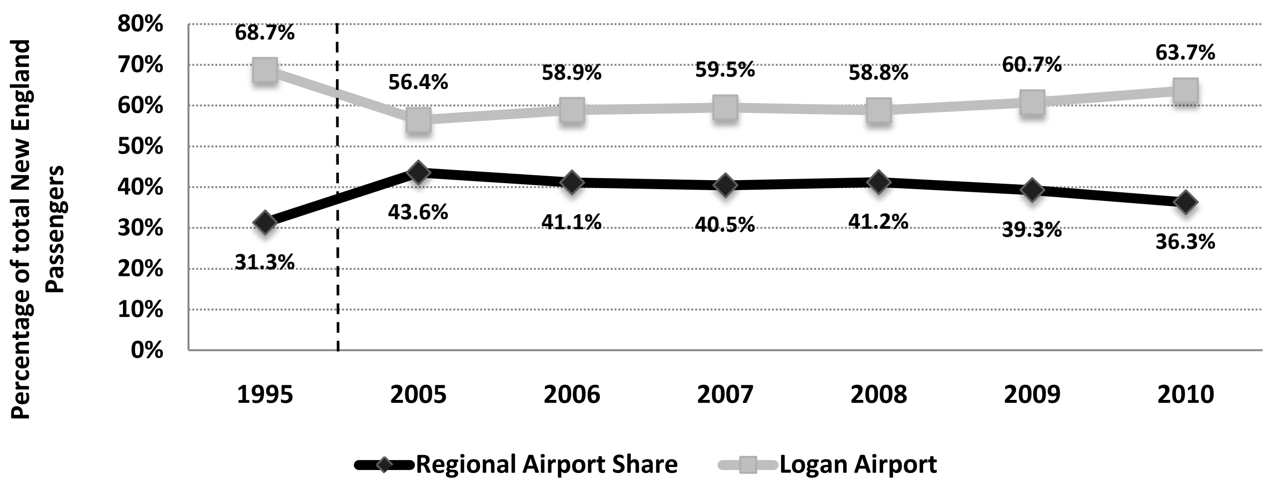
7 Airports Council International, 2010 North American Air Traffic Report.

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

Airport	Passenger Levels (millions)[1] 2005	2006	2007	2008	2009	2010	Percent Change (2009-2010)
Bradley International	7.38	6.91	6.52	6.11	5.33	5.34	0.19%
T.F. Green	5.73	5.20	5.02	4.69	4.33	3.94	-9.01%
Manchester-Boston Regional	4.33	3.90	3.89	3.72	3.18	2.81	-11.64%
Portland International Jetport	1.45	1.41	1.65	1.76	1.73	1.71	-1.16%
Burlington	1.37	1.37	1.41	1.52	1.43	1.30	-9.09%
Bangor	0.48	0.42	0.40	0.35	0.37	0.39	2.63%
Tweed-New Haven	0.13	0.08	0.08	0.07	0.07	0.07	0.00%
Portsmouth International [2]	0.01	0.04	0.11	0.08	0.00	0.00	-
Hanscom Field [3]	0.02	0.02	0.02	0.00	0.00	0.00	-
Worcester Regional [4]	0.00	0.03	0.00	0.00	0.04	0.07	75.00%
Subtotal	**20.90**	**19.38**	**19.10**	**18.30**	**16.49**	**15.63**	**-5.22%**
Logan Airport	27.09	27.73	28.10	26.10	25.51	27.43	7.53%
Total	**47.99**	**47.11**	**47.20**	**44.40**	**42.00**	**43.06**	**2.52%**

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 Portsmouth International passenger numbers for 2005-2008 revised to exclude through passengers. Portsmouth International served fewer than 5,000, but more than 0, passengers in 2010.
3 Hanscom Field served fewer than 5,000, but more than 0, passengers in 2008.
4 Worcester Regional Airport served fewer than 5,000, but more than 0, passengers in 2005 and 2008.

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



Source: Massport and individual airport data reports.
Note: 1995 data are provided for comparison purposes to show historical context.

With the exception of Bradley International, Bangor, and Worcester Regional, all of the regional airports experienced a drop in passenger traffic in 2010. Passenger traffic held steady at Bradley International Airport as new service by JetBlue Airways and service increases by Southwest Airlines and US Airways helped to offset other service cuts. Bangor International Airport saw a slight increase in passenger demand in 2010 despite continued service reductions. Worcester Regional Airport, which lost all commercial service in 2006 but regained regularly scheduled charter service by Direct Air at the end of 2008, experienced an increase in passenger traffic as Direct Air introduced an additional charter destination and attracted additional passengers in 2010.

Aircraft Operation Trends

This section reports on 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, commercial airline operations declined at many of the regional airports. Total commercial operations in the New England region (including Logan Airport) decreased 0.25 percent, from approximately 621,200 in 2009 to 619,600 in 2010. This reflects the national trend of commercial airline operations continuing to decline, though less severely than during the height of the economic recession in the prior year. Airlines continued to monitor and control capacity carefully in 2010 even as passenger demand showed signs of recovery. In 2010, total U.S. aircraft operations declined by 1.4 percent, while U.S. passengers increased by 2.4 percent.[8] Smaller communities, such as the New England regional airports, continued to be impacted in the difficult airline operating environment. The regional airports saw a decline of 2.2 percent in commercial operations, compared to an increase of 1.5 percent at Logan Airport.

GA operations began to recover at the regional airports in 2010. Total GA operations in the New England region increased by 1.9 percent. Military operations increased by 4.7 percent. GA operations continue to be the dominant type of aircraft activity at the regional airports. In 2010, GA accounted for 54.0 percent of total aircraft operations at the regional airports. By comparison, GA represented only 4.2 percent of aircraft activity at Logan Airport, which primarily accommodates the region's domestic and international commercial airline operations. Commercial airline operations accounted for 40.8 percent of total operations at the regional airports, compared to 95.8 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 36.4 percent of New England's air passengers enplaned or deplaned at one of the regional airports, these airports accounted for 66.2 percent of the region's aircraft activity. On average, there were approximately 22.7 passengers per aircraft operation at the regional airports compared to 77.7 passengers per operation at Logan Airport.

Historical aircraft operations from 2005 to 2010 are provided in *Appendix F, Regional Transportation.*

8 Airports Council International, 2010 North American Air Traffic Report.

Table 4-2 Aircraft Operations by Classification for New England's Airports

Airport	2009 Commercial[1]	2009 General Aviation[2]	2009 Military[2]	2009 Total	2010 Commercial[1]	2010 General Aviation[2]	2010 Military[2]	2010 Total	2010 Share of NE Total
Bradley International	82,021	19,586	2,726	104,333	80,418	18,759	3,028	102,205	9.80%
T.F. Green	62,233	19,438	260	81,931	60,128	21,096	347	81,571	7.83%
Manchester-Boston Regional	54,336	14,354	1163	69,853	53,971	13,636	933	68,540	6.58%
Portland International Jetport	35,909	25,473	778	62,160	35,035	19,224	384	54,643	5.24%
Burlington	31,068	16,009	4,104	51,181	29,538	18,464	4,776	52,778	5.06%
Bangor[3]	16,485	19,558	16,267	52,310	16,190	20,142	15,525	51,857	4.97%
Tweed-New Haven	3,096	37,722	486	41,304	3,201	31,884	381	35,466	3.40%
Portsmouth International	422	25,161	6,851	32,434	1,516	25,674	7,707	34,897	3.35%
Hanscom Field	0	148,696	1,215	149,911	0	161,942	1,795	163,737	15.71%
Worcester Regional	2,527	41,700	17	44,244	1,639	41,843	572	44,054	4.23%
Subtotal	**288,097**	**367,697**	**33,867**	**689,661**	**281,636**	**372,664**	**35,448**	**689,748**	**66.17%**
Logan Airport	333,064	12,242	NA	345,306	337,961	14,682	NA	352,643	33.83%
Total	**621,161**	**379,939**	**33,867**	**1,034,967**	**619,597**	**387,346**	**35,448**	**1,042,391**	**100.00%**

Airport	Percent Change (2009-2010) Commercial[1]	General Aviation[2]	Military[2]	Total
Bradley International	-1.95%	-4.22%	11.08%	-2.04%
T.F. Green	-3.38%	8.53%	33.46%	-0.44%
Manchester-Boston Regional	-0.67%	-5.00%	-19.78%	-1.88%
Portland International Jetport	-2.43%	-24.53%	-50.64%	-12.09%
Burlington	-4.92%	15.34%	16.37%	3.12%
Bangor[3]	-1.79%	2.99%	-4.56%	-0.87%
Tweed-New Haven	3.39%	-15.48%	-21.60%	-14.13%
Portsmouth International	259.24%	2.04%	12.49%	7.59%
Hanscom Field	-	8.91%	47.74%	9.22%
Worcester Regional	-35.14%	0.34%	3264.71%	-0.43%
Subtotal	**-2.24%**	**1.35%**	**4.67%**	**0.01%**
Logan Airport	1.47%	19.93%	-	2.12%
Total	**-0.25%**	**1.95%**	**4.67%**	**0.72%**

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 Commercial operations at Bangor include international aircraft making a technical stop.
NE New England

Airline Passenger Service in 2010

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.[9] This section examines changes in airline departures and seat capacity at the regional airports in 2010 and provides an overview of new and discontinued routes.

Service Developments at the Regional Airports

In 2010, a total of fourteen airlines provided scheduled passenger service from the ten regional airports to 44 non-stop destinations.[10] Scheduled commercial services continued to decrease slightly overall at the regional airports. Airlines eliminated or reduced frequencies on less profitable routes, impacting smaller communities in particular.

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 42.2 percent of the scheduled departures in the New England region in August 2010, down slightly from 44.5 percent in August 2009. The medium-size airports – Bradley, T.F. Green, and Manchester – as well as the smaller airports saw continued erosion in service share due to continued airline service cutbacks in 2010.

Details of scheduled passenger operations by market and carrier for the regional airports are presented in *Appendix F, Regional Transportation*.

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

	2005	2006	2007	2008	2009	2010
Logan Airport, MA	49.6%	52.8%	52.2%	53.5%	55.5%	57.8%
Bradley International, CT; Manchester-Boston Regional Airport, NH; T.F. Green Airport, RI	35.1%	33.6%	33.5%	32.3%	30.3%	29.5%
Bangor, ME; Burlington, VT; Hanscom Field, MA; Portland International Jetport, ME; Portsmouth International Airport, NH; Tweed-New Haven, CT; Worcester Regional, MA	15.3%	13.6%	14.3%	14.2%	14.2%	12.7%

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

9 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.
10 Includes Direct Air, which provides regularly scheduled charter service to Myrtle Beach, Punta Gorda, Sanford, and West Palm Beach from Worcester Regional Airport.

Bradley International Airport
Bradley International Airport in Windsor Locks, CT was the only medium-size airport to experience a slight service increase. Two new LCCs, Frontier and JetBlue Airways, began service at the Airport in 2010. Frontier introduced service to Milwaukee, while JetBlue Airways launched service to Fort Lauderdale and Orlando. US Airways and Southwest Airlines also significantly increased capacity at Bradley. US Airways increased seat capacity to Charlotte and Philadelphia. Southwest Airlines introduced new service to Denver and Fort Lauderdale, and also increased seat capacity to Tampa. Delta Air Lines, which integrated Northwest Airlines services into its system after completing a merger in 2009, reduced scheduled seat capacity at the airport, as did Continental Airlines. Markets that lost scheduled service in between 2009 and 2010 including Indianapolis, Raleigh/Durham, and St. Louis.

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 serving the airport. The most significant cutbacks were implemented by Southwest Airlines, which discontinued Nashville service and reduced frequencies on its Philadelphia, Baltimore, and Chicago Midway routes. Scheduled seat capacity at T.F. Green decreased by 2.9 percent in 2010.

Manchester-Boston Regional Airport
Manchester-Boston Regional Airport also experienced significant cutbacks by Southwest Airlines in 2010. Southwest Airlines reduced scheduled frequencies on its Baltimore and Philadelphia routes. United Airlines also cut seat capacity to Chicago O'Hare. Scheduled seat capacity at Manchester decreased by 9.7 percent.

Portland International Jetport
Portland International Jetport (ME) experienced decreases in airline capacity. Cutbacks in service by JetBlue Airways to New York JFK contributed to the bulk of the service reductions at Portland. Overall scheduled seat capacity dropped by 4.9 percent at Portland.

Burlington International Airport
Burlington International Airport (VT) experienced decreases in airline capacity. The Airport lost AirTran Airways service in 2009, saw additional service cuts by JetBlue Airways and other carriers in 2010. JetBlue Airways decreased seat capacity between Burlington and New York JFK, and the Airport continued to experience declines related to Delta's discontinuation of service to Atlanta in 2009. Overall scheduled seat capacity dropped by 12.2 percent at Burlington.

Worcester Regional Airport
Worcester Regional Airport, which lost all commercial service in 2006 when Allegiant Airlines pulled out, regained regularly scheduled charter service by Direct Air at the end of 2008. Direct Air started at Worcester with service to Punta Gorda and Sanford, Florida (FL) in 2008. As demand continued to increase, seasonal service to Myrtle Beach, South Carolina (SC) was introduced in 2009. In November 2010, Direct Air added new seasonal service to West Palm Beach, FL.

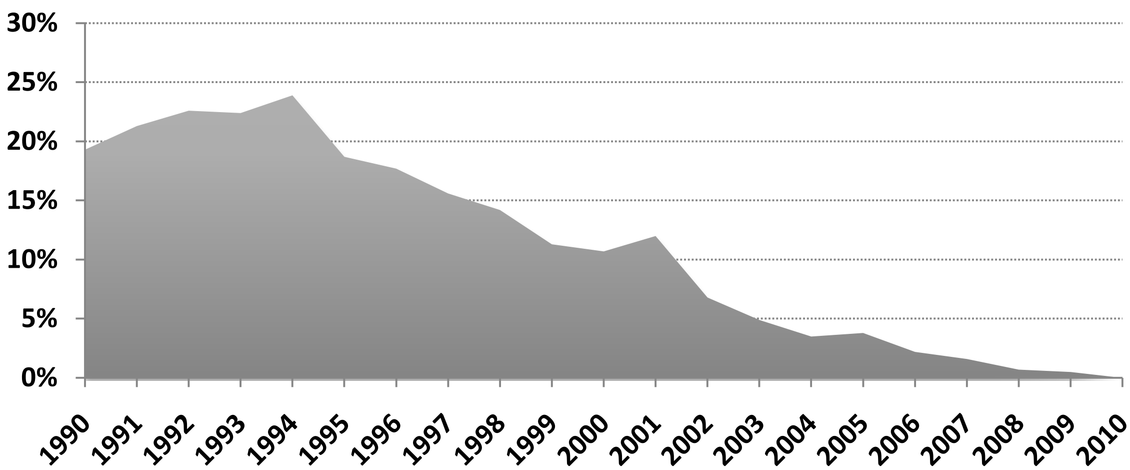
Bangor, New Haven, Portsmouth and Hanscom
The trend of airline service reductions also impacted the majority of other smaller regional airports. Apart from Allegiant Air, airlines at Bangor Airport (ME) reduced scheduled seats by over 10 percent in 2010. Tweed-New Haven Airport (CT) saw capacity on US Airways, the one carrier offering scheduled service, remain flat. Portsmouth International Airport (NH) and Hanscom Field (MA) both lost all scheduled service earlier in 2008, when Boston-Maine Airways discontinued service. Hanscom Field currently receives private, on-demand charter service by air taxi operator Linear Air. Portsmouth had not regained commercial passenger service as of 2010.

Regional Reliance on Logan Airport

Despite the service reductions at the regional airports in 2010, 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-nineties. In 2009, scheduled service to Logan Airport represented only 0.5 percent of all regional airport flights. 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 ten 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, Rockland, and Rutland, ME.

Figure 4-4 Share of Flights Originating at Regional Airports with Logan Airport as Destination



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.

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. Extending the runway will enable the Airport to accommodate demand for long-range non-stop flights to the West Coast. Safety projects include resurfacing Runway 16-34 and improving the Runway Safety Areas at its runway ends, 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.


Aerial view of the InterLink at T.F. Green

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 is currently conducting a 2010 Master Plan Update, an update of its previous 1997 Master Plan. The long-range planning initiative will provide a blueprint for development and improvement of airport facilities and infrastructure during the next decade. The focus for the current master plan update will be on terminal optimization, best use of landside property, and surface access and intermodal connection. Short-term project highlights planned for the next five years include:

- Roadway and parking improvements
- Construction of a glycol collection/treatment facility
- Curbside enhancements
- Refurbishing and expansion of baggage claim equipment

The Manchester Airport Access Road (MAAR) project was launched by the New Hampshire Department of Transportation in 2007 to provide a new exit and roadway off of the F.E. Everett Turnpike into Manchester-Boston Regional Airport. Moving at an accelerated pace, the project is now scheduled for completion in December 2011. The two-mile access road will provide 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 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 2009, Bradley completed a major runway reconstruction project involving the airport's primary arrival and departure runway (Runway 6-24) and a secondary runway (Runway 15-33). The initiative also included an upgrade of a major water main crossing and the installation of new electrical ductbanks and lighting cable.

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
- 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 Environmental Status and Planning Report* and the annual report on *The State of Hanscom*. In Fiscal Year 2010, Massport invested approximately $5.6 million in airfield, terminal and other facility improvements at Hanscom Field.

In 2010, Massport received FAA Airport Improvement Program (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. Other near-term airside improvements planned or recently completed include enhancements of runway safety areas and ongoing approach and departure surface vegetation management. On the landside, Hanscom continued renovations to the Civil Air Terminal building in 2010 and is moving forward in pursuing third party development of the Hangar 24 site, southwest of the airfield and the East Ramp.

Worcester Regional Airport (ORH)

Completed in 2008, the Worcester Regional Airport Master Plan Study (the Worcester Study) was funded by the FAA and the former Massachusetts Aeronautics Commission (MAC). The Worcester Study 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/general aviation facilities including a Fixed–base operator 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.

The following near-term projects identified in the Worcester Master Plan were completed or ongoing in 2010:

- Installed EMAS on the Runway 29 End in 2007
- Resurfaced 3,000 feet of Runway 11 in 2008
- Installed EMAS on the Runway 11 End in 2009
- Resurfaced 4,000 feet of Runway 29 and reconstructed Taxiway Delta in 2010
- VMP is being presented the Leicester and Worcester Conservation Commissions in September 2011

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 (0 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 Massachusetts Department of Transportation (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
- To design and install new airport trailblazer signs consistent with Logan Airport and MassDOT way-finding 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 Surface Transportation Context

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. In this section, Massport will highlight 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 newly unified MassDOT completed its first full year of operation in 2010. MassDOT brought together many Commonwealth entities which 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, chaired by 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.

The NERASP defines Logan Airport's functional role as 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[11] (although not in Boston itself) and identify a need for access to alternative forms of short-distance travel across these regions.[12] 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.[13] 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.[14]

Regional Cooperative Planning Efforts

The Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) is a formally established body which 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 multistate 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.

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

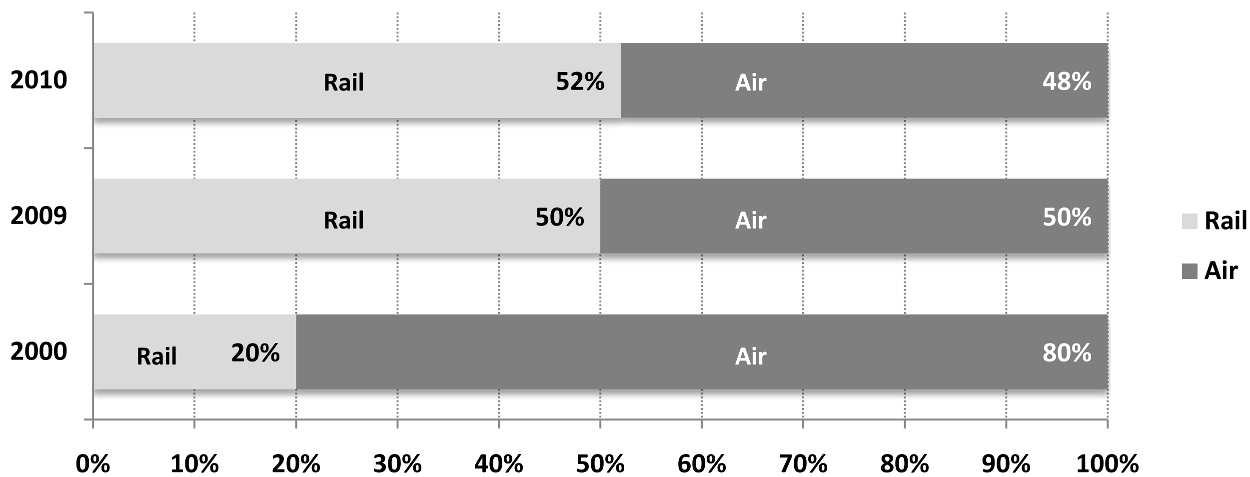
Amtrak's Northeast Corridor (NEC) is an intercity rail line that operates between Boston-South Station and Washington, DC via New York City. Other major destinations served by the route include Providence, RI; New Haven, CT; Philadelphia, PA; and Baltimore, MD. Logan Airport passengers can connect directly 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

11 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)
12 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.*
13 Transportation Research Board *ACRP 03-23: Integrating Aviation and Passenger Rail Planning*.
14 "Where High-Speed Rail Works Best" America 2050 - http://www.america2050.org/pdf/Where-HSR-Works-Best.pdf Page 1-2

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 28.7 million one-way trips in Fiscal Year 2010. The NEC represented 36 percent of total system-wide Amtrak ridership. In Fiscal Year 2010, the NEC carried 10.4 million passengers, an increase of 4.3 percent over 2009. Acela Express accounted for 3.2 million passengers, while the Northeast Regional accounted for 7.2 million passengers. Overall NEC ridership remains just below the 2008 peak of 10.9 million passengers; although 2011 indications are that ridership is continuing to increase. Amtrak's share of the Northeast total passenger market has increased substantially since the introduction of Acela service in 2000. In 2010, Amtrak captured approximately 52 percent of the total air/rail market between Boston and New York, up from 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



Source: Amtrak "ink" Volume 16, December 2010.

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 Northeast Corridor growth needs through 2030, including expanded capacity and improvements in Boston-New York and New York-Washington intercity travel times. A 59 percent increase in rail ridership, a 41 percent increase in train movements, 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. 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.[15] 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.[16] A more detailed collaborative study is planned in the near future.

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. Fifteen 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. Expanded service to Wickford, RI is expected to commence in late 2011. An eventual extension down to Kingston, RI is also being planned. Travel time between Boston and Warwick is approximately 1.25 hours, and 3 of the 15 daily Boston-Providence departures currently continue on to Warwick.

The extended commuter rail enhances ground access options from the Boston metro area to T.F. Green Airport. Based on the NERASP Study, the passenger catchment areas of T.F. Green 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.

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

Massport voluntarily participates in the interagency Transportation Sustainability Committee organized by MassDOT**.** The committee meets regularly and shares sustainability best practices among transportation agencies. GreenDOT is a comprehensive sustainability initiative with three primary goals: reduce greenhouse gas 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 greenhouse gas (GHG) reduction targets set out in the Executive Office of Energy and Environmental Affairs (EEA) 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. 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.

Healthy Transportation Compact

The Healthy Transportation Compact inter-agency 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

15 "A Vision for High-Speed Rail in the Northeast Corridor" Amtrak September 2010, Page 21.
16 Ibid.

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 routes strengthen connections between the neighborhood, terminals, airport buffers, mass transit and the Harborwalk (a multimodal off-road path); 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, 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 in the Boston MPO, providing input on policy and programming decisions.

MPOs are established in metropolitan areas with more than 50,000 residents and are responsible for conducting the federally required the cooperative, comprehensive, and continuous metropolitan transportation planning process. Based on this planning, MPOs determine which surface transportation system improvements will receive federal capital 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 Transportation Planning and Programming Committee (TTPC), participating in policy decisions related to the long-range Regional Transportation Plan and Transportation Improvement Program. The TPPC also guides the work conducted by Central Transportation Planning Staff (CTPS) via its Unified Planning Work Program.

Metropolitan Area Planning Council (MAPC)
Massport is also an ex-officio member of MAPC. MAPC is a regional planning agency serving the people who live and work in Metropolitan Boston. Its 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.

5

Ground Access to and from Logan Airport

Introduction

For many air travelers and airport users, the ground transportation facilities and services at Logan Airport provide a first impression of the Airport, Boston, and New England. This chapter reports on ground access to and from Logan Airport from the Boston metropolitan area. The chapter documents how passengers access the Airport and describes the Massachusetts Port Authority's (Massport) achievements in improving airport connectivity by diversifying ground transportation options and reducing reliance on single occupant vehicles (SOVs).[1]

Multimodal connectivity is an important element of airport planning, design and operations, affecting the daily travel choices that employees and passengers 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 and reducing transportation costs while improving customer service. High quality airport ground access can also promote economic activity and influence economic development patterns associated with the Airport.

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

Ground access to the Airport, within the metropolitan area, highlights in 2010 include:

On-Airport Transportation

- The total number of annual air passengers at Logan Airport increased 7.5 percent to 27.4 million, compared to 25.5 million in 2009. During the same period, average daily traffic on airport roadways increased by 5.1 percent from 2009 to 2010, while vehicle miles traveled (VMT) on the Airport increased by 4.8 percent.

1 An SOV passenger is defined as an air passenger that arrives at the Airport with no other air passengers in the vehicle.

- The number of vehicles parked on-Airport (measured by the revenue parking exits) increased by 4 percent in 2010 compared to 2009.
- Massport began construction of the Logan Airport Parking Deck Project, located on the 1,000-space Economy Lot in the North Cargo Area. It consolidates an additional 2,000 commercial parking spaces from various on-airport temporary commercial parking lots into a single structured parking facility containing approximately 3,000 commercial parking spaces. The garage maintains on-airport parking capacity in compliance with the limits imposed by the Logan Airport Parking Freeze. The garage was fully opened in March 2011.

Ground Access Activity

- Ground access activity to Logan Airport generally increased for all modes from 2009 to 2010 as a result of a 7.5 percent growth in the number of annual air passengers, as described in *Chapter 2, Activity Levels*.
- In 2010, Massport administered the periodic *Logan Airport Air Passenger Ground Access Survey*. This is Massport's primary tool for understanding the changes in ground access patterns and the effectiveness of its policies and services. Passenger origins remain similar to those identified in the *2007 Air Passenger Ground Access Survey*, while weekday market share of business trips decreased.
- The *2010 Logan Airport Air Passenger Ground Access Survey* indicates that share of high-occupancy vehicles (HOV) modes to the Airport have returned to 2004 levels (30 percent HOV mode share) after having decreased by 2 percent in the *2007 Air Passenger Ground Access Survey*.
- Metropolitan Bay Transportation Authority (MBTA) Silver Line boardings at the Airport continued to grow, increasing by 5 percent in 2010, while Blue Line boardings at Airport Station decreased slightly compared to 2009.
- In 2010, ridership on water transportation to the Airport increased by about 1 percent in comparison to the previous year.
- Limousine ridership increased by an estimated 16 percent, and taxi dispatches increased 12 percent in 2010 compared to 2009. Despite the increase in dispatches, the relative share in the use of these modes did not increase, according to the *2010 Logan Airport Air Passenger Ground Access Survey.*
- Over the past several years, transit services, including Logan Express bus service, have experienced increases in employee use. In 2010, Logan Express air passenger ridership increased by about 1 percent compared to 2009 levels, whereas employee use of Logan Express increased by 4 percent, and accounts for 42 percent of the service's ridership.

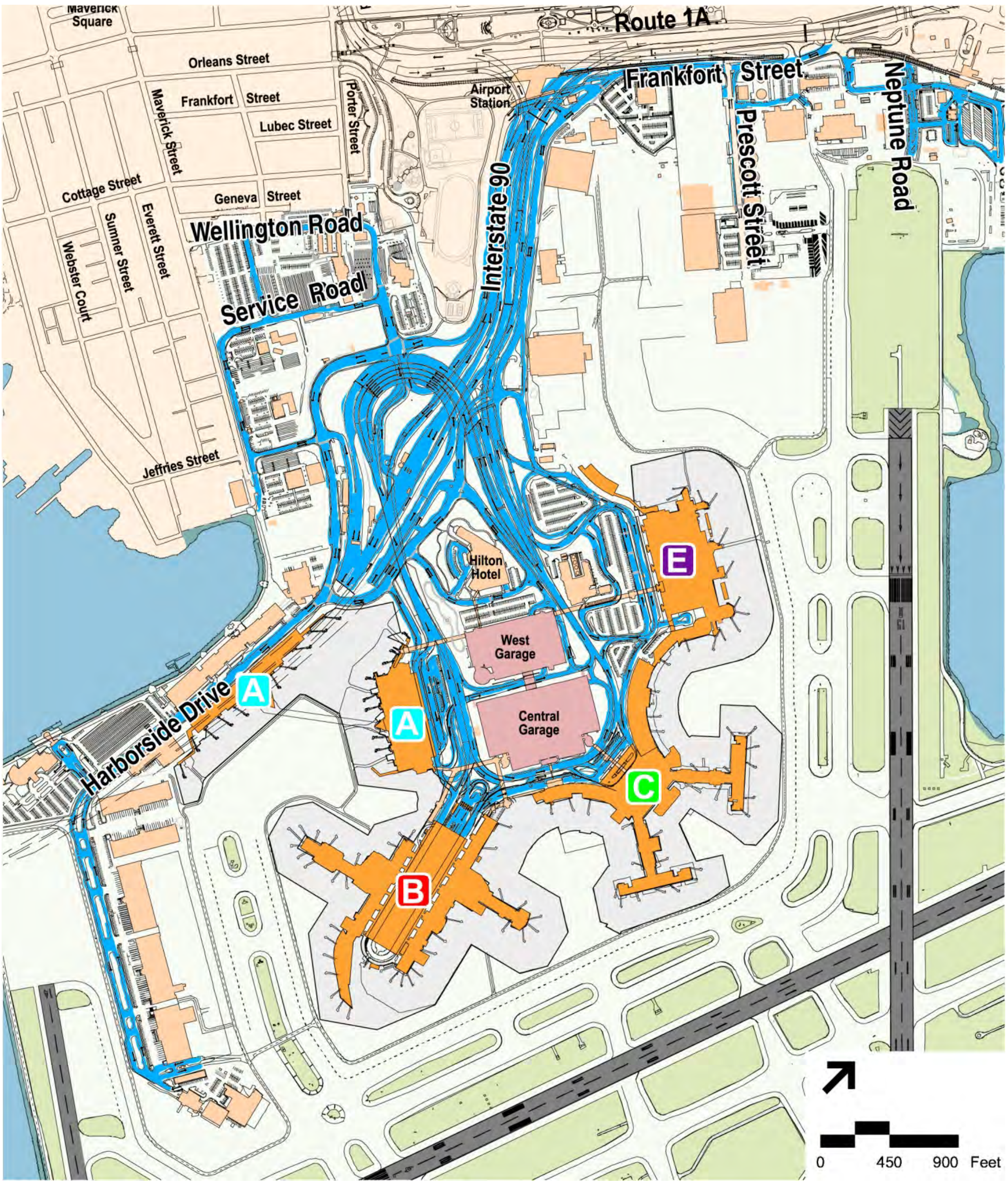
On-Airport Transportation

This section reports on Massport's management of:

- Traffic conditions, including traffic volumes and VMT calculations
- Parking conditions, including parking supply and demand, parking rates and parking facilities

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

Figure 5-1 Logan Airport Roadway Network, 2010



Traffic Conditions

This section presents ground access traffic conditions at Logan Airport in 2010, including gateway traffic volume and VMT estimates for Logan Airport's roadway system. Gateways are defined as access points to/from Logan Airport, which include the Route 1A roadway ramps, Ted Williams Tunnel (Interstate 90) ramps, Neptune Road/Frankfort Street, and Maverick Street. Figure 5-1 shows the roadway infrastructure at Logan Airport in 2010. No significant changes to the roadway system were made in 2010, although geometric modifications at four intersections began in the late fall of 2010 as part of the enabling projects of the Southwest Service Area Redevelopment (SWSA) project. These roadway changes were fully implemented in the spring of 2011 and will be analyzed in the *2011 Environmental Status and Planning Report* (*2011 ESPR*).

Gateway Traffic Volumes

Table 5-1 summarizes the daily gateway traffic volumes at Logan Airport for the years 2004 through 2010. It includes average annual daily traffic (AADT), average annual weekday daily traffic (AWDT), average weekend daily traffic (AWEDT), and annual air passengers. In 2010, the air passenger activity level increased to 27.4 million annual passengers, a 7.5 percent increase over 2009. This volume of air passengers ranks 2010 as the 4th busiest year in Logan Airport's history.

Table 5-1 Logan Airport – Gateways: Annual Average Daily Traffic

	AADT		AWDT		AWEDT		Annual Air Passengers	
Year	Volume	Percent Change	Volume	Percent Change	Volume	Percent Change	Level of Activity	Percent Change
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	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%**

Note: Gateway traffic volumes were not collected in 2006 due to the temporary closure of the Ted Williams Tunnel.
AADT Average annual daily traffic.
AWDT Average annual weekday daily traffic.
AWEDT Average weekend daily traffic.
NA Information Not Available.

The AADT entering and departing the Airport via its gateway roadways increased by 5.1 percent between 2009 and 2010. This increase in traffic volume can be attributed to:

- A 7.5 percent increase in air passenger activity in 2010;
- A 12 percent increase in taxi dispatches;
- A 16 percent increase in limousine ridership; and
- A 4.2 percent increase in parking activity (exits).

The traffic volumes remain lower than those experienced in the recent years with a similar or higher volume of air passengers. VMT in 2010, as discussed in the next section, are well below 1997 VMT estimates, reflecting the success of the Logan Airport Modernization project in reducing on Airport roadway trip lengths by improving circulation roadways.

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

Vehicle Miles Traveled

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

VMT on Logan Airport for each year are calculated using a model that was developed for the Logan Airport roadway system in 1994. Since then, the roadway network in the model has been adjusted on an annual basis to account for various changes of the airport roadway network over time. There were no changes to the roadway network in 2010. Modeled gateway traffic volumes have also been calculated annually to capture changes in traffic volumes at the airport gateways and changes from the roadway system configuration.

Consistent with previous years, the following specific time periods were analyzed for 2010:

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

The AWDT analysis provides an indication of the overall effect of changes in traffic flow during an average weekday. The High 8-Hour VMT was calculated by applying a ratio of 0.48 to daily traffic for each of the roadway links. This ratio is the same factor used in previous Logan Airport environmental filings. The morning and evening peak hour traffic volumes are based on the ratios of peak hour volumes to daily volumes obtained from previous model projections.

Table 5-2 summarizes the VMT estimates for Logan Airport-related traffic from 2004 through 2010. The AWDT VMT for airport-related traffic increased by 4.8 percent in 2010, which can be attributed to an increase in annual passengers at the Airport and a change in distribution of traffic volumes among the different gateways. In 2010, the availability of traffic volume data along some of the airport terminal roadways helped to better calibrate travel patterns within the Airport. The shift in traffic volumes from one gateway to another increased the travel distance on the airport roadways for vehicles to reach their destinations and the model of roadway distribution patterns was updated to reflect this change. This led to an increase in VMT for those trips. The 4.8 percent increase in VMT is lower than the 5.7 percent increase in airport-related AWDT volumes. Details of the 2010 VMT estimates are presented in *Appendix G, Ground Access*.

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

Analysis Year	AM Peak Hour	PM Peak Hour	High 8-Hour	Average Weekday	Average Weekday Percent Change
2004	8,292	10,563	77,029	160,477	3.5%
2005	8,477	10,998	80,240	167,166	4.2%
2006	NA	NA	NA	NA	NA
2007	9,594	12,304	88,614	184,613	10.4%
2008	8,533	10,941	78,663	163,882	(11.2%)
2009	8,098	10,379	74,612	155,442	(5.2%)
2010	**8,451**	**10,887**	**78,185**	**162,885**	**4.8%**

NA Information Not Available

Parking Conditions

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

The new Logan Airport Parking Deck (Economy Parking)

In 2010, the Logan Airport parking supply underwent several changes. Mid-year, Massport initiated construction of the SWSA Redevelopment Program with the ConRAC enabling projects. This effort started to eliminate various surface parking lots that were used to accommodate overflow parking. In addition, Massport began construction of the Logan Airport Parking Deck Project (Economy Parking), by adding two structured levels to the existing at-grade Economy Lot at the Robie Parcel in the North Cargo Area. Meanwhile, continued rehabilitation of the Terminal B garage and roadways caused the temporary loss of terminal-area commercial parking spaces. The impacts of these activities are detailed below in the Parking Supply section.

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 two reports for 2010 are provided in *Appendix G, Ground Access,* and posted on Massport's website.

The Logan Airport Parking Freeze sets an upper limit of permissible commercial and employee parking spaces at Logan Airport. Massport has periodically converted employee spaces to commercial spaces, within the overall limit imposed by the 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

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.

Parking Supply Changes

The location of parking at Logan Airport underwent significant changes in 2010, primarily because of two major activities: the start of the ConRAC program's enabling projects and the Logan Airport Parking Deck Project (Economy Parking). This section describes the changes and Table 5-4 highlights the details.

Parking Consolidation in the North Cargo Area

As described in *Chapter 3, Airport Planning*, in 2010 Massport began construction of the Logan Airport Parking Deck Project, a two-level parking deck above the existing surface parking lot in the North Cargo Area. The parking facility opened for full operation in March 2011. The parking structure allowed Massport to consolidate spaces located in various on-airport overflow and temporary parking areas to one central location that is served by a single shuttle bus route. The parking consolidation will result in significant customer service improvements, eliminate labor- and cost-intensive overflow parking management operations, and provide 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 from heading into East Boston via Frankfort Street and Neptune Road, directing the traffic to on-airport service roads.

Because the addition of the two-level parking deck relocates spaces from other on-Airport commercial parking sites, the overall parking capacity at the Airport remains unchanged and within the limits imposed under the Logan Airport Parking Freeze (refer to Table 5-4). The management of the parking will continue to be conducted to ensure strict compliance with the Parking Freeze. In addition to the benefits listed above, the new parking deck will simplify the monitoring and reporting of Logan Airport Parking Freeze compliance by accommodating more vehicles in the automated parking revenue control system.

Massport requested an Advisory Opinion from the Secretary of the Executive Office of Energy and Environmental Affairs (EEA) to confirm that the Parking Deck Project, as an interim measure, not creating any new parking spaces, would not require further review under the Massachusetts Environmental Policy Act (MEPA). The Secretary's Advisory Opinion, dated June 23, 2010, concurred that the proposed project was not subject to further MEPA review. Massport is, however, required by EEA to report on parking conditions in this chapter of the Environmental Data Report/Environmental Status and Planning Report (EDR/ESPR) to ensure that parking issues are comprehensively addressed under MEPA and in compliance with the SIP.

Impact of ConRAC-related Construction on Parking Supply

In 2010, Massport began construction of enabling projects for a ConRAC in the SWSA. The construction of these enabling projects for the ConRAC resulted in the removal of parking (temporarily or permanently) at several overflow surface lots, including Lot B in the South Cargo Area (which closed for construction of the temporary taxi pool on August 2, 2010), portions of the "Gulf Station" lot, and the "Sky Chefs" lot in the North Service Area. 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 will be reported in the *2011 ESPR*.) In addition, the former Post Office lot, the primary overflow parking lot, was permanently removed due to SWSA Redevelopment project construction in May 2011. Other overflow lots that were closed include the lot across from Wood Island Station (which is now the interim bus/limousine pool) and a lot/area off Lovell Street (which is being used for construction purposes).

Table 5-4 Logan Airport Parking Freeze: Allocation of Commercial Parking Spaces, 2010 and 2011

Location	Number of Spaces			Status
	March 2010	September 2010	March 2011	
Terminal Area				
Central Garage and West Garage	10,375	10,375	10,375	No change
Terminal B Garage	2,235	1,880	2,380	Ongoing renovations occasionally reduce capacity (from 2,640 spaces)
Gulf (fka Citgo) Lot	150	229	229	Restored the partial loss of spaces that occurred in 2010
Terminal E Lot 1	269	269	269	No change
Terminal E Lot 2	257	257	257	No change
Signature (General Aviation)	35	35	35	No change
North Cargo Area				
Economy Lot 2	932	0	n/a	Closed for construction, June 1, 2010
Logan Airport Parking Deck Structure: Economy Parking	n/a	n/a	2,880	Partially opened Nov. 2, 2010; fully opened March 2, 2011
North Service Area				
Sky Chef Valet Lot	260	645	0	Eliminated for construction purposes, November 3, 2010
Southwest Service Area				
Former USPS Site	416	416	416	Eliminated for consolidated rental car facility (ConRAC) construction, May 2, 2011
Vacant bus/limousine pool (temporary)	n/a	n/a	250	Briefly vacant and available in early 2011; eliminated for construction, May 2, 2011
Total spaces in service	14,929	14,106	17,091	
Total commercial spaces (freeze limit)	17,319	17,319	17,619[1]	Includes designated spaces and on-Airport hotel spaces

Source: Massport.

1 In 2010, 300 employee spaces were converted to commercial spaces under the Logan Airport Parking Freeze, increasing the inventory of commercial spaces to 17,619 commercial and reducing the inventory of employee spaces to 3,073.

Managing Parking Supply and Ensuring Compliance with the Parking Freeze Regulation

The existing supply of parking spaces on airport is carefully managed throughout the day, with particular attention during the week's peak-days (typically Tuesday-Wednesday-Thursday), to ensure compliance with the Logan Airport Parking Freeze and to manage efficiently the available supply of parking spaces on the Airport. Massport staff use several methods to monitor and manage the parking supply: the on-going tally of parking garage ins/outs 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.

As a result, at the early start of each day, staff has a clear picture of the available supply and what measures may go into effect later in the day. For example, during some periods of peak demand (or when normal capacity is reduced by construction or maintenance), other lots may be temporarily available for use by Massport for overflow parking. These lots are only used when their additional capacity will not exceed the overall capacity of commercial spaces allowed under the parking freeze. 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 Logan Airport Parking Deck Project has eliminated much of this practice, and the availability and use of overflow lots is now substantially diminished.

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 additional ground access services and facilities may be necessary to handle the anticipated future increase in travel demand. Solutions to this are actively being explored, as described below.

Ground Access Planning

In late 2010, Massport began to revise its long-range air passenger forecasts. Using these revised passenger forecasts and updated ground access data from the *2010 Logan Airport Air Passenger Ground Access Survey*, Massport has begun updating its long-term plans for Logan Airport's parking and ground access programs. Progress will be reported in the *2011 ESPR*. Called the Sustainable Ground Access Strategy and Service Plan, the effort will develop an implementable program of facilities and services consistent with goals related to HOV mode share, sustainability, business and financial, and customer service. Specifically, the work will:

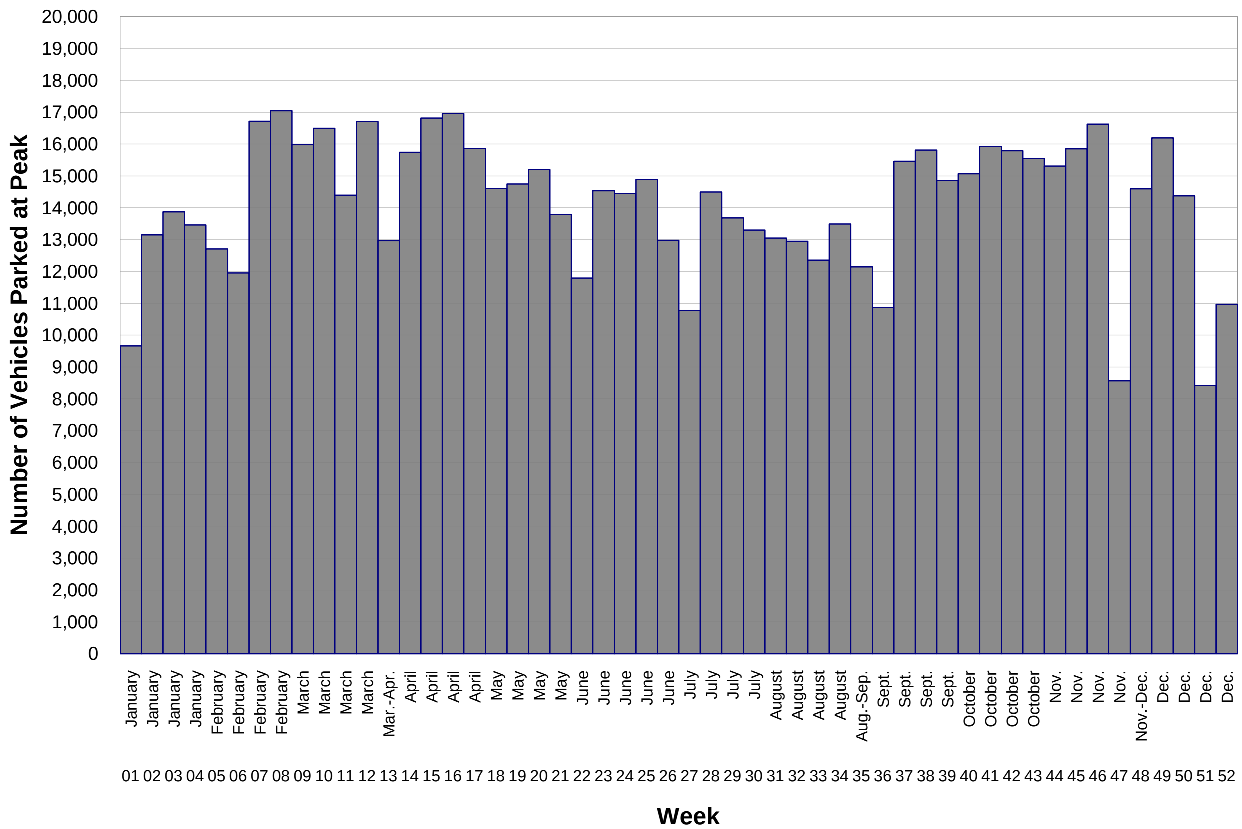
- Identify and analyze the impact of changing passenger demographics on mode choice,
- Estimate future parking demands
- Identify ground access and circulation requirements needed to meet growth in activity
- Develop new programs and services based on the emerging passenger markets; and
- Propose new programs and/or facilities to help meet Massport's HOV mode share goal.

Furthermore, Massport continues to explore ways to increase the utilization of Logan Express and to reduce private-vehicle drop-off/pick-up activity at Logan Airport. With the aid of the 2010 *Logan Airport Air Passenger Ground Access Survey*, an Economy Parking user survey, and analysis of recent Logan Express parking promotions, Massport is evaluating the sensitivity of travelers to parking rates and bus fares, and the potential mode shifts that might occur under different service and pricing scenarios.

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 results are presented in Figure 5-2.

Figure 5-2 Commercial Parking: Peak Daily Occupancy by Week, 2010



Source: Massport, Ground Transportation Unit.
Note: The chart shows the highest daily count for each week in 2010.
The maximum commercial parking spaces permitted by Logan Airport Parking Freeze is 17,319.
Most Massachusetts public schools had the following week-long school breaks in 2010: week 7 or 8, week 16, week 52. University breaks may differ. Columbus Day 2010 was during week 41. Thanksgiving 2010 was during week 47.

Parking Exits by Duration

Total parking activity (as defined by revenue parking exits) increased by 4 percent between 2009 and 2010, as presented in Table 5-5. However, the distribution of parking exits by length of stay decreased for stays of up to four hours. A decrease was noted in both the number of exits in that category and as a share of all parking exits. In other words, vehicles were parked for longer durations during 2010 and likely contributed to a lower turnover of parking spaces and, thus, resulting in the higher peaks seen in Figure 5-2 above. This trend is consistent with Massport's goal of reducing short-term parking at the Airport.

Table 5-5 Parking Exits by Length of Stay

		0-4 hrs.	>4-24 hrs.	>1-4 days	>4 days	Total
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%	
Percent Change (2009 to 2010)		*-2.9%*	*11.5%*	*12.3%*	*14.5%*	*4.2%*

Source: Massport, Ground Transportation Unit.

2010 Parking Rates

Massport establishes and controls parking rates, and has established separate parking rates for the Airport's terminal areas and the Economy Parking facilities, as detailed in Table 5-6. No changes to the rates were made in 2010. 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 exits flow, reducing emissions and fuel consumption during vehicle idling. Pay stations are located in the terminal and at the entrances to the Central Garage, Terminal B, and Terminal E parking lot. About 80 percent of parking patrons use the pay-on-foot system to pre-pay their parking fees.

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

Many off-Airport parking facilities, such as Pre-Flight parking in Chelsea, are privately owned and operated and are outside of the Logan Airport Parking Freeze. Massport has no control over rates at off-Airport parking lots. The parking rates for the three major off-Airport parking providers (Pre-Flight, Park-Shuttle-and-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, 2010

Location	Rate	Location	Rate
Central Parking, Terminal B Garage, Terminal E Lots 1 and 2		**Economy Parking**	
0 to 30 minutes	$3.00	Daily Rate	$18.00
31 minutes to 1 hour	$6.00	Additional days 0 to 6 hours	$ 9.00
1 to 1.5 hours	$9.00	Additional days 6 to 24 hours	$18.00
1.5 to 2 hours	$12.00	Weekly Rate (6-7 days)	$108.00
2 to 3 hours	$15.00		
3 to 4 hours	$18.00		
4 to 7 hours	$22.00		
7 to 24 hours	$24.00		
Additional days 0 to 6 hours	$12.00		
Additional days 6 to 24 hours	$24.00		

Cell Phone Waiting Lot

In September 2007, 50 parking spaces were assigned to a new Cell Phone Waiting Lot, a parking area located off Harborside Drive. To facilitate ConRAC construction phasing, in late 2010, the Cell Phone Waiting Lot was relocated to the intersection of Hotel Drive and North Service Road, in an area across the roadway from the American Airlines hangar. The new lot was expanded to 61 spaces.

Previously, drivers who were waiting for arrivals either used the short-term parking, circulated around the Airport, or dwelled at the curb until asked to move by state police officers. Thus, this parking lot provides a hassle-free waiting spot for drivers waiting for passengers on arriving flights. It 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.

2010 Parking Services

Massport offers guaranteed parking through its Parking PASSport Gold program. 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. Parking PASSport Gold is offered in dedicated areas of the Terminal B and Central Parking garages, and thereby eliminates the need for a motorist to circle the garage looking for available spaces. First implemented in 2006, the Parking PASSport GOLD program had 4,565 customers as of December 31, 2010, compared to 3,631 at the end of 2009. Customers in the Parking PASSport programs account for roughly 2 percent of parking exits at Logan Airport.

Hybrid/Alternative-Fueled Vehicle Preferred Parking

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

Pedestrian Facilities and Bicycle Parking

Massport has made substantial progress in providing pedestrian access Airport-wide. Sidewalks along Harborside Drive and Hotel Drive connect to the terminals, where a series of overhead walkways connect to Central Parking as well as the Hilton Hotel. The sidewalks along Harborside Drive and Maverick Street and the Harborwalk facilitate pedestrian access to the Airport water shuttle dock, MBTA station and the pedestrian and bicycle amenities at Memorial Stadium Park, Bremen Street Park and the East Boston Greenway. Pedestrian access was improved through the Maverick Street gate in 2007. Bicycle racks are provided at Terminal A, the Logan Office Center, Central Garage and Airport Station.

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 planned. Bicycle accessibility would be improved by connecting bikeways to Airport Station, Memorial Park, Bremen Street Park, the East Boston Greenway, and Maverick Street. Connections 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.

Ground Access Modes: Ridership and Activity Levels in 2010

The following sections provide an overview of transportation services available[2] to Logan Airport users from the Boston metropolitan area, reports on 2010 ridership levels, historical trends, and progress meeting ground access goals. Additionally, this section reports on Massport's cooperative planning ventures with other transportation agencies in Massachusetts.

Passengers and employees access Logan Airport using many HOV/shared-ride ground transportation modes, as well as non-HOV modes. While private automobiles, taxis, and rental cars often carry multiple occupants, they are not currently categorized as HOV modes.[3] Figure 5-3 shows the distribution of ground access mode share as reported in the *2010 Logan Airport Air Passenger Ground Access Survey*. Transportation modes are divided into HOV and non-HOV according to the following list:

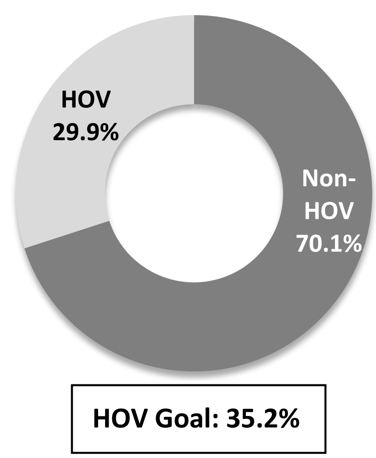
HOV (Shared-Ride) Modes

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

Non-HOV (Automobile) Modes

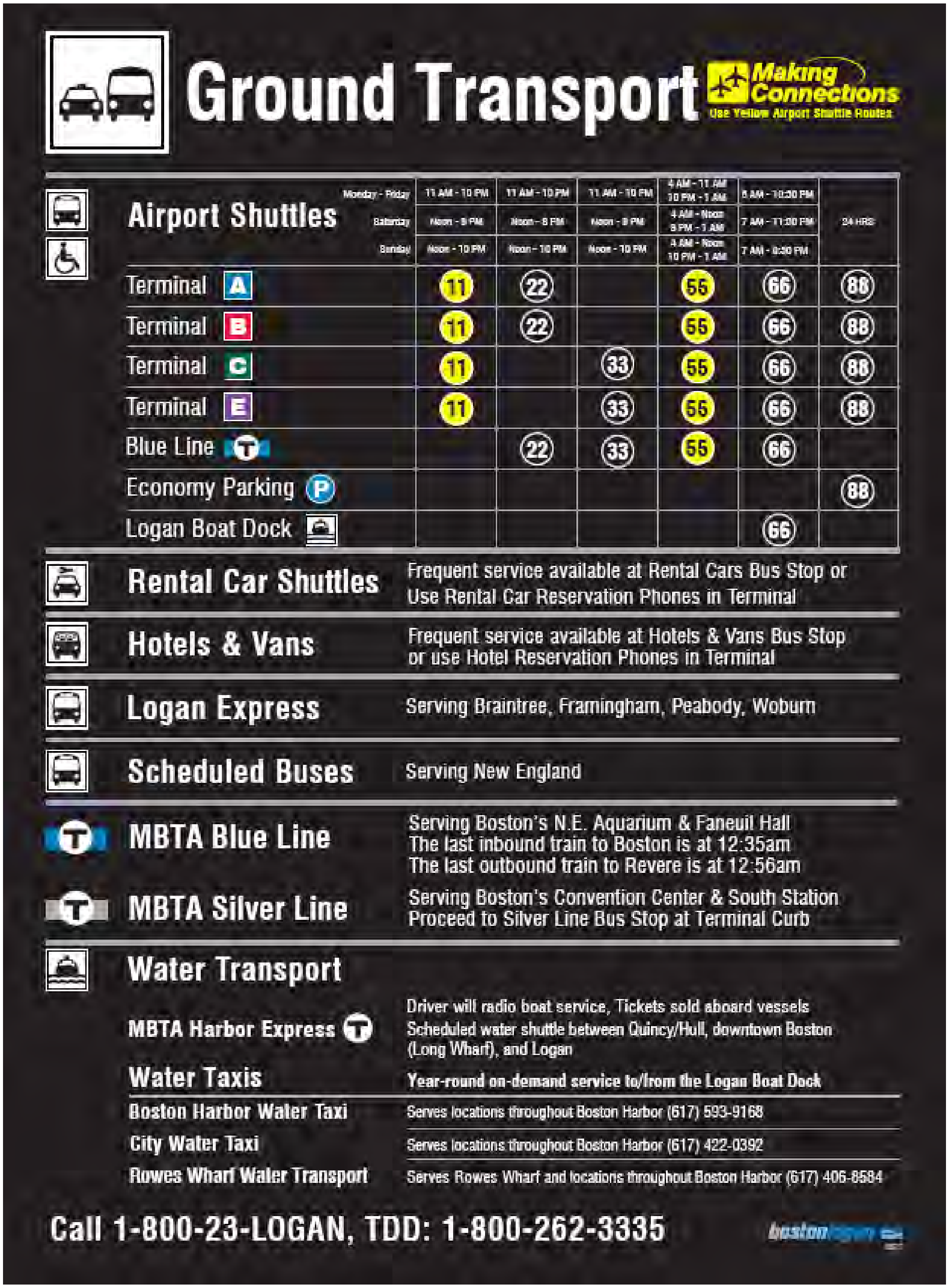
- Private Autos
- Taxi
- Rental Car

Figure 5-3 Ground Access Mode Share, 2010



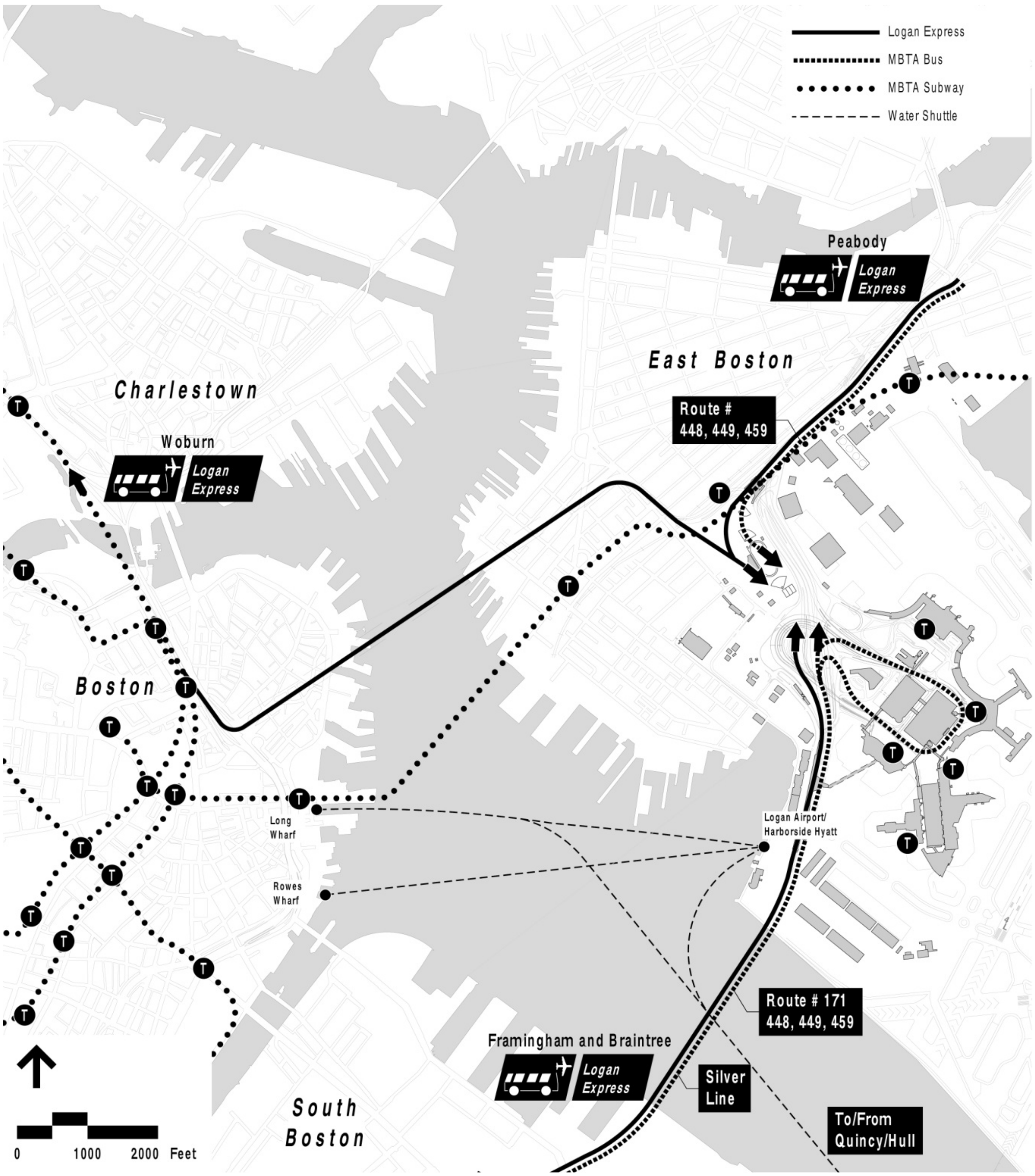
Source: 2010 Logan Airport Air Passenger Survey

2 For existing ground access options, an historical comparison of ridership levels is provided from 2004 Environmental Status and Planning Report (ESPR), the most recent ESPR. A complete list, dating to 1990 is provided in *Appendix G, Ground Access*.
3 The 2010 Logan Airport Air Passenger Ground Access Survey indicates that the average occupancy of these modes is 2.1 persons per vehicle, indicating that Massport is somewhat conservative in the calculation of HOV mode split.



Informational signage located at each terminal describes all ground transportation options available.

Figure 5-4 Logan Airport - Public Transportation Options



HOV Modes

Annual ridership levels for HOV/shared-ride transportation modes serving Logan Airport are summarized in Table 5-7. 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 periodic air passenger surveys.[4] The *2010 Logan Airport Air Passenger Ground Access Survey*[5] 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*.[6] The *2010 Air Passenger Ground Access Survey* is discussed in more detail later in this chapter.

Table 5-7 Annual HOV Transportation Activity Levels at Logan Airport

		MBTA		Logan Express Bus			Scheduled and Unscheduled HOV		
Year	Passenger Activity Levels	Blue Line[1]	Silver Line[2]	Air Passengers	Employees	Total	Water Transportation[3]	Shared-Ride Van/Buses[4]	Limousines[5]
2004	26,142,516	1,375,632	NS	857,530	408,297	1,265,827	112,493	761,320	1,448,581
2005	27,087,905	NA	254,608	837,530	397,660	1,235,190	50,000	701,500	1,250,180
2006	27,725,443	NA	642,177	891,918	418,051	1,309,969	115,113	775,640	1,591,361
2007	28,102,455	1,406,834	677,212	797,530	404,222	1,201,752	101,008	NA	1,448,060
2008	26,102,651	2,212,111	709,905	688,673	432,761	1,121,434	96,633	NA	1,385,317
2009	25,512,086	2,329,370	789,324	636,847	448,601	1,085,448	88,595	NA	1,227,096
2010	27,428,962	2,270,241	831,323	644,412	467,020	1,111,432	89,176	NA	1,426,316
% Change (2009-2010)	7%	(3%)	5%	1%	4%	2%	1%		16%

NA Not available.
NS Not in service.
1 Airport Station fare gate entrances only. Bremen Street Park entrance to MBTA Airport Station opened June 2007. Automatic Fare Collection introduced in January 2007.
2 Boardings at Logan Airport. Service began June 1, 2005; ridership for 2005 is for the seven-month period only.
3 Includes City Water Taxi, Rowes Wharf Water Transport, Boston Harbor Water Taxi, and MBTA Harbor Express.
In 2005, available water transportation services decreased from four companies to two. Also in 2005, the final CA/T connections to the Ted Williams Tunnel 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, based on limousine dispatches and an established average vehicle occupancy (based on *2010 Logan Airport Air Passenger Ground Access Survey*).

4 While the ridership information presented in this EDR 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.
5 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.
6 Source: Spring 1999, 2004, 2007, and 2010 Air Passenger Ground Access Surveys.

Rapid Transit

MBTA provides direct connections to Logan Airport via the Blue Line at Airport Station and via the Silver Line to each of the terminals. These services are used by over 7 percent of Logan Airport's air passengers, based on the *2010 Logan Airport Air Passenger Ground Access Survey*. For passengers with trip origins in Boston, Cambridge, Brookline and Somerville, almost 17 percent of them 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

Airport Station fare gate data indicate that 2.27 million riders entered the subway train station in 2010 (compared to 2.33 million riders in 2009). 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 EDR reporting.[7] The increase in ridership at Airport Station can be attributed to the opening of the Bremen Street Park entrance to the Station in 2007.

Silver Line Ridership

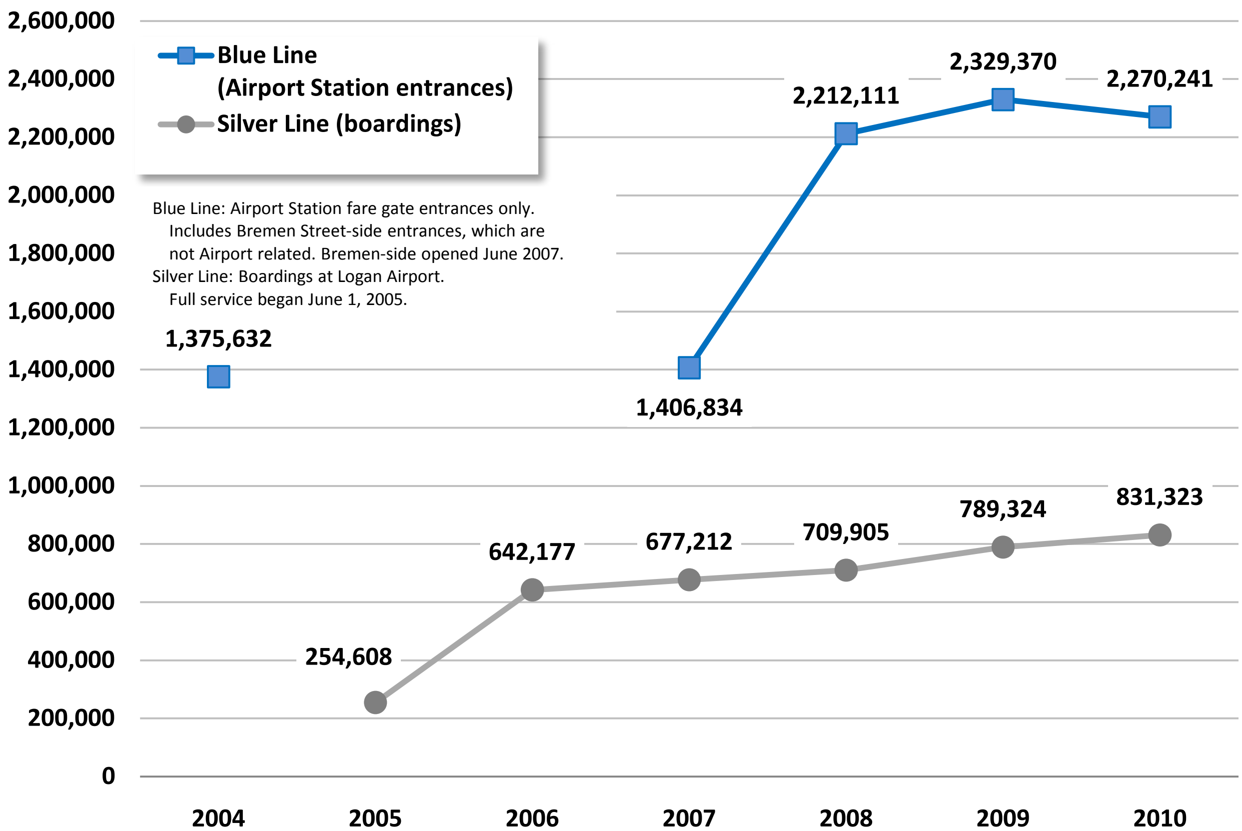
The Silver Line is a rapid bus transit service to Logan Airport providing a direct connection between the Red Line and Commuter Rail transit services at South Station and the Airport terminals via the South Boston Transitway and the Ted Williams Tunnel. Silver Line Airport buses are owned by Massport and operated by the MBTA with a Massport subsidy. The Silver Line is the only MBTA rapid transit service that provides a 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.

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

Bremen Street Park (neighborhood) entrance to Blue Line Airport Station and real-time flight information displays in the Blue Line Station lobby, which provides customers with convenient, direct flight information at the station.

7 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 5-5 Annual MBTA Ridership (Boardings) at Logan Airport



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. Parking rates are $11 per day or up to $66 per week.

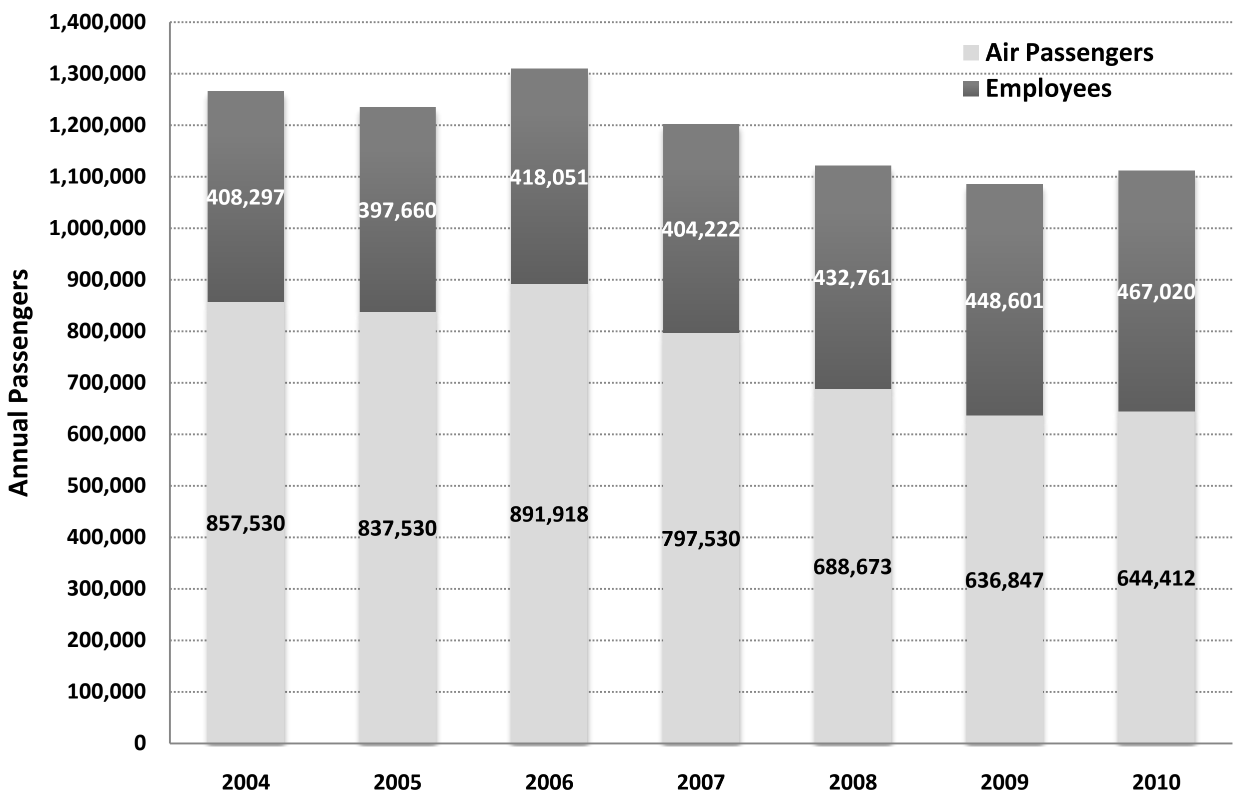
On weekdays and Sundays, scheduled half-hour headways are provided between the Braintree, Woburn, and Framingham locations and Logan Airport; one-hour headways are provided at these locations on Saturdays. In September 2009, the scheduled bus service to/from Peabody changed in response to low ridership and is now provided hourly on weekdays and every 1½ hours during the weekend. Service hours for all four locations are roughly 3:30 A.M. to midnight.

Recent annual ridership trends for Logan Express are shown on Figure 5-6 and Table 5-7. Air passenger ridership on Logan Express increased by over 1 percent, while employee ridership increased 4 percent from 2009 to 2010. 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*.

A Logan Express Bus on an airport roadway.

Figure 5-6 Logan Express Bus Annual Ridership



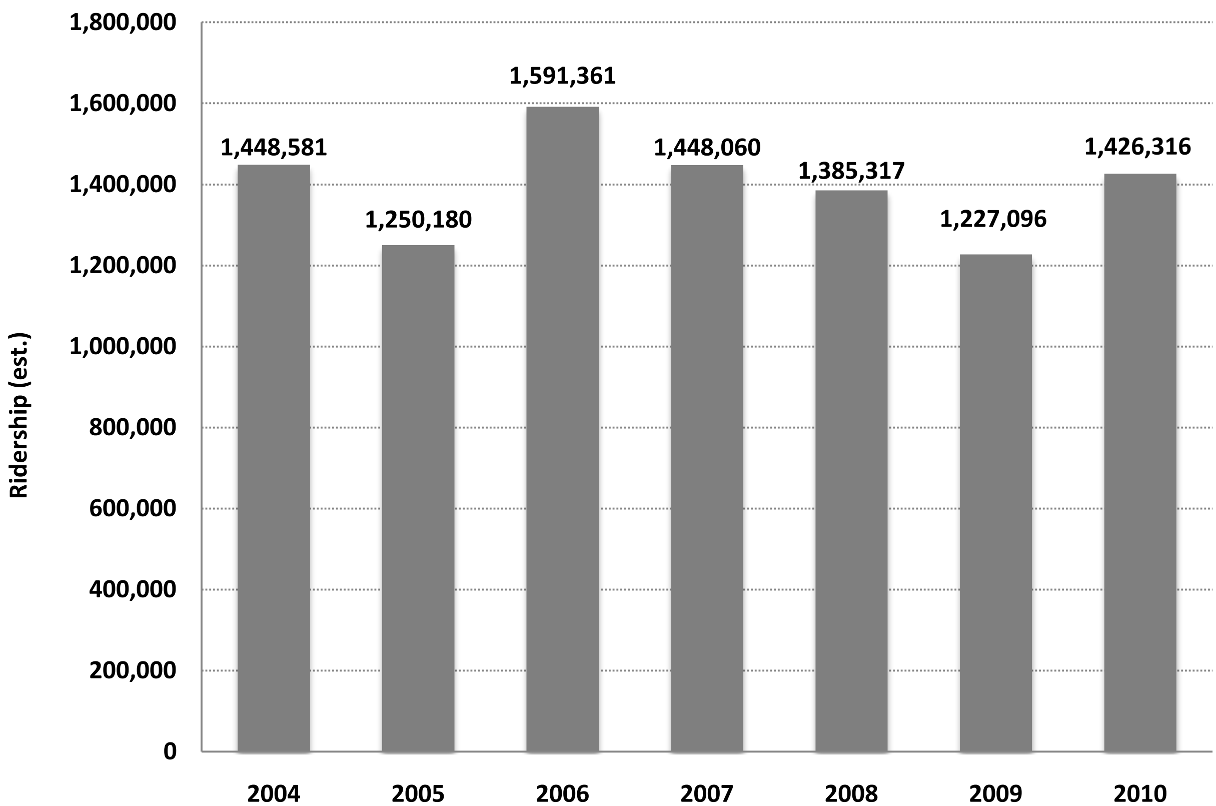
Note: In 2006, the Ted Williams Tunnel was fully and partially closed for inspections and repairs, which led to many travelers pursuing alternative modes of travel to Logan Airport.

Scheduled Buses, Shared-Ride Vans, and Limousines

Massport provides designated curb areas at all airport terminals to support the use of privately-operated shared-ride vans, buses, 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 over 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. Massport offers a 50 percent discount on the ground access fees for AFVs that use compressed natural gas (CNG) or are powered by electricity. As shown in Table 5-7 and Figure 5-7, the use of limousines increased by approximately 16 percent in 2010, closer to pre-recession levels of 2007.

Figure 5-7 Limousine Annual Ridership/Activity[1]



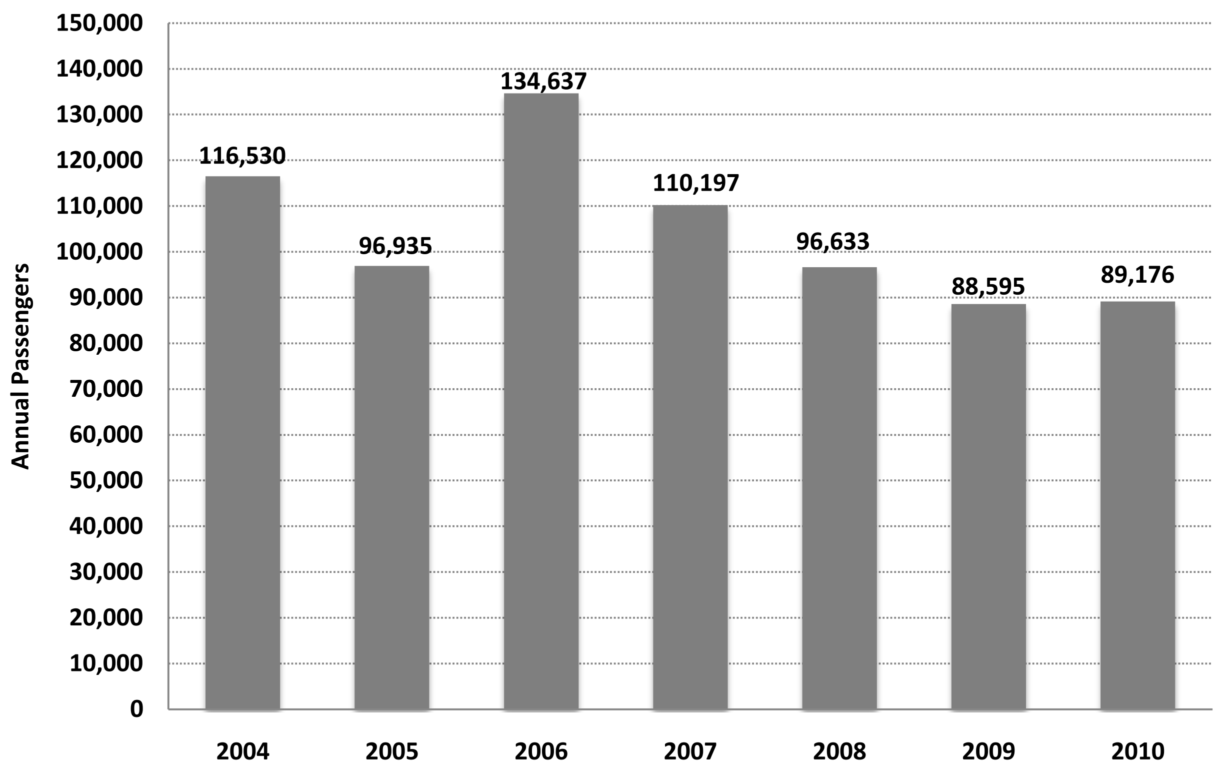
1 Limousines riders include outbound passengers only; ridership estimate is based on limousine dispatches and an established average vehicle occupancy.

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. These companies 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. Collectively, these companies serve numerous destinations throughout Boston Inner Harbor.) The water taxi landings 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. [8]

Annual ridership on water transportation experienced a 1 percent increase in 2010 compared to 2009, as shown in Figure 5-8. 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*.

Figure 5-8 Water Transportation Annual Ridership



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

8 The MBTA ferry schedule to/from the Logan Ferry Dock is not as frequent as Blue Line and Silver Line Schedules, 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 14 MBTA ferries to Boston on weekdays, however there are no MBTA ferries to Boston during morning commuting times. On weekdays, there are two MBTA ferries to Logan Airport in the morning, and four in the late evening.

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, which is the same average occupancy derived from the previous air passenger survey in 2007.

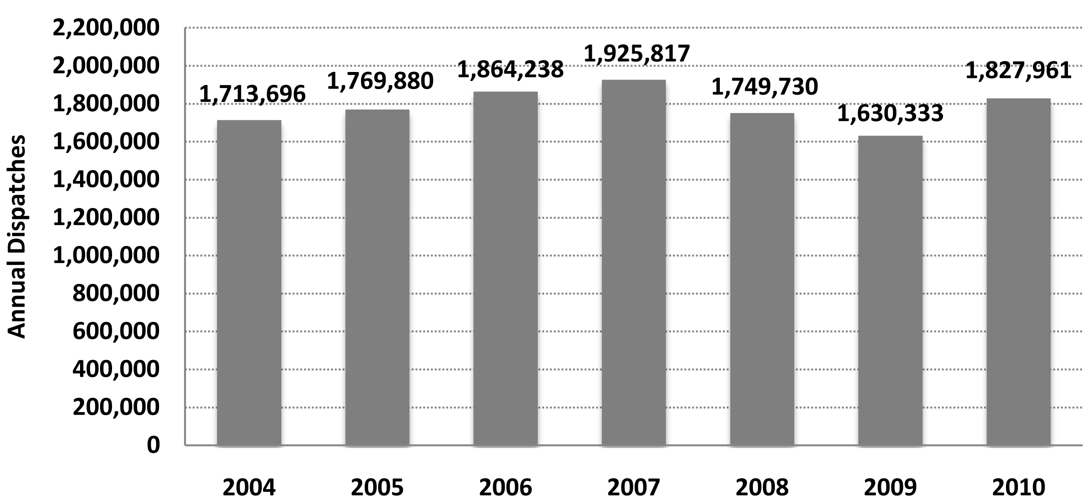
Automobile Access

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

Taxis

Taxi ridership trends are reflected in the total number of taxis dispatched from Logan Airport (serving outbound passengers). As shown in Table 5-7 and Figure 5-9, the total number of taxis dispatched rose in 2010 by 12 percent. Taxi dispatches reflect the increase in air passenger levels, while taxi vehicle occupancy has increased slightly as shown in the *2010 Air Passenger Ground Access Survey* between 2007 and 2010. Mode share found in taxi use by Logan Airport passengers remains well below the highest recorded levels (2.14 million dispatches in 2000). 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.

Figure 5-9 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.

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 with the ConRAC 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 consolidate the bus fleet into a single diesel-electric hybrid and CNG fleet serving all terminals 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.

Ground Access HOV Goal

For any commercial service airport, effective connectivity to the metropolitan area is necessary for efficient operations. The cost, speed, convenience, safety, and attractiveness of all modes of transportation connecting to the Airport affect how passengers and employees access the Airport. Surface transportation to airports has environmental impacts, and is considered a standard component of airport GHG emissions inventories, considered as "Category 3/Scope 3" emissions (see *Chapter 7, Air Quality/Emissions Reduction*). Improving multimodal connectivity is one way an airport can improve its environmental footprint. This reduces GHG emissions associated with surface transportation to the airport, while reducing transportation costs and improving convenience.

Potential environmental benefits are one reason why Massport is committed to a long-term goal to promote and support public and private HOV services aimed at serving air passengers, Airport users and employees. Massport's goal is to attain a 35.2 percent HOV ground access mode share at the 37.5 million air passenger annual level. Massport accomplishes this by promoting ridership on HOVs and maintaining and enhancing efficient transportation access and parking options in and around Logan Airport to reduce the reliance on SOVs.

Logan Airport Employee Transportation

Airport employee transportation has different ground access considerations than passenger transportation. Airport employees often have non-traditional and unpredictable working hours which 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.

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;
- Run free employee shuttle buses between Airport Station and employment areas in the SWSA and the South Cargo Area (SCA) locations;
- Operate early morning Logan Express bus trips for early commuters;
- Support the Logan Transportation Management Association (TMA);

- Create and maintain a comprehensive sidewalk system on Logan Airport to facilitate employee and pedestrian access, and provide bicycle racks.

Logan Transportation Management Association

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/support for expanded HOV services and discount fares for Airport employees.
- Provide a forum for Logan Airport tenants and employees to address common transportation concerns, and to work with government entities to create coordinated transportation management programs.

The Massachusetts Department of Transportation's (MassDOT) Office of Transportation Planning, through its Mass*RIDES* program, is the coordinator for the Logan TMA. Mass*RIDES*'s administrative support for the Logan TMA allows Massport to use its financial resources to support transportation demand management (TDM) services. Massport contributes $65,000 annually to the Logan TMA. Massport also provides space and equipment for the Logan TMA office (The Transportation Store) in Terminal C.

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. It 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 2010 included:

- East Boston early morning shuttle service (Sunrise Shuttle), which was launched in August 2007, continued operations. This shuttle service provides low-cost efficient transportation to Airport employees who live in East Boston. The shuttle service operates outside of MBTA service hours between 3:00 AM and 6:00 AM, with half-hourly shuttles transporting employees between various East Boston locations and the Airport terminals. Ridership levels have steadily increased since the shuttle's launch and have reached 636 riders per month (up from 425 per month in 2009).
- Computerized ride-matching services for participating in carpools and vanpools.
- Individualized commuter mobility programs for member organizations that present the best actions a company can take to reduce its own employees' dependence on the automobile.
- Airport-wide and individual employer events, such as Transportation Awareness Day, to disseminate information about Logan TMA services.
- 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.

2010 Logan Airport Air Passenger Ground Access Survey

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 an extensive survey of air passengers typically every three years. Since the late 1970s, the *Logan Airport Air Passenger Ground Access Survey* is one of Massport's primary tools 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 HOVs instead SOVs. The survey is the principal means of measuring air passenger HOV mode share. The previous Air Passenger Ground Access Survey was administered in 2007.

In addition to collecting information about mode choice, the survey also facilitates a better understanding of air passengers' origins within the Metropolitan Boston area and New England, shifts in market segments (i.e., business/non-business and resident/non-resident populations), and the perceived effectiveness of customer ground access services provided at Logan Airport. This section presents the results of the *2010 Logan Airport Air Passenger Ground Access Survey* and compares the findings to the results of previous surveys in relation to:

- Survey Administration;
- Origin in the Metropolitan Boston Area;
- Market Segment;
- Ground Access Mode Share by Market Segment; and
- Aggregate Ground Access Mode Share.

Survey Administration

The survey was conducted from Thursday, April 29 through Wednesday, May 12, 2010, a period consistent with previous surveys. A sample of departing passengers was surveyed in the departure lounges through the use of a detailed self-completion questionnaire. Administering the survey in departure lounges allows for control of the survey sample with a more defined audience in a defined space than in other parts of the airport terminal. This also captures passengers at a convenient time in their travel, while waiting to board a flight. A total of 281 flights were surveyed, providing over 9,350 usable responses.

Ground Access Modes of Travel

As discussed previously, air passengers traveling to and from Logan Airport have several ground access modes available to them, tabulated in the survey as follows:

- Private Automobile: This 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 by 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: Travel 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: This 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 30 percent during this time period.

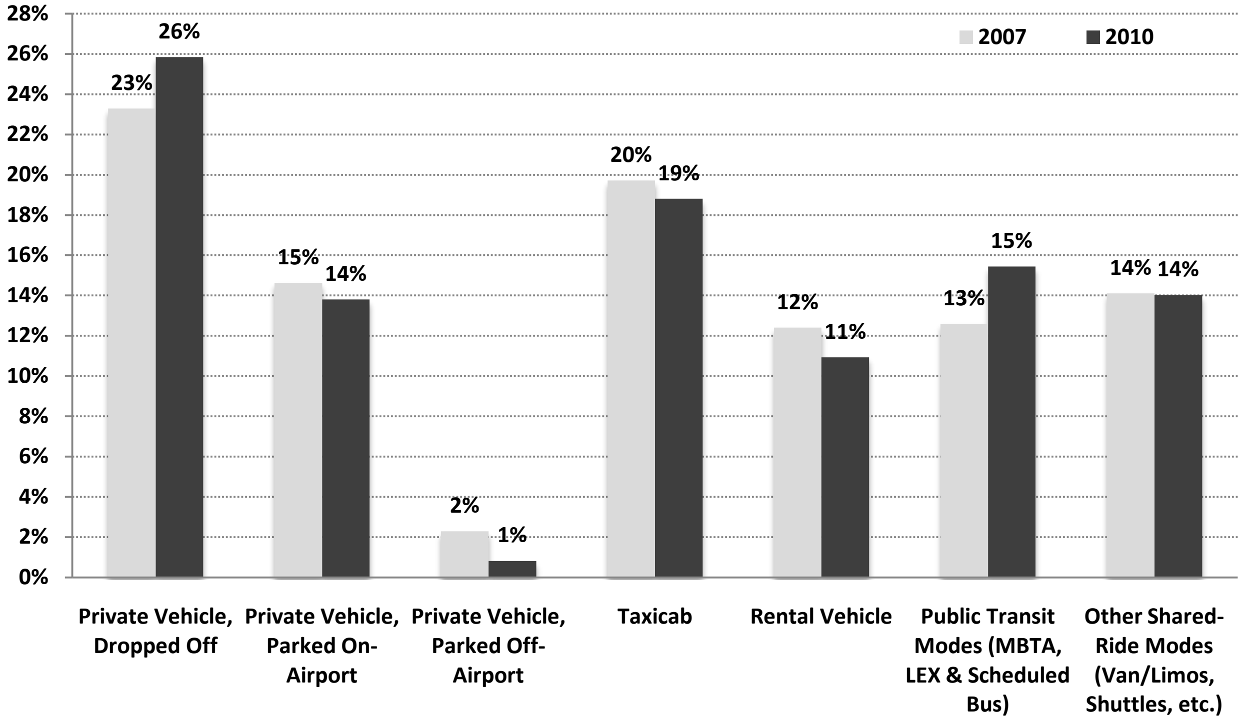
Table 5-8 Ground Access Mode Share (All Passengers) by Survey Year

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.

Figure 5-10 illustrates a comparison of air passenger ground access mode shares, as revealed by the responses in the 2007 and 2010 surveys. Overall public transit share increased, but private vehicle drop-off share increased as well.

Figure 5-10 Ground Access Mode Share, All Air Passengers (2007 and 2010)



Source: 2007 and 2010 Logan Airport Air Passenger Ground Access Surveys. Numbers may not add up due to rounding.

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 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 Weekday Average Vehicle Occupancy by Ground Access Mode, 2007 and 2010		
Mode	2007	2010
	Vehicle Occupancy	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 Modes	2.9	3.9

Source: Massport, 2007 and *2010 Logan Airport Air Passenger Ground Access Survey.*

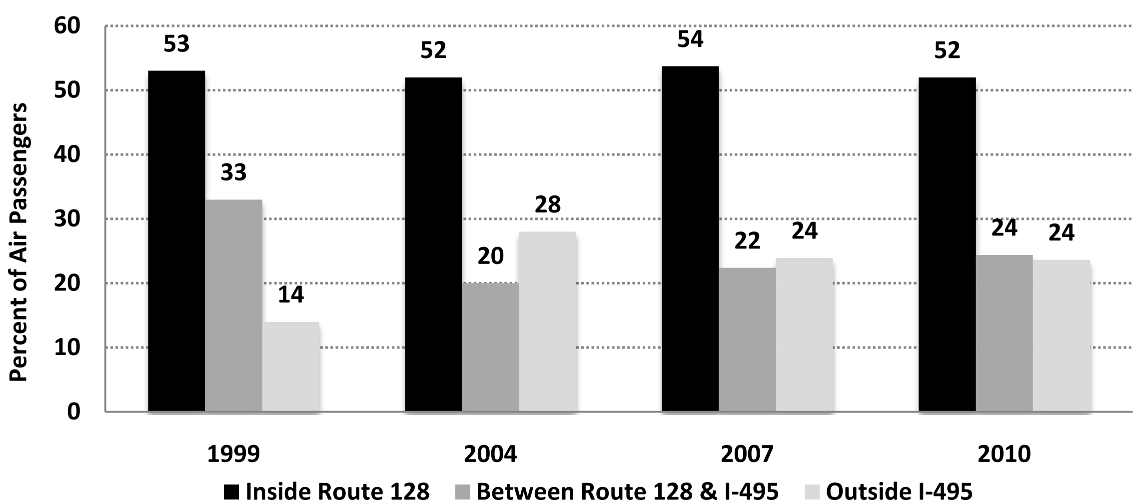
Notes: The true average occupancy per vehicle arriving at the Airport cannot be computed from the responses to the survey since identifying multiple travel parties arriving in a single vehicle is not possible. Average vehicle occupancy was calculated as the average occupancy of arriving vehicles across 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.

Origins of Air Passengers

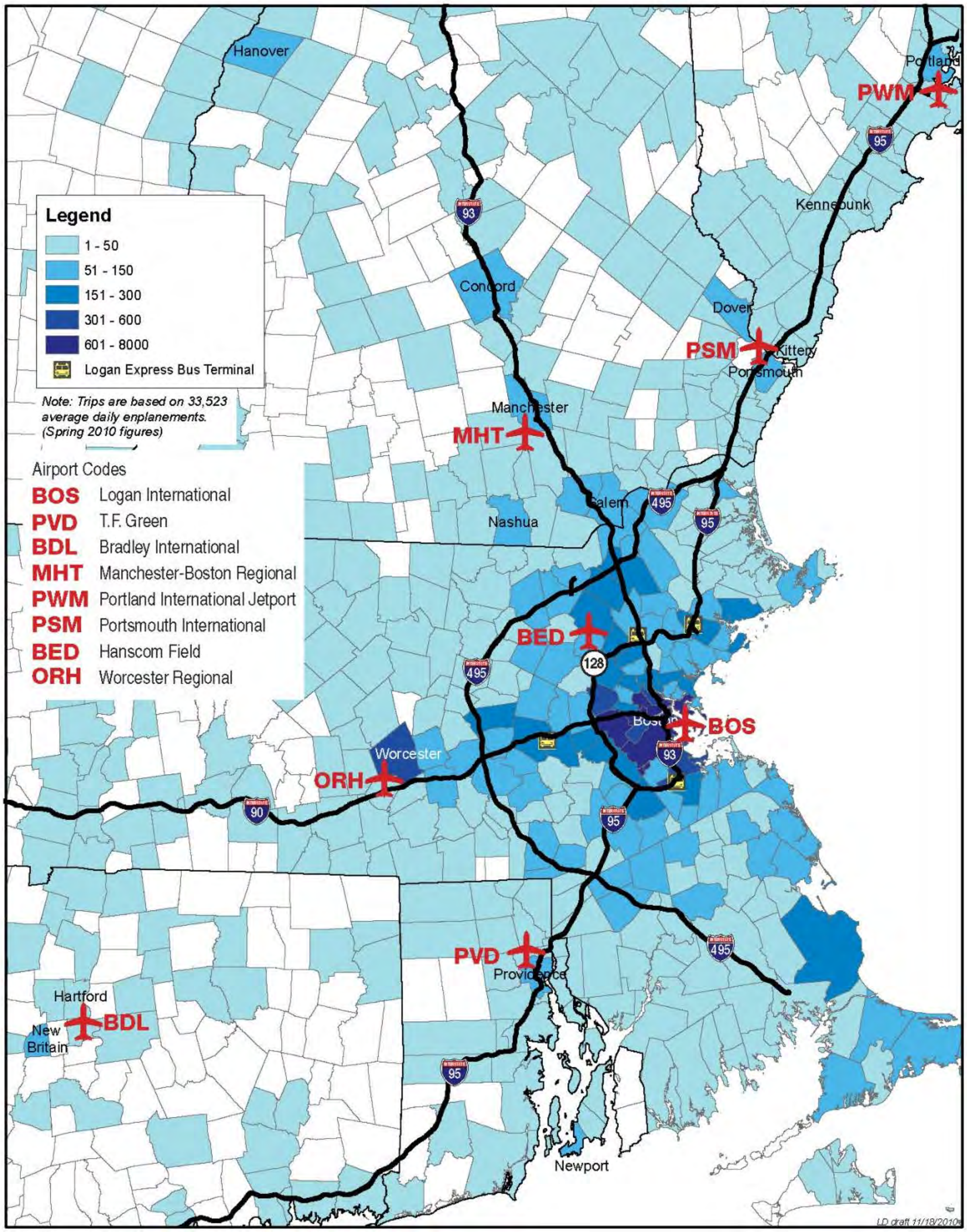
Figure 5-11 indicates how the distribution of air passenger trips by geographic area has changed since 1999. Figure 5-12 shows the distribution of air passenger trips by municipality. In 2010, the share of trips coming from inside Route 128 decreased slightly and a corresponding increase as a share of the total trips was seen between Route 128 and Interstate 495. The majority of trips still originate in Boston and other communities within Route 128. Passenger origins outside remained approximately the same compared to the *2007 Logan Airport Air Passenger Ground Access Survey*.

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.
* Based on air passengers departing on both weekdays and weekend days.

Figure 5-12 Distribution of Average Daily Ground Access Trips to Logan Airport by Municipality



Source: 2010 Air Passenger Ground Access Survey.

Market Segment: Trip Purpose and Residency

Massport characterizes air passengers into four distinct market segments:

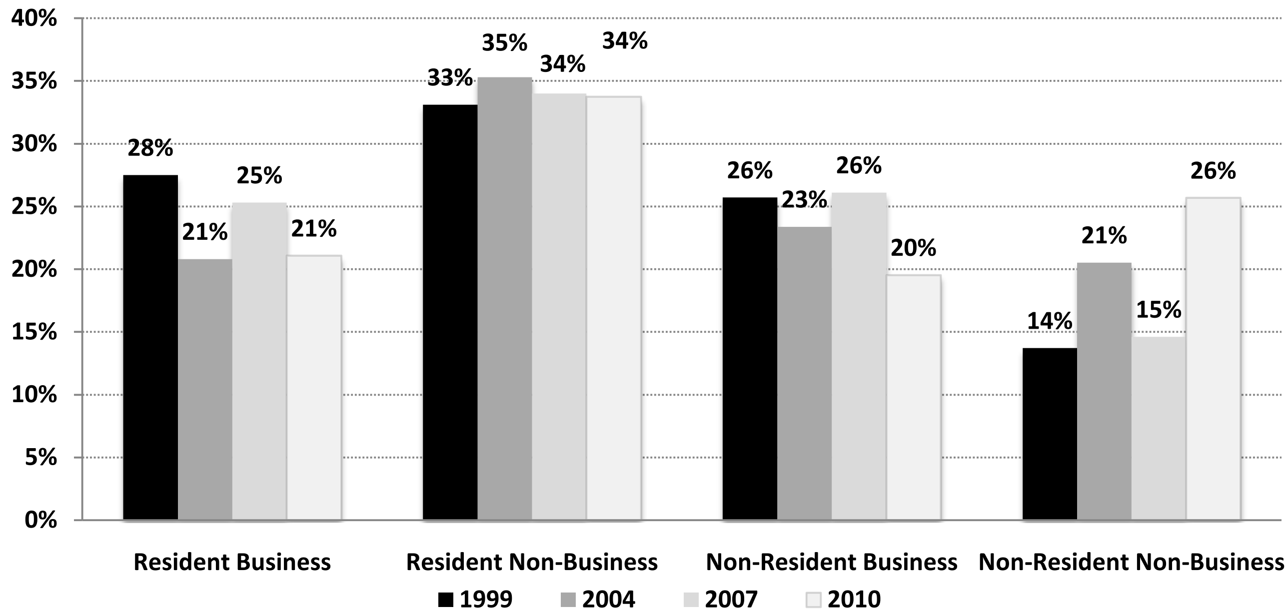
- *Resident Business*: passengers living within the region served by Logan Airport and traveling for business reasons.
- *Resident Non-Business*: passengers living within the region served by Logan Airport and conducting personal travel, (e.g., leisure trip).
- *Non-Resident Business*: passengers living 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 live in New England and 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 user groups. This information assists Massport in developing appropriate ground access service for passengers.

Figure 5-13 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 attracting air passengers from beyond the Airport's traditional market area.

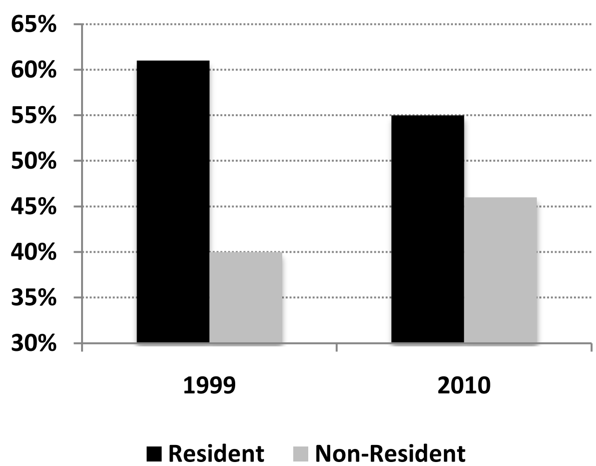
Figure 5-14 uses the data from business, non-business, residents, and non-residents to reveal general trends over time. Most notably, in 2010 the weekday market share of business trips dropped to about 40 percent overall, compared to 52 percent in 2007. This is possibly due to the proliferation of competing low-fare air carriers which typically attract a higher percentage of non-business passengers. This follows a general trend since the 1999 survey of a lower percentage of business travelers and a higher percentage of non-business travelers. It also shows a less pronounced trend since the 1999 survey of a greater percentage of non-resident passengers and a smaller percentage of resident passengers.

Figure 5-13 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.

Figure 5-14 Weekday Market Segments, 1999-2010 (Trip Purpose and Residency Divided)



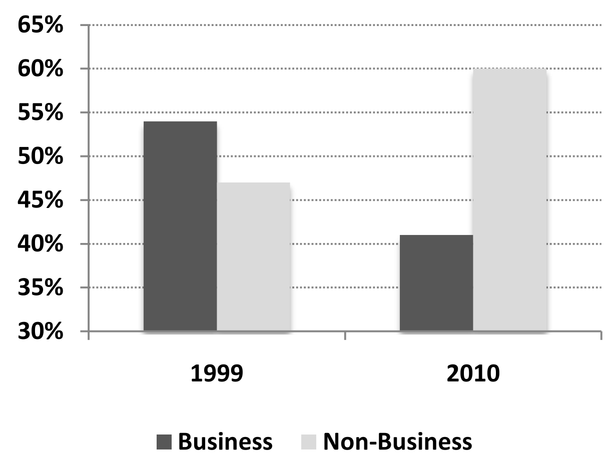


Table 5-10 presents mode shares by market segment. HOV mode share is lower among the business segments compared to the non-business segments. Business travelers typically have low HOV mode share because they have high sensitivity to time, require flexibility and schedule reliability, and often make decisions related more to convenience than to cost, which is often covered by the 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, tend to travel at off-peak fly times/days.

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

	Resident Business				Non-Resident Business			
Ground Access Mode	1999	2004	2007	2010	1999	2004	2007	2010
Non-HOV								
Private Automobile	50.0%	54.0%	54.0%	58.7%	9.0%	18.0%	12.0%	11.7%
Taxi	23.0%	19.0%	18.0%	16.2%	31.0%	30.0%	35.0%	36.1%
Rental Car	1.0%	1.0%	2.0%	0.6%	34.0%	24.0%	29.0%	26.8%
Subtotal Non-HOV	74.0%	74.0%	74.0%	75.6%	74.0%	72.0%	76.0%	74.7%
HOV								
Unscheduled HOV	12.0%	11.0%	13.0%	10.3%	6.0%	7.0%	8.0%	10.2%
Scheduled HOV	9.0%	8.0%	6.0%	6.1%	8.0%	7.0%	3.0%	3.0%
Transit	5.0%	5.0%	6.0%	4.4%	8.0%	6.0%	6.0%	5.0%
Courtesy shuttle	<1%	1.0%	<1%	2.3%	4.0%	7.0%	5.0%	4.7%
Other	<1%	1.0%	1.0%	1.2%	<1%	1.0%	2.0%	2.4%
Subtotal HOV	26.0%	26.0%	26.0%	24.4%	26.0%	28.0%	24.0%	25.3%
	Resident Non-Business				Non-Resident Non-Business			
Ground Access Mode	1999	2004	2007	2010	1999	2004	2007	2010
Non-HOV								
Private Automobile	46.0%	49.0%	51.0%	48.7%	35.0%	38.0%	36.0%	35.9%
Taxi	15.0%	16.0%	14.0%	12.5%	16.0%	15.0%	19.0%	16.9%
Rental Car	1.0%	3.0%	2.0%	1.9%	20.0%	17.0%	19.0%	18.1%
Subtotal Non-HOV	62.0%	68.0%	67.0%	63.1%	71.0%	70.0%	73.0%	70.8%
HOV								
Unscheduled HOV	10.0%	9.0%	7.0%	8.1%	4.0%	5.0%	3.0%	3.7%
Scheduled HOV	11.0%	13.0%	12.0%	11.6%	10.0%	11.0%	6.0%	8.3%
Transit	14.0%	8.0%	11.0%	10.6%	12.0%	8.0%	9.0%	9.2%
Courtesy shuttle	2.0%	1.0%	3.0%	4.5%	3.0%	5.0%	5.0%	6.3%
Other	<1%	1.0%	1.0%	2.1%	<1%	1.0%	4.0%	1.7%
Subtotal HOV	38.0%	32.0%	33.0%	36.9%	29.0%	30.0%	27.0%	29.2%

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

Ground Access Goals

Massport has established a number of goals related to the ground access system, parking facilities, and other transportation infrastructure that serve air passengers, Airport employees, and other Airport users. 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.

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

- Provide, promote and support HOV/shared-ride modes (Logan Express, MBTA, water transportation, etc.);
- Establish, support and actively participate in the Logan TMA; and
- Improve terminal curbside access for HOV modes.

Table 5-11 lists each ground access goal and updates Massport's initiatives associated with each goal.

Logan Airport's Roadways and Terminal A Satellite Concourse as viewed from the Hilton Hotel.

Table 5-11 Ground Access Planning Goals and Progress

Goal	2010 Update
Increase air passenger ground access 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 27.4 million air passengers use HOV modes to access the Airport. Massport continues to provide and actively promote numerous HOV options that are available to air passengers, including Logan Express bus service, the Silver Line, water shuttle service, and frequent, free shuttle bus service to and from the MBTA Airport Blue Line rapid transit station. Massport is working on a long-range Ground Access Policy Plan, including investigating ways to increase HOV mode share.
Reduce employee reliance on commuting alone by private automobile	Massport continues to support the Logan Transportation Management Association (TMA) with $65,000 annually as well as providing office space and equipment for the Logan TMA Store in Terminal C. Through a partnership with the Massachusetts Department of Transportation's (MassDOT) MassRIDES program, the Commonwealth provides Massport with a Logan TMA coordinator. Massport uses funds from the Logan TMA to support the early morning Sunrise Shuttle serving East Boston. In 2010, Massport and the Logan TMA successfully obtained Job Access and Reverse Commute (JARC) funding administered by the Federal Transit Administration to start a second Sunrise Shuttle route; this new service is expected to launch in the fall of 2011.
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 Airport Blue Line station, the Silver Line service extension to Logan Airport, and the Urban Ring planning. Following MassDOT's acquisition of a critical rail right-of-way, Massport is undertaking the East Boston-Chelsea Bypass. This will add an important roadway link to the Logan Airport ground access network, enhancing transit and commercial vehicle access to the airport while reducing traffic and emissions in East Boston neighborhoods.
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.[9] 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 ITS features for managing the unified shuttle bus system as well as other ground transport operations.
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 existing economy lot at the Robie parcel. This facility fully opened in early 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 demand and patterns in this chapter and shown in Table 5-4.

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

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6

Noise Abatement

Introduction

Massport strives to minimize the noise effects of 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 including: 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 comprehensive noise abatement 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 impact from Logan Airport operations.

This chapter describes noise conditions at Logan Airport related to airport operations during 2010 and compares the findings to those for 2009. Noise conditions for 2010 were assessed primarily through computer modeling, supplemented by the analysis of measured noise levels from Logan Airport's noise monitoring system. Information presented includes 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.

Key Findings

In 2010, the following changes occurred in the noise environment:

- Annual aircraft operations increased from 345,306 in 2009 to 352,643 (2.1 percent increase) in 2010 with commercial operations increasing by 1.5 percent and general aviation (GA) operations rebounding by 19.9 percent from 2009. However, these GA operations represent only a small percentage (4.2 percent) of total operations at Logan Airport.

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

- The number of aircraft operations in 2010 remained below historic peak levels (13.8 percent decline since 2005). Daily operations in 2010 averaged approximately 966 compared to approximately 946 in 2009, an increase of about 20 operations per day.

- The 2010 DNL contours are similar in size compared to 2009. The DNL 65 decibel (dB) contour remained the same in Revere and in most of Winthrop. The extent of the DNL 65 dB contour decreased slightly in the Point Shirley section of Winthrop due to the reduced number of departures from Runway 9 and due to the reduced number of aircraft arrivals over South Boston and East Boston. The geographic extent of the DNL 65 dB contour increased in East Boston near the Airport and out over Boston Harbor due to an increase in departures from Runway 15R.

- This *2010 EDR* reports on the findings of the Integrated Noise Model's (INM) results of the population impacted by airport related noise and used both the 2010[2] and 2000 Census data as a basis for comparison.

  - Using the 2000 Census, the overall number of people exposed to values greater than DNL 65 dB decreased by 11 percent in 2010, compared to 2009. An estimated 3,870 people were exposed to levels greater than DNL 65 dB as depicted in the 2010 contour, compared to 4,335 in 2009. This is the first time that the number of people exposed to the DNL 65 dB noise level has been fewer than 4,000 and that the number of people within the DNL 65 dB in Boston has dropped below 1,000 to 711 people.
  - Using the 2000 Census, the total population exposed to noise levels greater than DNL 70 dB decreased in 2010 compared to 2009 (Table 6-6). In 2009, the total population greater than DNL 70 dB was 243, and in 2010 the number dropped to 198. There was a reduction of 40 people in Winthrop and a decrease of 5 people exposed to greater than DNL 70 dB in Boston, resulting in the drop in the total impacted population.
  - Using the new 2010 Census, the overall number of people exposed to DNL values greater than 65 dB decreased to 3,830 people, 40 people fewer than with the 2000 Census. Within the DNL 70 dB contour the number of people has dropped to 130, which is 68 fewer than with the 2000 Census. Due to the updated population and Census block boundaries of the 2010 Census, there were no people within the DNL 70 dB contour in the City of Boston.

- Essentially all of the residences exposed to levels greater than DNL 65 dB in 2010, the owners of which have chosen to participate in the Massport's residential sound insulation program (RSIP), have been programmed for sound-insulation by Massport.

- The 2010 CNI of 151.9 Effective Perceived Noise Decibels (EPNdB) remained well below the cap of 156.5 EPNdB established under Massport's noise regulations. This reduction from the 2009 level reflects the continued use of quieter aircraft even though the number of aircraft operations increased slightly in 2010.

- In accordance with the mitigation commitments associated with the Logan Airside Improvements Planning Project,[3] this *2010 EDR* reports on dwell and persistence of aircraft-related noise in the neighborhoods that surround Logan Airport. The level and duration of dwell and persistence has decreased for areas affected by departures from Runways 22L, 22R, 9 and 33L, but increased over areas affected by operations from Runways 27 and 22L due to the increase in departures from Runway 27 and arrivals at night to Runway 22L.

2 The 2010 US Census Public Law 94-171 data (PL94-171) was released in March of 2011. The data was downloaded from the US Census web site on April 7, 2011, www.census.gov/.
3 Logan Airside Improvements Planning Project Final EIS, Section 4.2.3 PRAS Monitoring and Reporting, June 2002.

- In 2010, Massport provided sound insulation to 83 homes, nearly half of which were in Chelsea. The focus of this 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 Sound Insulation program, 11,219 homes have received sound insulation treatment in East Boston, South Boston, Winthrop, Revere, and Chelsea.

Airspace and Airfield Changes:

- The aRea NAVigation (RNAV) departure portions of Phase 1 of the Boston Logan Airport Noise Study (BLANS) were implemented in 2010. The primary focus of the BLANS is to determine viable means to reduce noise from aircraft operations at, to and from Boston Logan International Airport without diminishing airport safety and efficiency.[4] Starting on February 1, 2010, departures from Runway 9 began using the RNAV procedures. Starting on May 3, 2010, departures from Runway 4R began using the RNAV procedures, and on November 18, 2010, RNAV procedures began being implemented for Runways 15 and 22R and 22L. The 2010 Flight Track Monitoring report in *Appendix H, Noise Abatement* shows that the percent of shoreline crossings by aircraft above 6,000 feet remains above 97 percent.

- The RNAV procedures route the aircraft out over the Harbor following a well-defined narrow path and back over the South Shore farther south and at a higher altitude than they did previously. This has reduced overflights for many areas on the South and North shores due to the optimization of the airspace over Boston Harbor. All of these improvements are designed to reduce the noise levels of residents in these areas. The Flight Track Monitoring report in *Appendix H*, *Noise Abatement* shows that while the number of Runway 9 departures crossing back over the South shore in 2010 is approximately the same as in 2009, a higher percentage of the aircraft are flying farther south, crossing over the Cohasset area instead of the Hull area and at a higher altitude.

- A new visual approach (Light Visual Approach) to Runway 33L which began during the summer of 2009 has seen increased use in 2010. The procedure, also an outcome of Phase 1 of BLANS, keeps aircraft offshore avoiding areas of Cohasset and Hull at night during visual flight rules and is shown in Figure 6-12.

- This is the second year the new flight track data collected from Massport's AirScene.com noise and operation monitoring system was used for the modeling process. AirScene is intended to track flights more accurately than the previous system. The new flight track data retains 97 percent of the available information for modeling which is an improvement over the 90 percent that the previous system provided.

4 For more information, visit the BOSTON LOGAN AIRPORT NOISE STUDY (BLANS) WEBSITE at www.bostonoverflightnoisestudy.com/index.aspx.

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 0 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 Federal Aviation Administration (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. No Stage 1 aircraft operate 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 United States (U.S.) unless its takeoff weight is 75,000 pounds or less.

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

- Stage 3 aircraft were certified for service before 2006 and are relatively quiet jets, though some are Stage 2 aircraft which have been re-engined or have been fitted with hushkits to allow them to meet the 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 cumulatively 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. Though not required, the majority of aircraft in the 2010 Logan Airport fleet would also meet the new Stage 4 noise limits if they were recertificated.

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]

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."

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 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 meet original noise limits, set in 1969; Stage 3 aircraft meet more stringent limits, established in 1977; and Stage 4 aircraft 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 complete 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" that 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.

Aircraft operators responded to the Stage 1 and 2 phase outs in two primary ways. The most common was to retire their non-compliant aircraft. Some operators modified some of their aircraft to meet the more stringent standards. A number of modification approaches were undertaken, including 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 under these approaches still operate at Logan Airport, but the number is generally declining due to aircrafts' age and high operating costs (in particular 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 very 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 to support these findings. While Part 161 does not require this information for a Stage 2 restriction, Part 161 states that it would be "useful." Moreover, in practice, 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."[10]

Although several (on the order of a dozen) airports have embarked on efforts to adopt both Stage 2 and 3 restrictions in the past 21 years, 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. Even in that case, however, 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 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 – for Stage 3 restrictions – approval processes. 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
- Restricting use of certain runways by noisier aircraft and time of day

10 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.

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 the 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 *2010 EDR* and will be used in future years, include:

- Continued use of the latest version update to the FAA's 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 (INMv7.0b)[11] to model the 2010 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 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 *2010 EDR* is the second year the AirScene.com data has been used for all aspects of the modeling process. The measured noise and the flight track data all comes 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 which provide 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 2010.

- The modeling process includes continued use of U.S. Geological Survey (USGS) digital terrain data. INMv7.0b 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™.[12] The *2004 Environmental Status and Planning Report (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 360,402 traces were collected from the system and 349,397 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 352,644 operations in 2010. This

11 INM Version 7.0b was released in September 2009.
12 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.

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 330,993 flight tracks (94.7 percent) used these specially designed profiles of which 172,282 (98.7 percent) of the available departure profiles and 158,711 (90.7 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 INMv7.0b 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.
- 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.
- 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 INMv7.0b 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 2010.

Noise Model Inputs

The FAA's INMv7.0b was released for general use on September 30, 2009, and has been used for the *2009 EDR* and the *2010 EDR* as the primary analytical tool to assess the noise environment at Logan Airport. The modeling also includes provisions for over-water sound propagation and hill effects that have been tailored to the local environment and approved by FAA's Office of Environment and Energy (AEE) based on previous special studies. Documentation of these features is included in earlier editions of EDRs and ESPRs. A comparison of the enhancements between INMv7.0b, and the prior version of INM, INMv7.0a was included in the *2009 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 which follow or are included in *Appendix H, Noise Abatement.*

The following section summarizes the average-day operations for 2010 used in the noise modeling and compares them to 2009 data.

Fleet Mix

Since 2004, Massport has relied heavily on radar data as the primary source of input for noise calculations, since radar data typically are more accurate than the information reported by air carriers. These radar data typically 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 2010, aircraft types at Logan Airport were matched to the INMv7.0b 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.[13] 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 which meet Stage 4 jet requirements are also broken out from the Stage 3 jet aircraft data for 2009 and 2010. These Stage 4 aircraft are defined as aircraft certified as Stage 4 and all Stage 3 aircraft which *if recertified* would qualify for Stage 4. 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 of operations by categories of aircraft operating at Logan Airport in 2010 and includes similar data for 2009 and prior years back to 2005. Data prior to 2005 are included in *Appendix H, Noise Abatement*.

Commercial Operations

Compared to 2009, the percent of commercial aircraft operations at Logan Airport has remained consistent. Figure 6-1 presents the commercial operations groups in terms of percent of the total for each year. Commercial traffic includes both passenger and cargo operations.

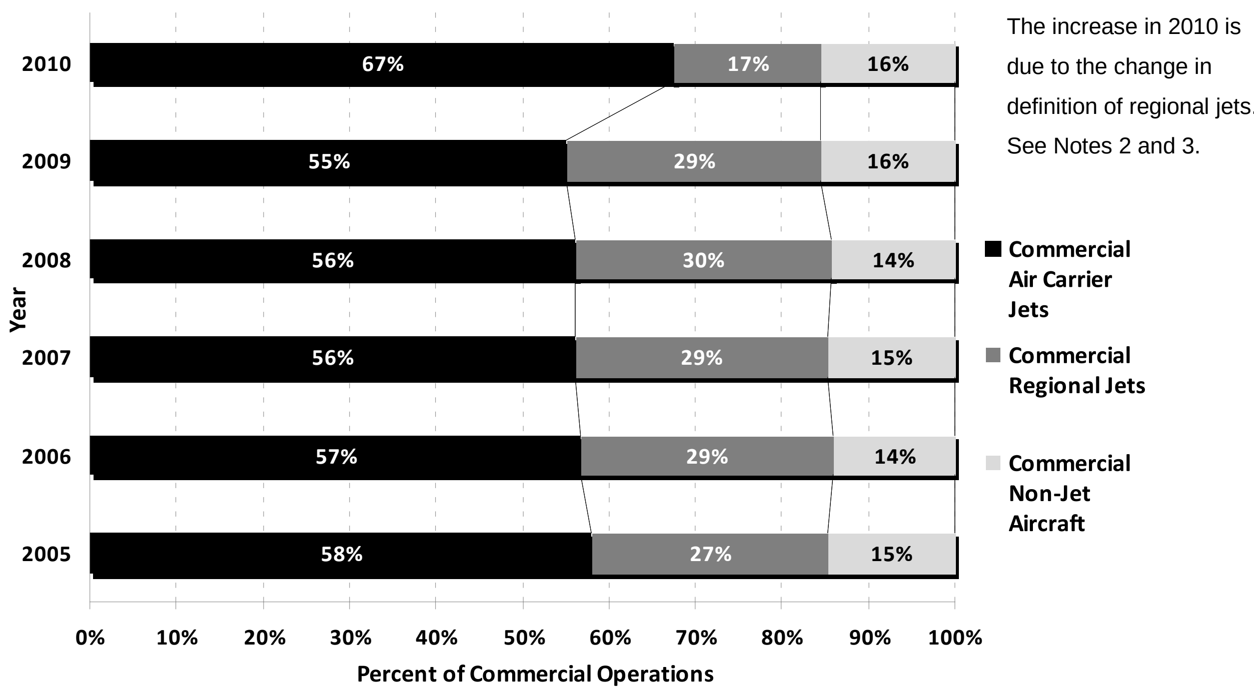
Regional jets in this chapter of the *2010 EDR* have been redefined as those aircraft with fewer than 80 seats, consistent with the categorization in *Chapter 2, Activity Levels*. [14] For years prior to 2010, the regional jets (RJ) in this chapter were classified as aircraft with less than 100 seats. 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 types have become available the smaller 35-50 seat types have been replaced by 70 to 90 seat types with the 90 seat types flying many of the traditional air carrier routes. The reporting in this chapter is affected by the change in definition because two popular models (CRJ-900 and the EMB190) in use at Logan Airport are redefined from RJ to air carrier jet

13 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.

14 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 *2010 EDR* categorizes aircraft with 70-75 seats and below as regional jets and aircraft with 85 seats and higher aircraft as air carrier.

categories. This redefinition results in a large increase of modeled air carrier jets to 67 percent and a large decrease in modeled RJ operations to 17 percent. The increase in air carrier jets was almost entirely offset by the decrease in RJs with all commercial jets remaining at 84 percent overall in 2009. Non-jet commercial operations remained consistent at 16 percent of the overall commercial fleet. This change in definition of some of the commercial jet types does not affect the modeling results, simply how the attribution of noise sources are reported in the tables.

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 For 2010 – the split between Air Carrier Jets and Regional Jets is 80 seats with Regional Jets having less than 80.
3 Prior to 2010 – the split between Air Carrier Jets and Regional Jets is 100 seats with Regional Jets having less than 100.

Compared to 2009, the number of average daily operations (Table 6-1) indicates a modest increase in air carrier activity, with overall commercial traffic increasing by 1.5 percent in 2010. The change in RJ definition results in a large increase of modeled air carrier jets by 121 operations per day and a large decrease in modeled RJ operations by 109 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 2009 to 2010 is 11.67 operations per day. Non-jet commercial operations increased 1.75 operations per day to almost 144 per day. Nighttime commercial operations (between 10:00 PM and 7:00 AM) in 2010 increased seven percent compared to 2009 primarily during the shoulder time periods (before midnight and after 5:00 AM). Overall, commercial operations appear to be recovering from the economic downturn prevalent in 2009.

General Aviation Operations

Modeled GA activity exhibited a 19.9 percent increase, from approximately 33 daily operations in 2009 to 40 daily operations in 2010 (Table 6-1). Use of Stage 2 GA jets increased by an average one landing and take-off cycle per week; use of Stage 3 GA jets increased by 26.5 percent. Non-jet GA activity levels in 2010 were unchanged compared to 2009. Overall GA nighttime operations increased by 28.9 percent, from 3.1 operations per night in 2009 to 4.0 per night in 2010. However, this comparison should be put into context: GA nighttime operations in 2009 were at a historical low and 2010 opeations were at their second lowest since 2005. Although the overall increase in GA activity compared to 2009 may seem large, from a historical perspective, 2010 GA operations were the second lowest recorded in over 10 years, with 2009 being the lowest. Data prior to 2005 are included in *Appendix H, Noise Abatement.*

Table 6-1 Modeled Average Daily Operations by Commercial and General Aviation Aircraft[1,2]

		2005[3]	2006[3]	2007[3]	2008[3]	2009[3]	2010[4]
Commercial Aircraft							
Stage 2 Jets[5]	Day	0.05	0.03	0.03	0.01	0.00	0.01
	Night	0.01	0.00	0.01	0.01	0.00	0.01
	Total	**0.06**	**0.03**	**0.04**	**0.02**	0.00	**0.02**
Stage 3 Jets (All)	Day	765.76	767.55	748.13	699.39	667.45	674.25
	Night	113.66	114.81	118.29	114.30	103.05	107.92
	Total	**879.42**	**882.36**	**866.42**	**813.69**	**770.50**	**782.17**
Air Carrier Jets	Day	505.48	490.63	472.39	443.15	422.92	530.76
	Night	91.99	92.71	96.28	89.89	82.21	95.42
	Total	**597.47**	**583.34**	**568.66**	**533.04**	**505.14**	**626.18**
Regional Jets	Day	260.34	276.95	275.77	256.24	244.53	143.49
	Night	21.68	22.11	22.03	24.40	20.84	12.50
	Total	**282.01**	**299.06**	**297.80**	**280.64**	**265.37**	**155.99**
Non-Jet Aircraft	Day	148.77	140.81	145.27	132.52	136.43	138.53
	Night	3.02	3.26	3.47	4.00	5.56	5.21
	Total	**151.79**	**144.07**	**148.73**	**136.52**	**141.99**	**143.74**
Total Commercial	Day	914.59	908.41	893.43	831.92	803.88	812.78
Operations	Night	116.68	118.09	121.77	118.31	108.62	113.13
	Total	**1031.27**	**1026.51**	**1015.19**	**950.23**	**912.50**	**925.91**
GA Aircraft							
Stage 2 Jets[5]	Day	2.29	1.90	1.24	0.36	0.09	0.27
	Night	0.25	0.17	0.19	0.03	0.01	0.04
	Total	**2.54**	**2.07**	**1.43**	**0.38**	**0.10**	**0.30**
Stage 3 Jets	Day	58.84	61.08	54.82	43.98	22.18	27.80
	Night	9.33	6.57	6.39	4.52	2.33	3.21
	Total	**68.16**	**67.65**	**61.21**	**48.49**	**24.51**	**31.01**
Non-Jets	Day	14.00	15.05	11.98	15.13	8.19	8.19
	Night	4.75	1.39	3.61	1.08	0.75	0.72
	Total	**18.75**	**16.44**	**15.58**	**16.20**	**8.93**	**8.92**
Total GA Operations	Day	75.12	78.03	68.04	59.46	30.46	36.26
	Night	14.33	8.13	10.19	5.62	3.08	3.97
	Total	**89.46**	**86.15**	**78.22**	**65.08**	**33.54**	**40.22**
Total	Day	989.71	986.43	961.46	891.39	834.33	849.03
	Night	131.02	126.22	131.96	123.93	111.70	117.10
	Total[3]	**1120.73**	**1112.66**	**1093.42**	**1015.31**	**946.03**	**966.13**

Source: Massport's Noise Monitoring System, Revenue Office numbers, HMMH 2011.

1 Operations include scheduled and unscheduled operations and data for years prior to 2005 is available in *Appendix H, Noise Abatement.*

2 For 2010 – the split between Air Carrier Jets and Regional Jets is 80 seats with Regional Jets having less than 80 seats.

3 Prior to 2010 – the split between Air Carrier Jets and Regional Jets is 100 seats with Regional Jets 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 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 at three measurement locations—takeoff, landing, and sideline—based on an aircraft's maximum certificated weight. The heavier the aircraft, the more noise it is permitted to make within limits.

The *Airport Noise and Capacity Act of 1990* (and its implementing regulations known as FAR Part 91), 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 they add new aircraft. The new Stage 4 noise standard applies to any new jet aircraft type designs over 12,500 lbs 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 has indicated any movement towards restricting the remaining recertificated Stage 3 aircraft from carrier fleets. Because of the substantial differences in noise 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 2005. The majority of the commercial jet fleet meets Stage 4 requirements. Certificated Stage 3 aircraft as a percentage of the commercial jet fleet dropped slightly compared to 2009 accounting for 98.9 percent of the commercial jet fleet in 2010. This is due to a slight rise in the use of hushkitted aircraft by Delta Airlines as a result of the Delta and Northwest merger.

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
2005		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%[3,6]	99.1%[3]	0.9%	0.0%	100%
2010	93.2%[3]	98.9%[3]	1.1%[5]	0.0%	100%

Source: Massport's Noise Monitoring System, Revenue Office numbers, HMMH 2011.

1 Data for years prior to 2005 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.

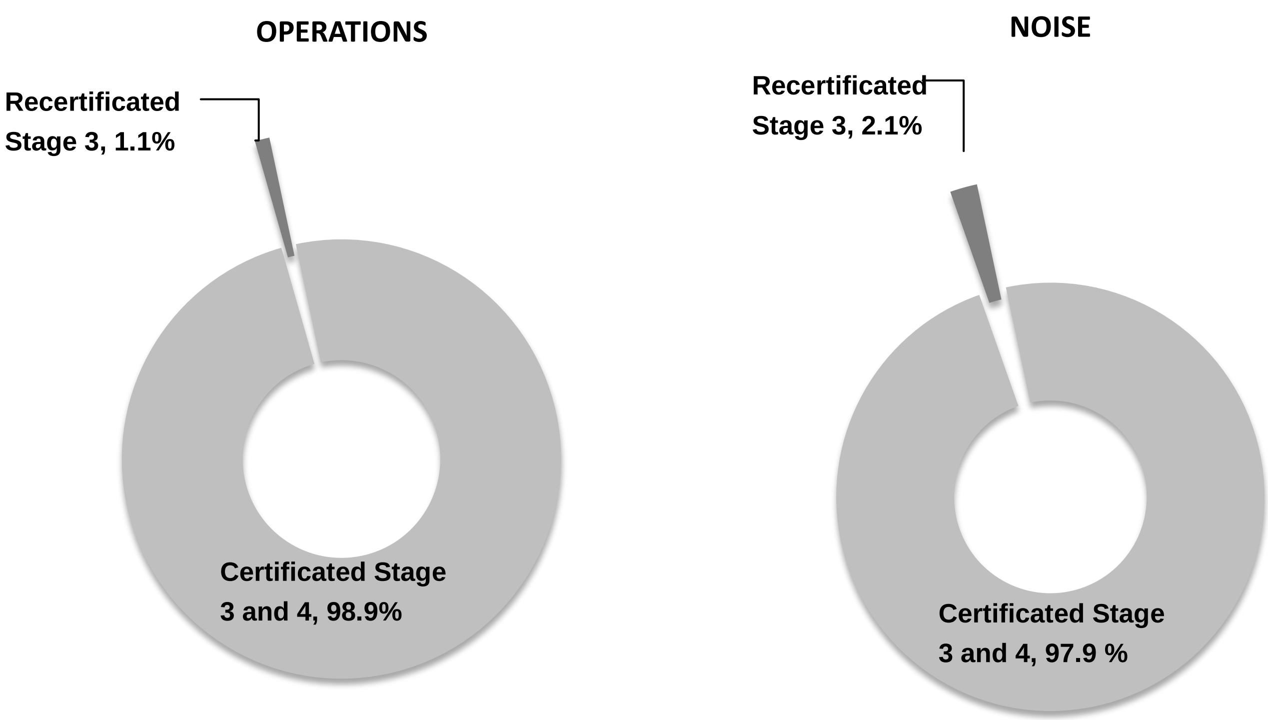
4 Recertificated Stage 3 aircraft are aircraft originally manufactured as a certificated Stage 1 or 2 aircraft under FAR Part 36 which have been either retrofitted with hushkits or have been re-engined to meet Stage 3 requirements.

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 Intl, FedEx). A few charter operators also use these aircraft.

6 The identification of aircraft meeting Stage 4 requirements during 2009 has been revised due to an error identified in the categorization of one aircraft types.

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 1.1 percent of the commercial jet operations but creating approximately 2.1 percent of the noise exposure.

Figure 6-2 Relative Contributions of Commercial Jet Operations and Noise at Logan Airport, 2010



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.
Noise calculations include the 10 dB nighttime penalty.

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, both the U.S. House of Representatives[15] and the U.S. Senate[16] versions of the FAA reauthorization bills, under consideration at the time of this filing, include a phase-out of these types of operations. 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 Abatement Office staff of potential non-compliant flights when they occur.

15 The FAA Reauthorization and Reform Act of 2011 (H.R. 658), passed on April 1, 2011.
16 The FAA Air Transportation Modernization and safety Improvement Act (S. 223), passed on February 17, 2011.
17 PREFLIGHT is the prior Flight track processing system which is still operating using PASSUR radar data.

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 ITT NOMS system, which is the noise office primary source of data.

In addition, Massport takes note of 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 4.7 percent from 103.0 operations per night in 2009 to 107.9 operations per night in 2010 and nighttime flights by commercial non-jet operators decreased by 6.3 percent from 5.6 operations per night in 2009 to 5.2 operations per night in 2010, but were still the second lowest since 2005. Nighttime GA operations rose 28.9 percent. These changes resulted in an overall increase in nighttime operations of 4.8 percent in 2010. 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 12.1 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
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
Change (2009 to 2010)	4.88	-0.35	0.89	5.40
Percent Change	4.7%	-6.3%	28.9%	4.8%

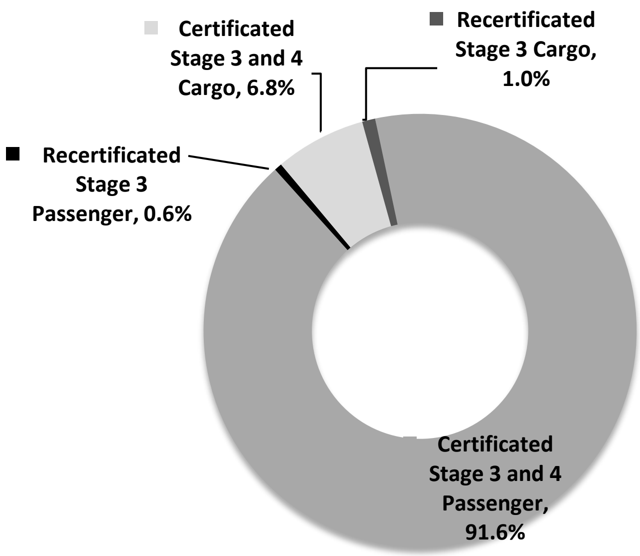
Source: Massport and ITT radar data. HMMH, 2011.
1 Data for years prior to 2005 is available in *Appendix H, Noise Abatement.*

Figure 6-3 shows the nighttime jet commercial activity by air carrier and cargo operators. It shows that cargo operations accounted for 7.8 percent of all commercial nighttime operations in 2010. Other findings indicate:

- There was a reduction overall in nighttime cargo flights which comprised 8.5 percent of the total commercial night operations in 2009, and in 2010 comprised 7.8 percent of the total. This also resulted in an increase in the percentage of passenger operations as part of total commercial nighttime flights which increased from 91.5 percent in 2009 to 92.2 percent in 2010.
- Flights by cargo operators using recertificated Stage 3 aircraft comprised 1.0 percent of the commercial nighttime activity compared to the 0.8 percent reported for 2009.
- Even though there was an increase in night operations by passenger operators in 2010, passenger airlines flew only 0.6 percent of total night commercial jet operations in recertificated Stage 3 aircraft compared to 0.9 percent in 2009.
- 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 aircraft age and are taken out of service.

Figure 6-3 Commercial Nighttime Jet Operations Part 36 Stage Breakdown, 2010

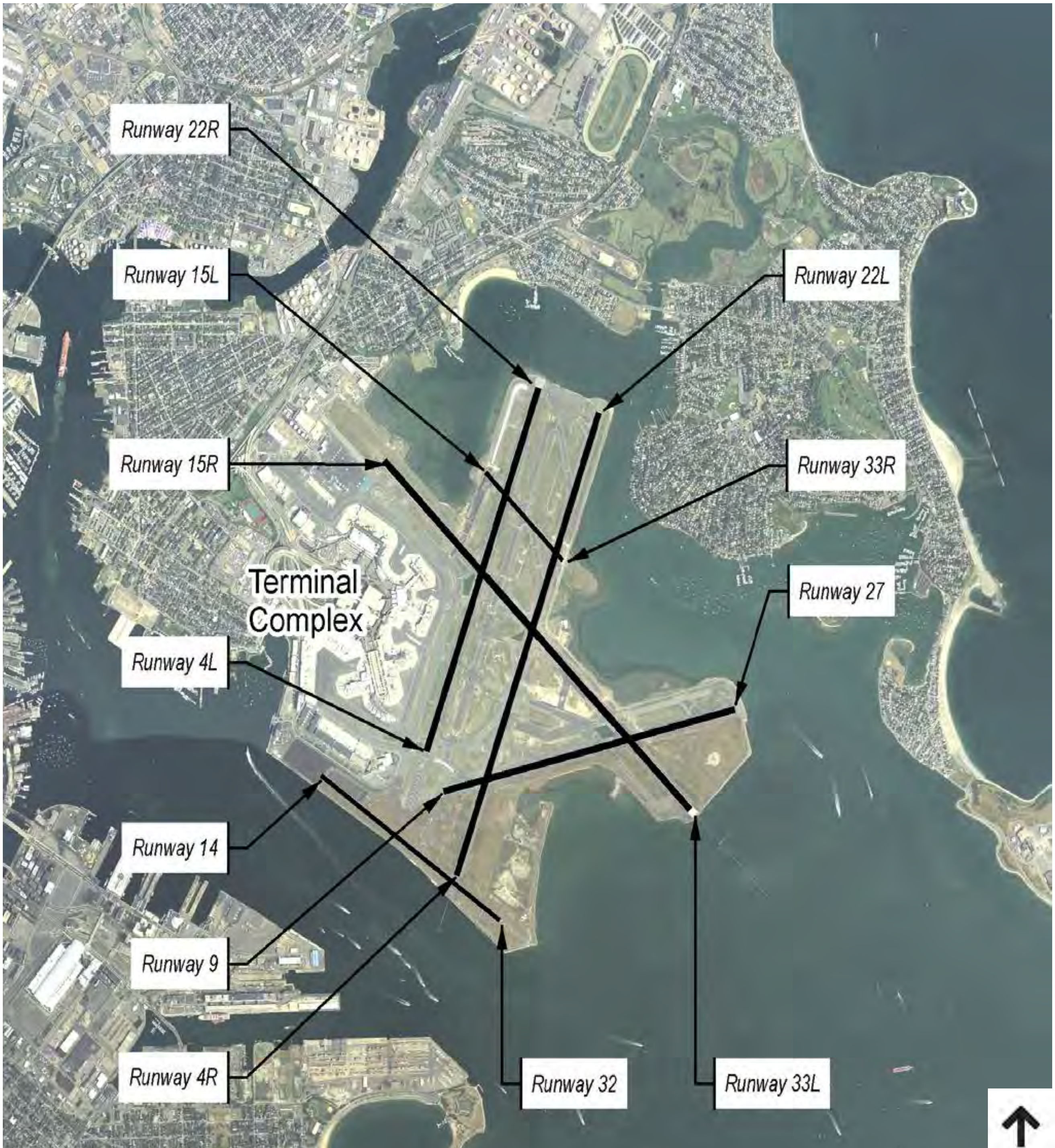


Source: Massport, HMMH Analysis, 2011.
Notes: Recertificated Stage 3 includes aircraft that were original manufactured as Stage 1 or 2 aircraft and then modified to and re-certificated to meet Stage 3 requirements. Certificated Stage 3 & 4 includes aircraft that were originally manufactured certificated 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 new centerfield taxiway are shown in Figure 6-4. The background map for this graphic was updated for this *2010 EDR* to show the taxiway which opened in 2009. The 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 with 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 14-32 provides the FAA with a second arrival runway, thereby reducing delays at the Airport.

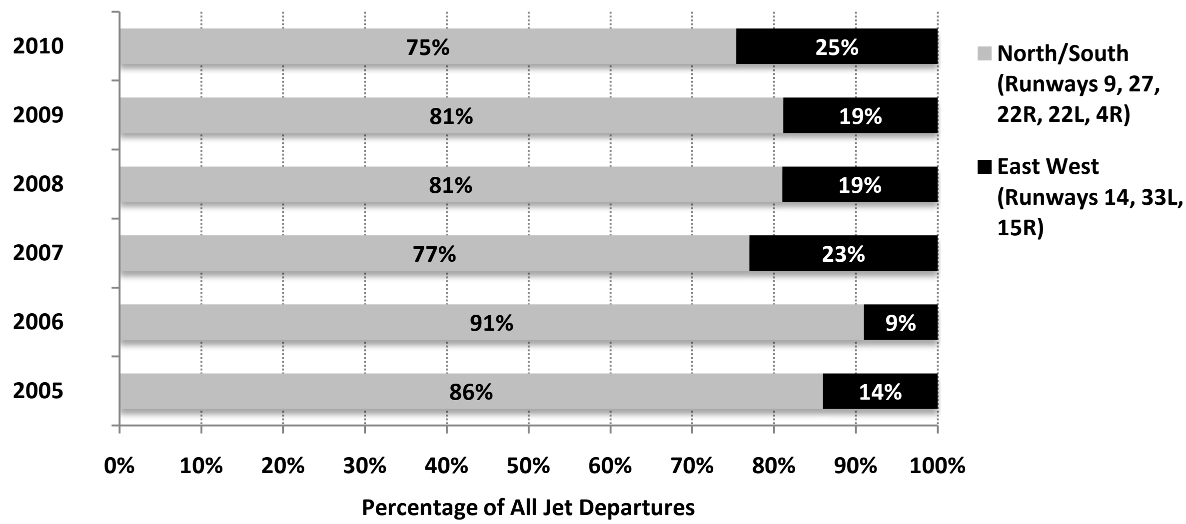
Figure 6-4 Logan Airport Runways



Source: HMMH, Inc. 2011, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP), 2010.
Note: The NAIP mapping was the latest aerial imagery available for the development of these graphics and reflects the completed centerfield taxiway.

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.



Runway use conditions in 2010 were as follows:

- Overall the Airport continued to be characterized by a north-south operating flow in 2010. Jet aircraft departures operated in this flow 75 percent of the time which is 6 percent less than in 2009 as shown in Figure 6-5.
- Combined arrivals to Runways 4L and 4R decreased by 5 percent to 33 percent in use in 2010 compared to 2009. Departures from Runway 4R decreased by 3 percent from 2009.
- Arrivals to Runway 22L decreased 2 percent in 2010 with departures remaining at 2 percent. Runway 22R departures decreased by 3 percent to 31 percent. Runway 22R remained consistently the most used departure runway at Logan Airport.
- Departures on Runway 27 increased by 4 percent to 10 percent in 2010, and departures on Runway 9 decreased 4 percent to 28 percent in 2010. Arrivals to Runway 27 increased from 30 percent in 2009 to 32 percent in 2010. During 2009, Runway 9-27 had extended weekend closings for resurfacing.
- Departures on Runway 33L increased 1 percent to 17 percent in 2010, and departures on Runway 15R increased 5 percent to 8 percent in 2010. Arrivals to Runway 15R decreased from 3 percent in 2009 to 1 percent in 2010. Arrivals to Runway 33L increased from 11 percent in 2009 to 16 percent in 2010.
- For the fourth full year 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 2009.

Table 6-4 presents consolidated annual runway use by jets. The 2010 radar data used for this analysis was obtained from the Logan Airport NOMS system; this is the second year this data has been used for modeling. Prior to 2009, the radar data was obtained from the PASSUR system and was analyzed with Massport's PREFLIGHT™ software.

Table 6-4 Summary of Annual Jet Aircraft Runway Use[1]

	Runway									
	4L	4R	9	14[2]	15R	22L	22R	27	32[2]	33L
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%	0%	3%	2%	34%	6%	-	16%
Arrivals	7%	31%	0%	-	3%	17%	0%	30%	1%	11%
2010										
Departures	0%	4%	28%	<1%	8%	2%	31%	10%	-	17%
Arrivals	5%	28%	0%	-	1%	15%	0%	32%	1%	16%

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 2005 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).
NA Runway was not available.

Preferential Runway Advisory System

Developed in 1982 and enhanced in 1990 and subsequent years, the Preferential Runway Advisory System (PRAS) is a set of short-term and long-term runway use goals that includes 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 the 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, NH. 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. Phase Three of the on-going BLANS will evaluate whether or not to begin use of the PRAS system. Until then, Massport remains committed to providing a comparison each year 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 2010 to that of 2009, and to the PRAS goals. The 2010 utilizations shown in bold indicate improvements toward the goals for all runways. The effective jet runway use in 2010 made progress towards the PRAS goals, with arrivals and departures on most runways. The arrival percentages for Runways 4R, 4L, and 33L all moved closer to the PRAS goals and for departures, Runways 9, 15R, 22L, 22R, 27, and 33L all moved closer to the PRAS goals.

Runway 15R departure effective runway use shows a large increase over 2009 from 7.7 percent to 24.1 percent (a 16.4 percent increase) whereas the runway use without the nighttime factor shows an increase of only 5 percent. This indicates a much higher use of Runway 15R at night by jet aircraft compared to 2009. Runway 33L departures show the opposite, while the runway use increased slightly the effective use declined from 2009 which indicates a reduced use of Runway 33L at night.

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.

Table 6-5 Effective Jet Aircraft Runway Use in Comparison to PRAS Goals

	PRAS Effective Usage Goals		2009 Effective Usage		2010 Effective Usage	
Runway End	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
4R/L	21.1%	5.6%	32.8%	6.3%	**26.9%**	3.6%
9	0.0%	13.3%	0.0%	**29.2%**	0.0%	**20.4%**
15R	8.4%	23.3%	**2.5%**	**7.7%**	1.2%	**24.1%**
22L/R	6.5%	28.0%	**21.7%**	**33.6%**	22.0%	**25.2%**
27	21.7%	17.9%	**20.9%**	**8.0%**	20.4%	**11.8%**
33L	42.3%	11.9%	**21.5%**	**15.2%**	**28.9%**	**14.9%**
14[1]	NA	NA	-	<0.1%	-	<0.1%
32[1]	NA	NA	0.6%	-	0.6%	-

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 above, for this *2010 EDR*, 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 Environmental Status and Planning Report (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. This system uses every available radar track for modeling which has suitable data. This allows Massport to take into account runway closures and/or temporary or permanent airspace changes which occur during the year. 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. 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.

For the *2010 EDR*, 349,397 flight tracks were modeled to calculate the noise levels surrounding Logan Airport. Figures 6-6 through 6-11 provide a representative sample of flight tracks used with RealContours™ to develop the 2010 contours.[19] 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 May 2010, when the runway use was similar to the 2010 yearly average presented previously. Additional figures, and associated text, at the end of this chapter describe the RNAV[20] Standard Departure Procedures (SIDS) changes that were in effect at the end of 2010.

- Figure 6-6 displays air carrier jet departures following the recommended departure routes. The Runway 27 WYLYY Seven RNAV departure procedure is evident in this graphic as the departures from Runway 27 do not show the dispersion that is seen at the other runways. The RNAV SIDS for Runway 4R and Runway 9 were also beginning to be used during this flight track period.

19 Runway use from each month was developed and compared to the annual runway use information. May 2010 provided the closest match to annual results.

20 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.

- 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.
- 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 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.

Meteorological Data

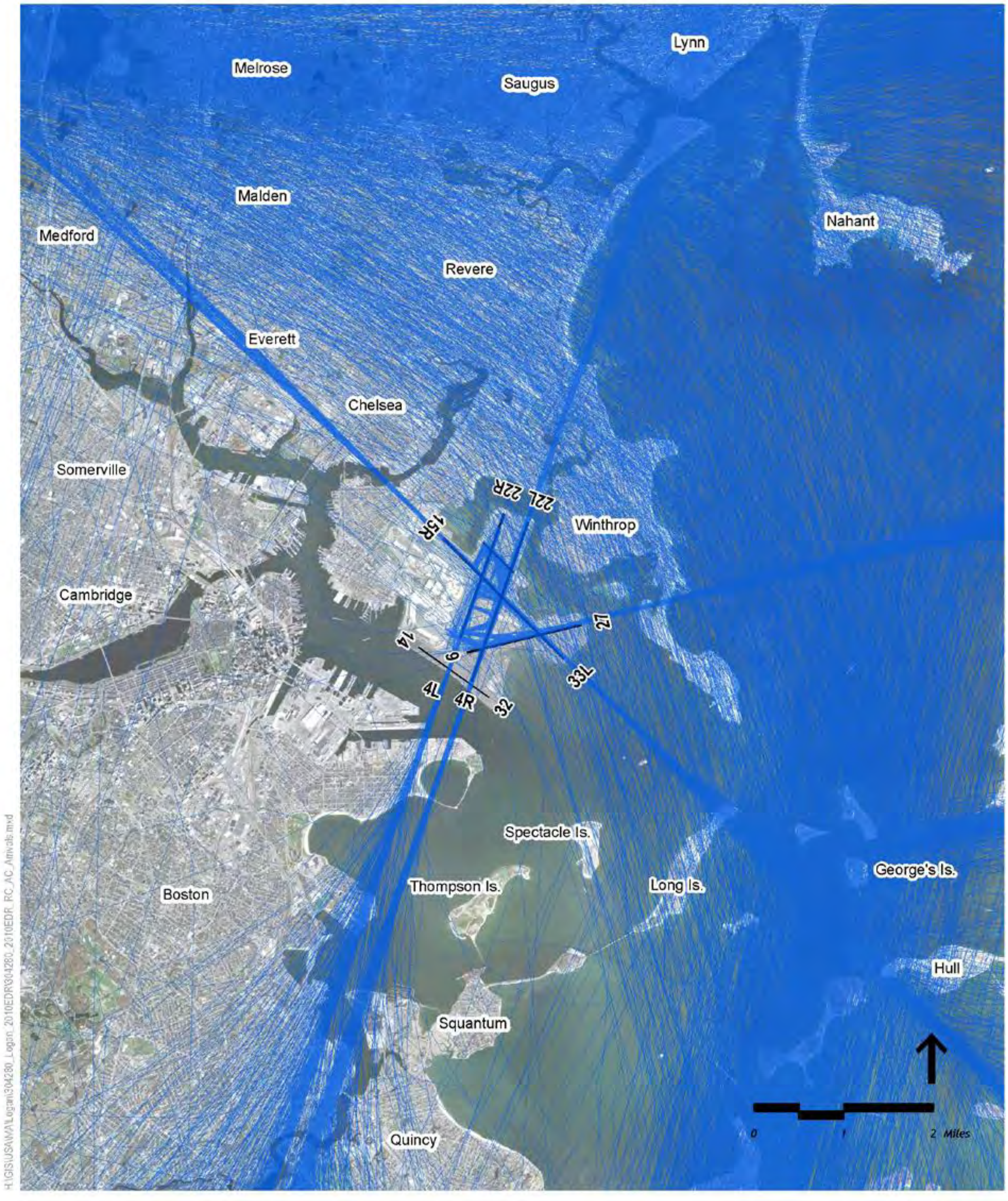
The INM has several settings that reflect aircraft performance profiles and sound propagation based on meteorological data. Meteorological settings include average temperature, barometric pressure, and relative humidity at the Airport. Massport obtained weather data for 2010 from the National Climatic Data Center (NCDC). Average daily values for each of the settings were used in the development of the 2010 noise conditions. The average conditions for each day allowed the modeling system used by Massport to develop performance profiles based on each days conditions and allowed the INM model to use each day's conditions to affect the propagation of noise. This is an improvement over previous years (prior to 2008) which only used the annual average value to model these conditions.

Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours ™ Air Carrier Departure Tracks (May 2010)

Figure 6-6

Departure Flight Tracks

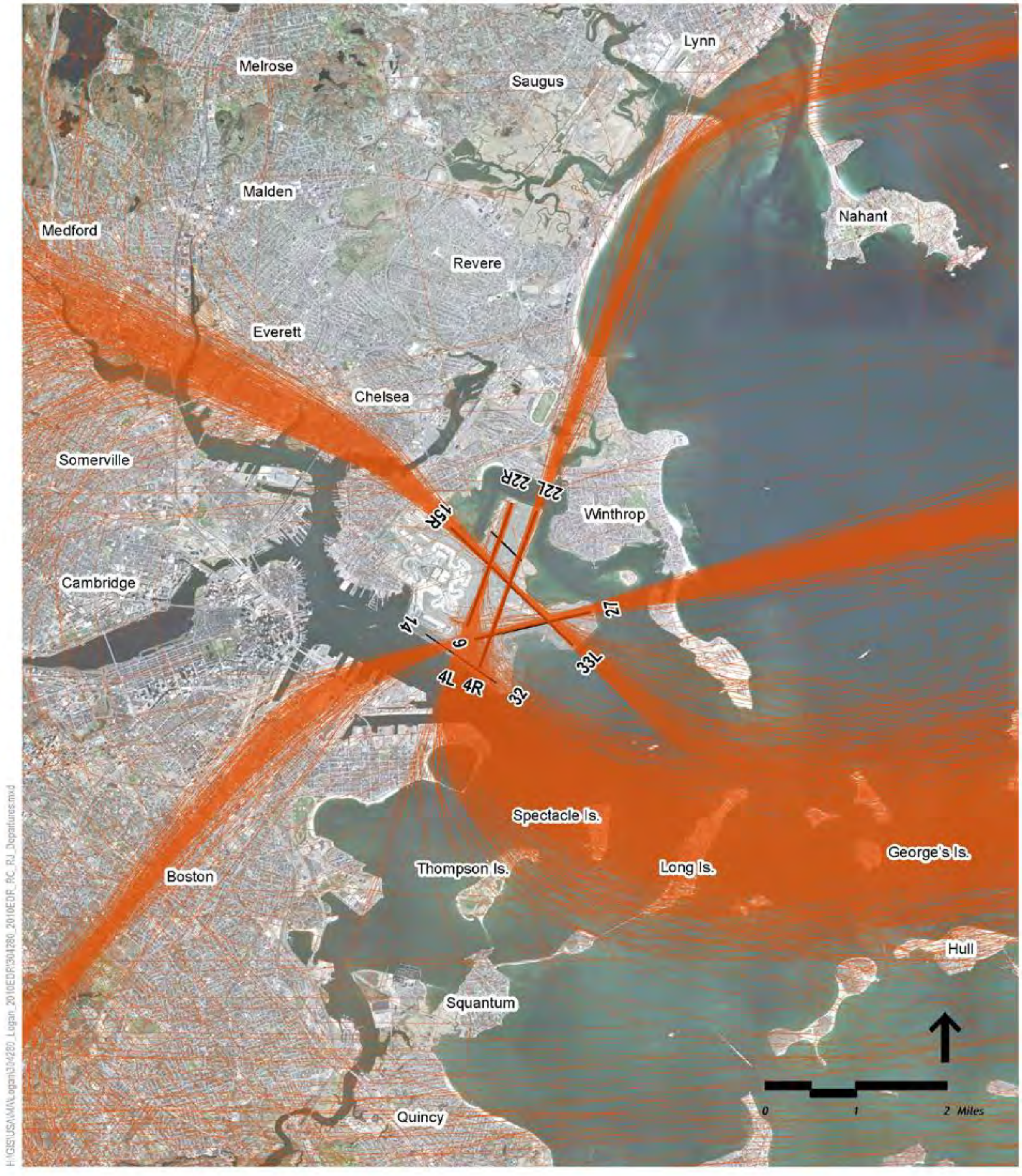


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Air Carrier Arrival Tracks
(May 2010)

Figure 6-7

Arrival Flight Tracks

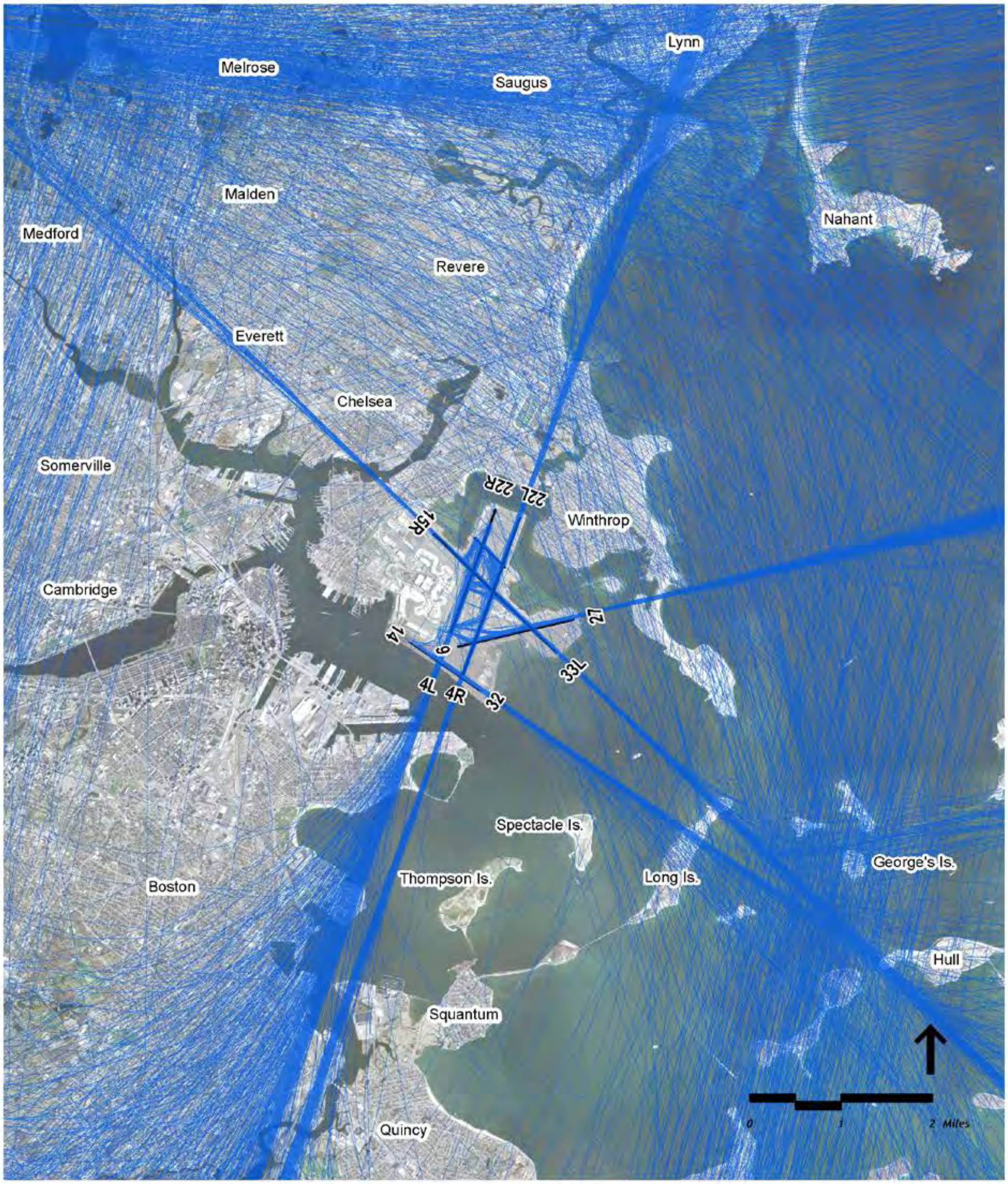


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Regional Jet Departure Tracks (May 2010)

Figure 6-8

Departure Flight Tracks

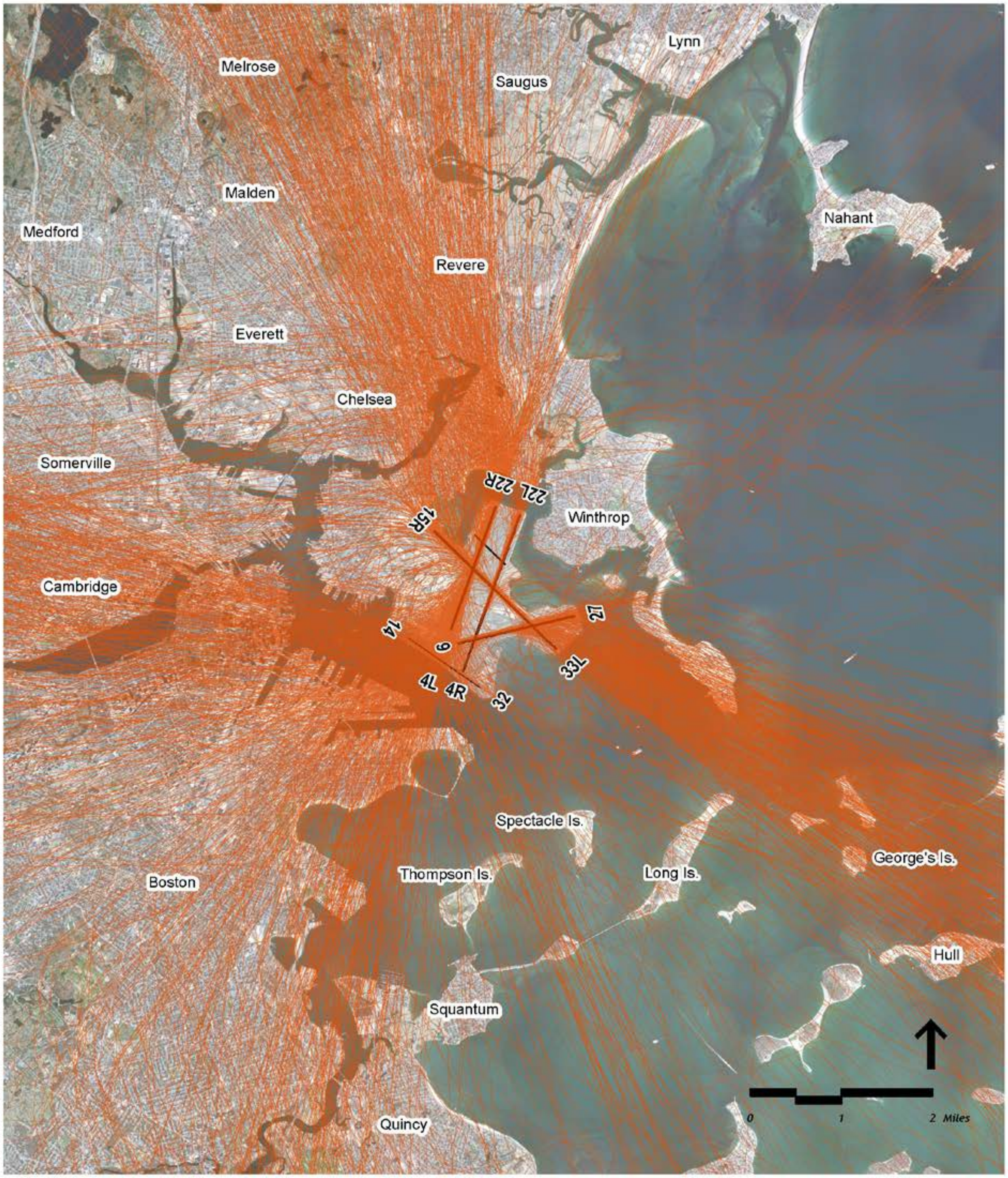


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Regional Jet Arrival Tracks (May 2010)

Figure 6-9

Arrival Flight Tracks

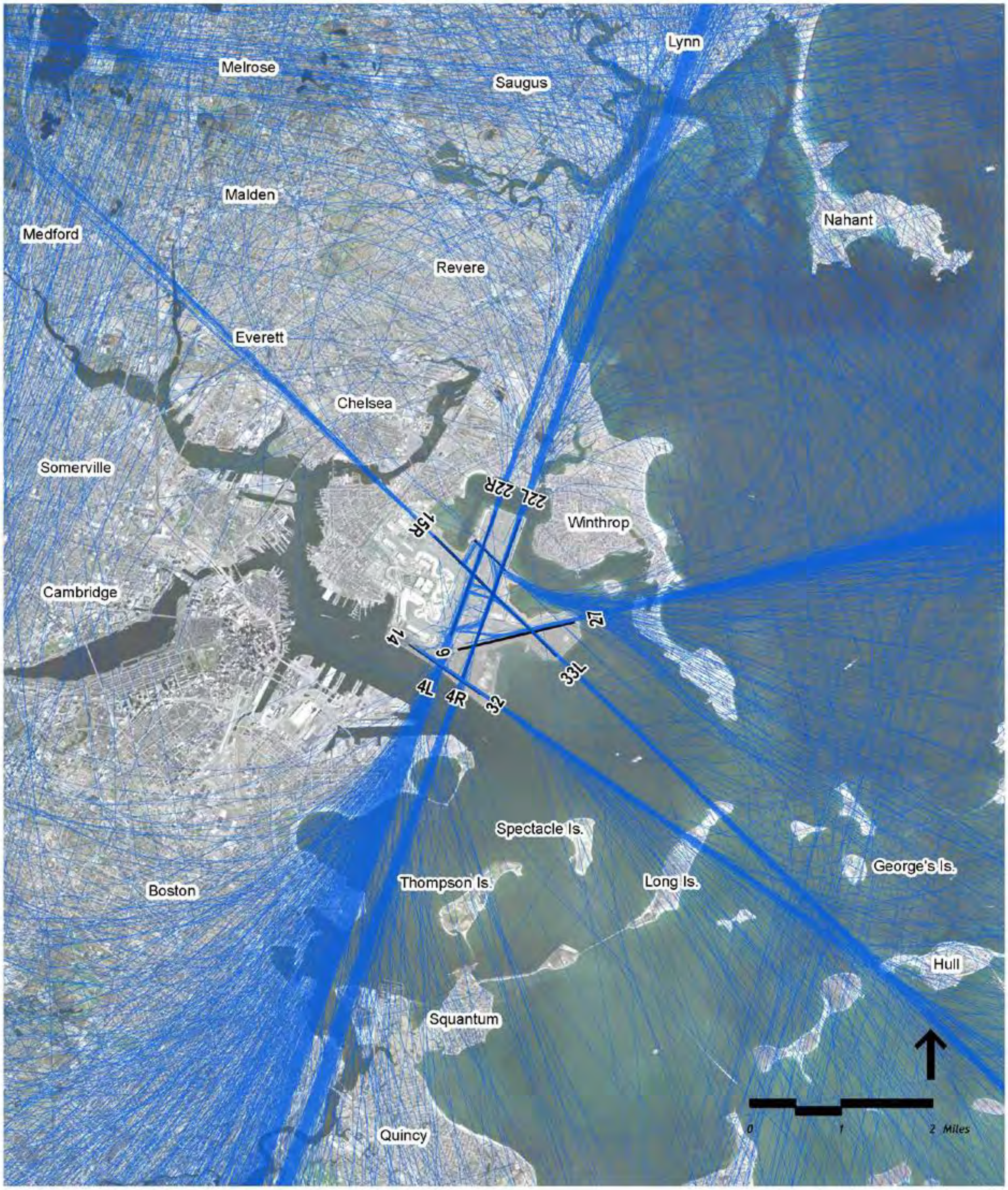


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Non-Jet Departure Tracks (May 2010)

Figure 6-10

Departure Flight Tracks

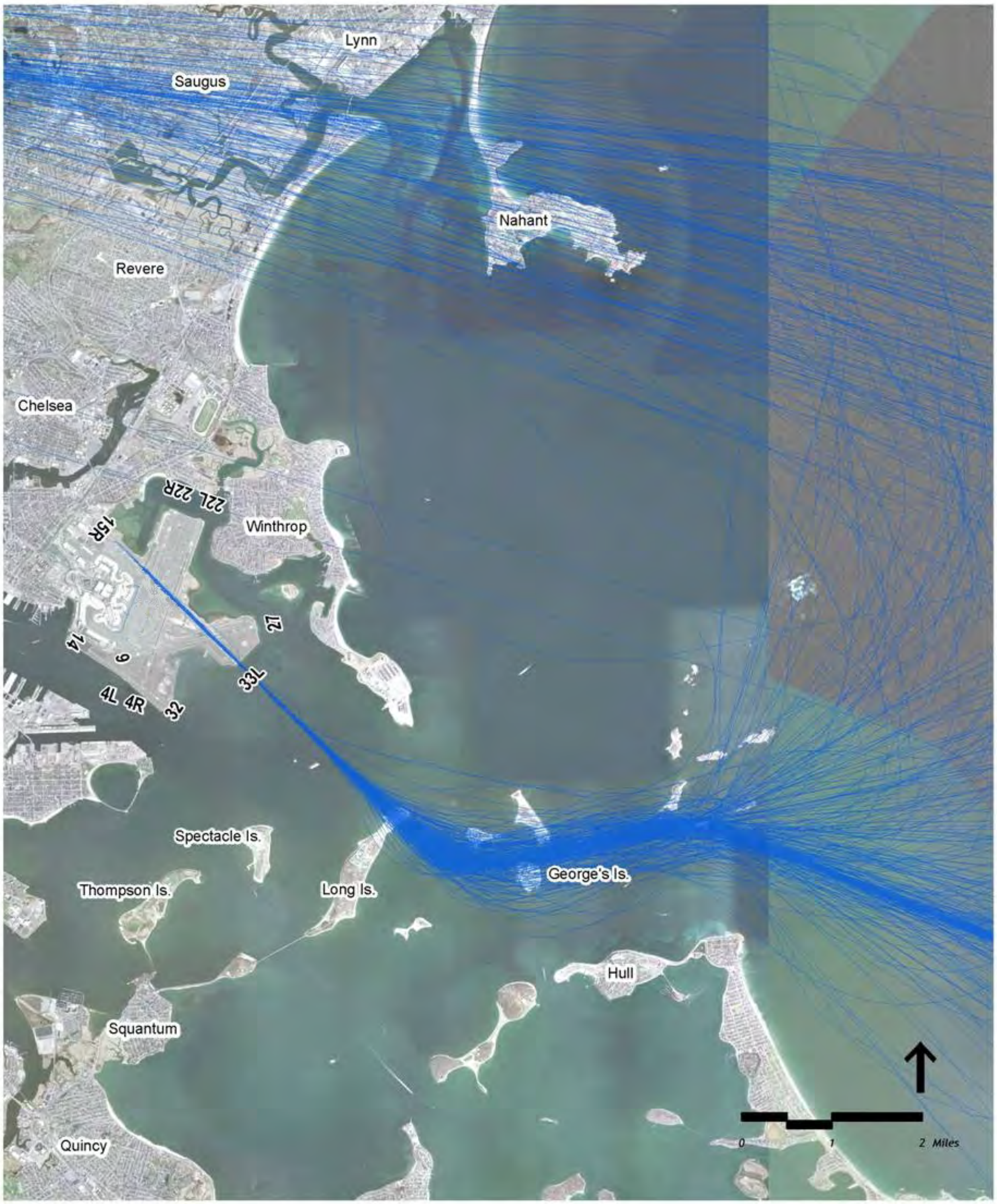


Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

RealContours™ Non-Jet Arrival Tracks (May 2010)

Figure 6-11

Arrival Flight Tracks



Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

Runway 33L Light Visual Approach Tracks (May 2010)

Figure 6-12

Arrival Flight Tracks

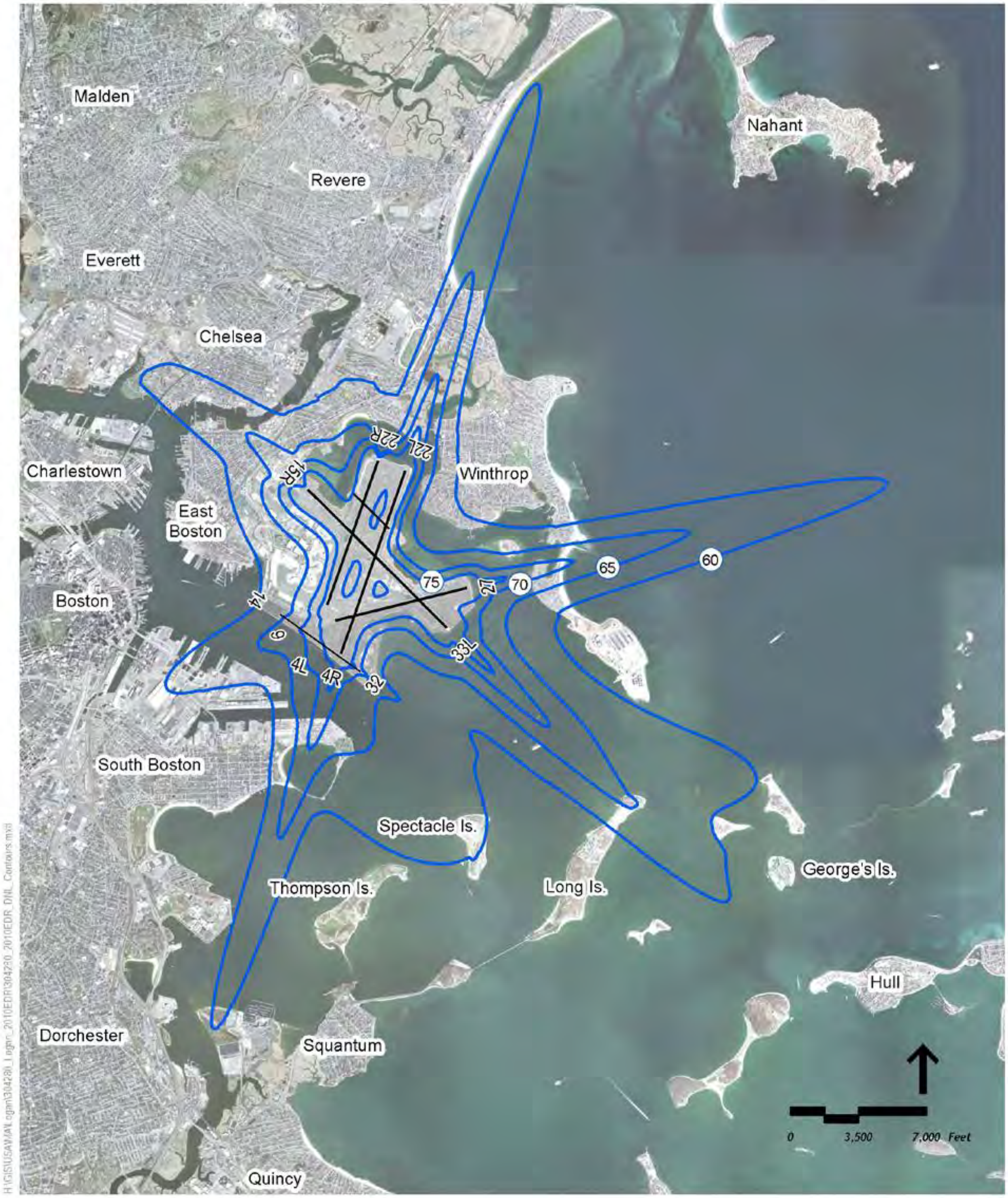
Noise Levels in 2010

Day-Night Noise Contours for 2010

The 2010 DNL contours were prepared using FAA's INMv7.0b 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 2010 and 2009. Differences between these contours are a result of the operational differences (increased operations, changes in fleet mix, and changes in runway use) from one year to the next. Both the 2009 and 2010 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 shape of the 2010 DNL 65 dB contour is consistent with the 2009 DNL 65 dB contour. Fewer arrivals to Runway 15R and a decrease in nighttime departures from Runway 33L reduced the noise contours in East Boston resulting in a substantial decrease in 2010 to impacted population counts in those areas. Other decreases in the DNL 65 dB contour near Winthrop and South Boston are mainly attributable to decreased use of Runways 9, 22L and 22R for departures and Runways 4R and 4L for arrivals. The main increase in the 2010 noise contours is largely overwater to the southeast of the Airport towards Hull. This change is due to increased use of Runway 15R for departures and Runway 33L for arrivals and does not result in an increase to population impacted by noise.

The comparison between the 2010 and the 2009 DNL contours were both generated by INMv7.0b (Figure 6-14). The 65 dB DNL 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

2010 DNL Contour (INM 7.0b)

60-75 DNL Contours for 2010 Operations Using INM 7.0b

Figure 6-13

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

2010 DNL Contour (INM 7.0b)
2009 DNL Contour (INM 7.0b)

Comparison of the 65 dB DNL Contours for 2009 and 2010 Operations Using INM 7.0b

Figure 6-14

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 2010 are shown in Table 6-6 by community and are compared to previous years.

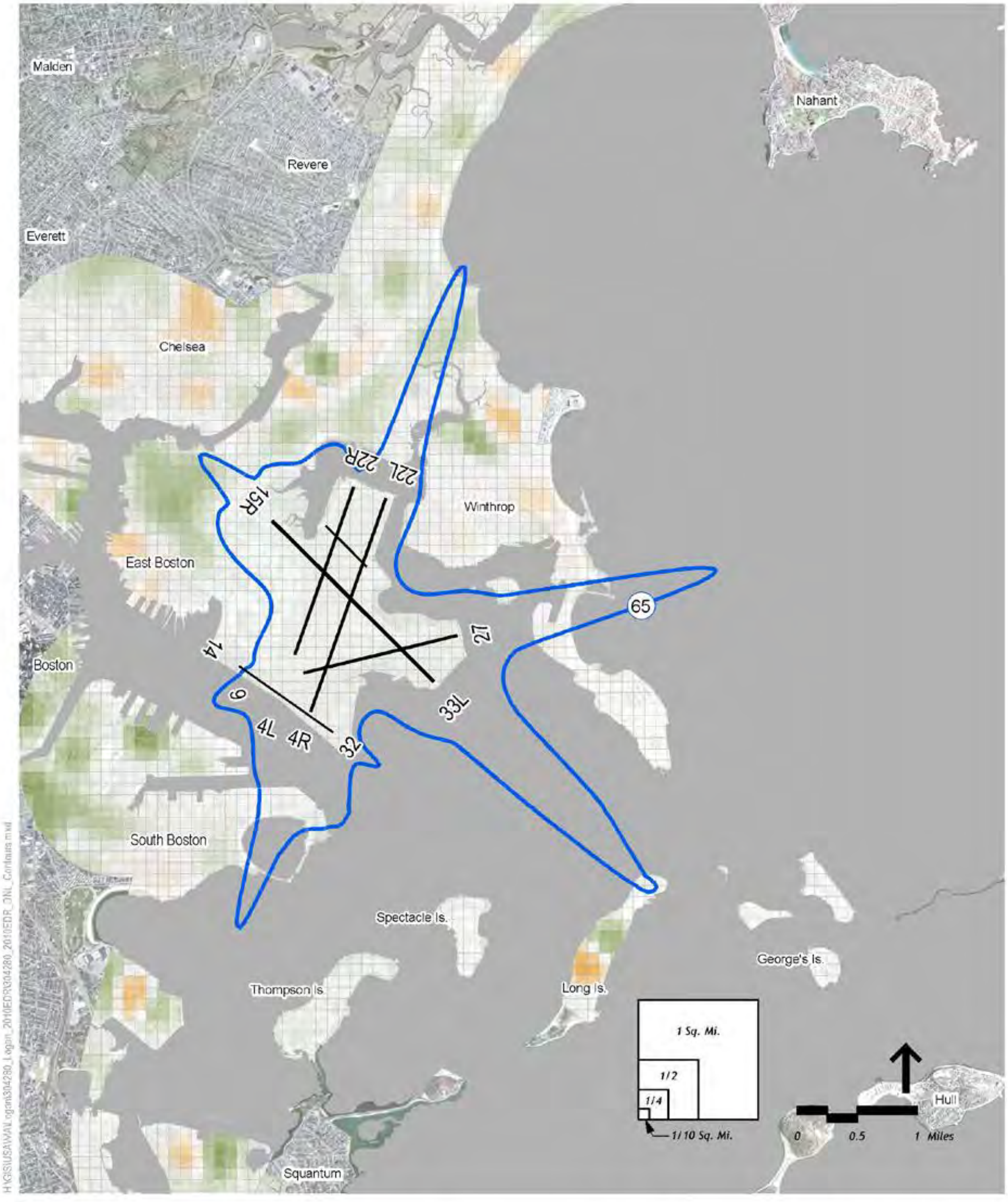
Population counts since 2001 are based on U.S. Census data for 2000. However the U.S. Census 2010 data became available in early 2011 and has been incorporated into this EDR. The *2010 EDR* presents counts from both sets of census data and compares them to 2009. The 2010 census data includes updated population counts and can be used to demonstrate the changes in population in an area over a ten year period. Figure 6-15 highlights the difference between the two U.S Census data sets in areas near and greater than the 2010 DNL 60 dB contour. The DNL 65 dB contour is shown for reference. The difference is presented using population density since the census blocks (the smallest geographic area for which the counts are provided) have changed over the ten year period. The orange areas show where the 2010 Census indicates more people compared to the 2000 Census, while green areas show where the 2010 Census indicates fewer people compared to the 2000 Census.

Figure 6-15 shows relatively little change in population between 2000 and 2010 in areas within the DNL 65 dB contour except for in Revere which shows some decrease. The only areas showing an increase are in Chelsea, a small area in East Boston, a couple areas near Revere Beach, a small area in Winthrop and in North Quincy, which are all outside the DNL 65 dB contour. There are areas in East Boston, Revere and South Boston which show a decrease from 2000 to 2010 in the number of people per square mile.

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 each year, using the latest INM results. The noise analysis is based upon the most recently FAA-approved INM (INMv7.0b). Table 6-7 provides an additional breakdown of the estimated population in East Boston and South Boston residing within the 65 dB DNL contour. Table 6-6 and Table 6-7 contain two sets of results for 2010. One set of results uses U.S. Census 2000 data while the other uses U.S. Census 2010 data.

The 2010 DNL noise contours using the 2000 U.S. Census versus the 2010 U.S. Census are similar. The 2010 U.S. Census has more people within the DNL 65 dB contour in Winthrop compared to the 2000 U.S. Census. There were fewer people within the DNL 65 dB contour in Boston and Revere using the 2010 U.S. Census compared to the 2000 U.S. Census.

The differences in affected population between 2009 and 2010 in Tables 6-6 and 6-7 are due to fleet mix and runway use changes. The small increase in operations did not noticeably affect the contours and population counts. The drop in population is primarily due to runway use changes between 2009 and 2010. The reduction in departures from Runway 33L at night and the reduction in arrivals to Runway 15L reduced the number of people in East Boston impacted by noise. The reduction in departures from Runway 9 reduced the noise impact in Winthrop.



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

Source: Massport NOMS / ERA Multi-Lat, MassGIS, USDA NAIP 2010

Change Between 2000 and 2010 US Census Population Density Data within the 2010 DNL Contour (Population / Sq. Mile)
Figure 6-16

Figure 6-15

Table 6-6 Noise-exposed Population by Community[1]

Boston

Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
2005	2000	0	65	104	2,020 [3]	2,189 [3]
2006	2000	0	65	99	1,054 [3]	1,218 [3]
2007	**2000**	0	0	169	4,094	4,263
2008 (7.0a)	**2000**	0	0	0	2,376	2,376
2008 (7.0b)	**2000**	0	5	0	3,487	3,492
2009 (7.0b)	**2000**	0	5	67	937	1,009
2010 (7.0b)	**2000**	0	0	67	644	711
2010 (7.0b)	**2010**	0	0	0	689	689

Revere

Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
2005	2000	0	0	82	2,540	2,622
2006	2000	0	0	82	2,540	2,622
2007	**2000**	0	0	0	2,450	2,450
2008 (7.0a)	**2000**	0	0	0	2,434	2,434
2008 (7.0b)	**2000**	0	0	0	2,434	2,434
2009 (7.0b)	**2000**	0	0	0	2,512	2,512
2010 (7.0b)	**2000**	0	0	0	2,505	2,505
2010 (7.0b)	**2010**	0	0	0	2,413	2,413

Chelsea

Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
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[4] (7.0b)	**2000**	0	0	0	0	0
2010[4] (7.0b)	**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
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)	**2000**	0	0	131	523	654
2010 (7.0b)	**2010**	0	0	130	598	728

Everett

Year	Census	80+ DNL	75-80 DNL	70-75 DNL	65[2]-70 DNL	Total (65+)[2] DNL
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)	**2000**	0	0	0	0	0
2010 (7.0b)	**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
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)	**2000**	0	0	198	3,672	3,870
2010 (7.0b)	**2010**	0	0	130	3,700	3,830

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 are provided for 2000 and 2010 U.S. Census block data (as indicated) and the contours are from the RealContours™ system

1 Data for years prior to 2005 is available in *Appendix H, Noise Abatement.* 70a and 70b refer to INMv7.0a and INMv7.0b 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
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)	**2000**	711	0	**711**	0	2,505	654	0	**3,870**
2010 (INMv7.0b)	**2010**	689	0	**689**	0	2,413	728	0	**3,830**
Change 2009 (2000 Census) to 2010 (2000 Census)		-298	0	**-298**	0	-7	-160	0	**-465**
Change 2009 (2000 Census) to 2010 (2010 Census)		-320	0	**-320**	0	-99	-86	0	**-505**

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 are provided for 2000 and 2010 U.S. Census block data (as indicated) and the contours are from the RealContours™ system
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 2004 is available in *Appendix H, Noise Abatement.*
3 These values reflect the effect of the FAA-approved terrain adjustment in Orient Heights.

The changes in fleet mix and runway use between 2009 and 2010 led to a decrease in the total number of people living within the 65 dB DNL contour using the 2000 Census from 4,335 to 3,870, a decrease of 465 people (11 percent). The largest decrease was over East Boston, which had 298 fewer people exposed to noise levels DNL 65 dB or greater compared to 2009. The total population exposed to noise levels between DNL 70 to 75 dB using both Census datasets also decreased when compared to 2009.

Comparing the two Census datasets (2000 and 2010 Census) using the 2010 DNL contours, there were 40 fewer people exposed to DNL 65 dB and higher using the 2010 Census due to decreases in both East Boston and Revere which offset an increase in people exposed in Winthrop (due to a small increase in population in the Point Shirley area). The number of people exposed to noise levels greater than DNL 70 dB in Boston using the 2010 DNL contours and the 2000 Census decreased slightly to 67 people and further dropped to zero under the updated 2010 Census data. The number of people exposed to DNL 70 dB or greater in Winthrop dropped from 171 people in 2009 to 131 in 2010 using the 2000 Census or 130 using the 2010 Census.

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 under 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 *2010 EDR* 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 2010, with the Airport's new noise measurement equipment and new 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.

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.

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, which 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 2009 DNL values at each location to the measured 2010 DNL values. Measured sound levels remained almost constant between 2009 and 2010. Six locations had a change greater than 1 dB; eleven locations had a decrease less than 1 dB; and twelve locations reported 2010 values within 1 dB of 2009 values. The average measured value for 28 of the sites was 55.3 dB in 2009 and dropped 0.1 dB to 55.2 dB in 2010 (Site 3 and 12 are excluded from the averages due to issues at each site). The average of the absolute difference between the measured values at each site between 2009 and 2010 is 1.3 dB.

Figure 6-16 Noise Monitor Locations

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

Table 6-8 Measured Versus Measured - Comparison of Measured DNL Values From 2010 to 2009

Location	Site	Distance from Logan Airport (miles)	2009 Measured Aircraft (DNL)	2010 Measured Aircraft (DNL)	Difference in Measured Aircraft (2009 to 2010)
South End – Andrews Street	1	3.7	52.7	54.6	1.9
South Boston – B and Bolton	2	2.9	54.1	57.7	3.6
South Boston – Day Blvd. near Farragut	3	2.5	60.6	64.1	3.5
Winthrop – Bayview and Grandview	4	1.6	71.5	70.2	(1.3)
Winthrop – Harborview and Faun Bar	5	1.9	64.1	62.6	(1.5)
Winthrop – Somerset near Johnson	6	0.8	60.9	62.4	1.5
Winthrop – Loring Road near Court	7	1.0	65.2	65.1	(0.1)
Winthrop – Morton and Amelia	8	1.6	60.8	59.1	(1.7)
East Boston – Bayswater near Annavoy	9	1.3	66.9	66.2	(0.7)
East Boston – Bayswater near Shawsheen	10	1.3	62.3	62.3	0.0
East Boston – Selma and Orient	11	1.8	56.5	55.7	(0.8)
East Boston Yacht Club	12	1.2	61.1	-	-
East Boston High School	13	1.9	61.3	62.2	0.9
East Boston – Jeffries Point Yacht Club	14	1.2	55.7	56.2	0.5
Chelsea – Admiral's Hill	15	2.8	61.2	61.2	0.0
Revere – Bradstreet and Sales	16	2.4	68.2	67.5	(0.7)
Revere – Carey Circle	17	5.3	60.0	58.6	(1.4)
Nahant – U.S.C.G. Recreational Facility	18	5.9	44.1	43.0	(1.1)
Swampscott – Smith Lane	19	8.7	43.5	42.0	(1.5)
Lynn – Pond and Towns Court	20	8.4	51.3	51.9	0.6
Everett – Tremont near Prescott	21	4.5	52.3	50.6	(1.7)
Medford – Magoun near Thatcher	22	6.0	50.2	50.6	0.4
Dorchester – Myrtlebank near Hilltop	23	6.3	52.5	50.9	(1.6)
Milton – Cunningham Park near Fullers	24	8.1	49.1	47.9	(1.2)
Quincy – Squaw Rock Park	25	4.2	42.0	40.4	(1.6)
Hull – Hull High School near Channel Street	26	6.0	56.5	57.4	0.9
Roxbury – Boston Latin Academy	27	5.3	50.5	54.2	3.7
Jamaica Plain – Southbourne Road	28	7.7	43.2	45.5	2.3
Mattapan – Lewenburg School	29	7.3	41.2	40.5	(0.7)
East Boston – Piers Park	30	1.5	50.9	49.5	(1.4)
Absolute Average [1]	-	-	55.3	55.2	1.3

Notes: Changes in ( ) represent a decrease in measured noise level from 2009 to 2010.
Site 12 was not operational for most of 2010. It was operational in 2009.
Site 3 had tree growth, tapping issue.
1 Site 3 and 12 are not included in the Average values.

Table 6-9 compares the measured 2010 DNL value at each measurement site to the modeled 2010 DNL value. The average measured value for 28 of the sites is 55.2 dB in 2010 and the average modeled value is 56.4 dB in 2010 (Site 3 and 12 are excluded from the averages due to issues at each site). The difference between measured versus modeled for each year is provided in the table. The average of the absolute difference between the measured versus modeled values for 2009 is 1.9 dB and improved to 1.5 dB in 2010.

The differences between the measured and modeled in 2010 are presented and compared to the measured versus modeled differences from 2009. 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, approximately half of the sites experienced improvements that narrowed the difference between the measured and modeled values. The two sites in Winthrop off the end of Runway 9 both correspond well with measured values (within 2 dB). At Site 4, which is the closest to the Airport and near the water, INM over-predicted the level by 1.9 dB but at Site 5 it was only over by 0.1 dB. At Site 3, the measured values were affected by activities at the site, and thus were higher than modeled values. The differences between the modeled and measured values at Sites 19, 24, 25, 28, 29, and 30 are because the aircraft are farther from the microphone at these locations; thus, it is more difficult to distinguish the aircraft events from ambient noise levels at those sites.

A view of the Airport from the Bayswater Area of East Boston. Noise Monitor Site 9 is shown, which primarily measures noise from departures and arrivals to Runway 4R-22L and Runway 4L-22R.

Table 6-9 Measured Versus Modeled - Comparison of Measured DNL Values to RealContours™-modeled DNL Values, 2010

Location	Site	Distance from Logan Airport (miles)	2010 Measured Aircraft – Only DNL	2010 Modeled RC Results INMv7.0b(DNL)[1]	2009 Difference - Measured vs. Modeled	2010 Difference - Measured vs. Modeled
South End – Andrews Street	1	3.7	54.6	52.9	(0.6)	(1.7)
South Boston – B and Bolton	2	2.9	57.7	57.8	1.7	0.1
South Boston – Day Blvd. near Farragut	3	2.5	64.1	59.4	(0.5)	(4.7)
Winthrop – Bayview and Grandview	4	1.6	70.2	72.1	1.2	1.9
Winthrop – Harborview and Faun Bar	5	1.9	62.6	62.7	(0.5)	0.1
Winthrop – Somerset near Johnson	6	0.8	62.4	61.3	0.2	(1.1)
Winthrop – Loring Road near Court	7	1.0	65.1	66.9	2.5	1.8
Winthrop – Morton and Amelia	8	1.6	59.1	60.7	0.4	1.6
East Boston – Bayswater near Annavoy	9	1.3	66.2	70.0	3.1	3.8
East Boston – Bayswater near Shawsheen	10	1.3	62.3	61.9	(0.7)	(0.4)
East Boston – Selma and Orient[2]	11[2]	1.8	55.7	57.3	0.2	1.6
East Boston Yacht Club	12	1.2	-	66.5	5.7	-
East Boston High School	13	1.9	62.2	61.8	0.4	(0.4)
East Boston – Jeffries Point Yacht Club	14	1.2	56.2	55.4	(0.4)	(0.8)
Chelsea – Admiral's Hill	15	2.8	61.2	59.9	(1.0)	(1.3)
Revere – Bradstreet and Sales	16	2.4	67.5	67.7	(0.3)	0.2
Revere – Carey Circle	17	5.3	58.6	58.6	(1.3)	0.0
Nahant – U.S.C.G. Recreational Facility	18	5.9	43.0	44.4	1.5	1.4
Swampscott – Smith Lane	19	8.7	42.0	45.6	3.0	3.6
Lynn – Pond and Towns Court	20	8.4	51.9	51.8	(0.8)	(0.1)
Everett – Tremont near Prescott	21	4.5	50.6	52.1	1.0	1.5
Medford – Magoun near Thatcher	22	6.0	50.6	50.9	0.7	0.3
Dorchester – Myrtlebank near Hilltop	23	6.3	50.9	52.9	0.8	2.0
Milton – Cunningham Park near Fullers	24	8.1	47.9	52.9	3.4	5.0
Quincy – Squaw Rock Park	25	4.2	40.4	46.2	4.4	5.8
Hull – Hull High School near Channel Street	26	6.0	57.4	55.5	(1.3)	(1.9)
Roxbury – Boston Latin Academy	27	5.3	54.2	52.5	0.2	(1.7)
Jamaica Plain – Southbourne Road	28	7.7	45.5	48.7	3.7	3.2
Mattapan – Lewenburg School	29	7.3	40.5	46.3	4.4	5.8
East Boston – Piers Park	30	1.5	49.5	53.0	1.9	3.5
Absolute Average[3]			55.2	56.4	1.9	1.5

Note: 2009 and 2010 Modeled results were computed for the whole year.
1 INMv7.0b 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 INMv7.0b result for Site 11.
3 Site 3 and 12 are not included in the Average values.
NA Not available.

Supplemental Metrics

To better describe the noise environment, this *2010 EDR* includes supplemental noise metrics: cumulative noise index, 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 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 mathematically 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.[21]

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 2010 CNI of 151.9 EPNdB represents a 0.4 dB decrease from 2009. The CNI decreased compared to 2009 in all categories. The 2010 CNI remained well below the cap of 156.5 EPNdB.

Partial CNI Calculations
Partial CNI values were obtained by summing the noise energy 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 5.8 dB more noise to the total exposure in 2010 than cargo aircraft.
- 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 decreased 0.7 dB with nighttime cargo decreasing by 0.8 dB.
- Cargo noise has continued to decrease slightly each year as the major carriers improve their fleets. One Lear 25 (Stage 2 aircraft less than 75,000 lbs.) operation occurred during 2010 by a cargo operator. The operator typically operates a Lear 35 (Stage 3 aircraft less than 75,000 lbs.).

21 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						
	2005	2006	2007	2008	2009	2010	Change (2009-2010)
Full CNI (Entire Commercial Jet Fleet)	**153.2**	**152.6**	**152.7**	**152.9**	**152.3**	**151.9**	**(0.4)**
Total Passenger Jets	152.1	151.4	151.5	151.9	151.1	150.9	(0.2)
Total Cargo Jets	146.6	146.5	146.4	146.1	145.9	145.1	(0.8)
Total Daytime	148.2	147.5	147.2	147.6	147.1	146.8	(0.3)
Total Nighttime	151.6	151.0	151.2	151.4	150.7	150.3	(0.4)
Total Stage 2 Jets	NA	NA	NA	NA	NA	113.6[2]	NA
Total Stage 3 Jets	153.2	152.6	152.7	152.9	152.3	151.9	(0.4)
Daytime Stage 2	NA	NA	NA	NA	NA	103.6[2]	NA
Nighttime Stage 2	NA	NA	NA	NA	NA	113.1[2]	NA
Daytime Stage 3	148.2	147.5	147.2	147.6	147.1	146.8	(0.3)
Nighttime Stage 3	151.6	151.0	151.2	151.4	150.7	150.3	(0.4)
Passenger Jet Stage 2	NA	NA	NA	NA	NA	NA	NA
Passenger Jet Stage 3	152.1	151.4	151.5	151.9	151.1	150.9	(0.2)
Cargo Jet Stage 2	NA	NA	NA	NA	NA	113.6[2]	NA
Cargo Jet Stage 3	146.6	146.5	146.4	146.1	145.9	145.1	(0.8)
Daytime Passenger	147.9	147.2	146.9	147.3	146.8	146.6	(0.2)
Nighttime Passenger	150.1	149.3	149.7	150.0	149.1	149.0	(0.1)
Daytime Cargo	135.8	135.5	135.8	135.8	135.2	134.5	(0.7)
Nighttime Cargo	146.2	146.1	146.0	145.6	145.5	144.7	(0.8)
Daytime Passenger Stage 2	NA	NA	NA	NA	NA	NA	NA
Daytime Passenger Stage 3	147.9	147.2	146.9	147.3	146.8	146.6	(0.2)
Nighttime Passenger Stage 2	NA	NA	NA	NA	NA	NA	NA
Nighttime Passenger Stage 3	150.1	149.3	149.7	150.0	149.1	149.0	(0.1)
Daytime Cargo Stage 2	NA	NA	NA	NA	NA	103.6[2]	NA
Daytime Cargo Stage 3	135.8	135.5	135.8	135.8	135.2	134.4	(0.8)
Nighttime Cargo Stage 2	NA	NA	NA	NA	NA	113.1[2]	NA
Nighttime Cargo Stage 3	146.2	146.1	146.0	145.6	145.5	144.7	(0.8)

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 2005 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 on one day during 2010. The operator typically operates a Lear 35 aircraft at Logan Airport.

Table 6-11 Annual Operations and Partial CNI by Airline and per Operation, 2010

Airlines with more than 100 flights in 2010	2010 Operations[1]	2010 Total Airline CNI (EPNdB)	Partial CNI (EPNdB) per Operation 2009	Partial CNI (EPNdB) per Operation 2010	Airline Category
FedEx	3,033	143.7	109.4	108.9	Cargo
United Parcel Service	1,372	137.9	107.7	106.5	Cargo
DHL Airways	513	132.7	106.9	105.6	Cargo
TACV-Cabo Verde	240	127.3	104.3	103.5	International
Capital Cargo International	421	129.4	104.5	103.1	Cargo
Air France	995	133.0	103.7	103.0	International
Miami Air	133	122.5	100.7	101.3	International
British Airways	2,082	134.2	100.4	101.0	International
SATA International Airlines	403	126.4	100.6	100.4	International
Lufthansa	1,662	132.2	100.2	100.0	International
Virgin Atlantic	707	128.0	99.9	99.5	International
Swiss Air	720	127.8	100.0	99.3	International
United Airlines	16,316	140.8	100.0	98.7	Domestic
American Airlines	23,735	141.4	98.0	97.6	Domestic
Alaska Airlines	1,733	130.0	98.1	97.6	Domestic
Compass Airlines	1,071	127.6	97.6	97.3	Regional
Delta Air Lines (Northwest Airlines)[2]	30,552	142.2	97.4 (98.1)	97.3	Domestic
Jetblue Airways	52,243	144.3	96.8	97.2	Domestic
Alitalia	625	125.0	97.4	97.1	International
Aer Lingus	1,097	127.5	96.7	97.1	International
Iberia Air Lines Of Spain	435	123.3	96.6	96.9	International
Southwest Airlines	13,727	138.2	97.0	96.8	Domestic
Continental	10,869	137.1	98.7	96.7	Domestic
Virgin America	3,394	131.9	97.7	96.6	Domestic
Spirit Airlines	3,023	131.3	98.3	96.5	Domestic
Aeromexico	165	118.4	NA	96.2	International
Air Canada	3,917	131.9	96.7	96.0	International
US Airways Express/Republic	5,757	133.0	95.8	95.4	Regional
US Airways	37,345	140.9	96.2	95.2	Domestic
Frontier Airlines	568	122.4	NA	94.9	Domestic
AirTran Airways	13,744	136.1	95.3	94.7	Domestic
Sun Country Airlines	313	119.6	93.8	94.6	Regional
Shuttle America Corp	3,605	129.8	94.0	94.2	Regional
Icelandair	816	123.0	93.0	93.9	International
Mesaba Airlines	1,094	124.3	NA	93.9	Regional

Table 6-11 Annual Operations and Partial CNI by Airline and per Operation, 2010 (Continued)

Airlines with more than 100 flights in 2010	2010 Operations[1]	2010 Total Airline CNI (EPNdB)	Partial CNI (EPNdB) per Operation 2009	Partial CNI (EPNdB) per Operation 2010	Airline Category
AWAC - US Air Express	6,266	129.5	89.5	91.5	Regional
American Eagle Airlines	17,771	134.0	92.0	91.5	Regional
Delta Connection/Atlantic SE	1,517	122.7	88.1	90.9	Domestic
Bombardier Business Jet Solutions	223	114.1	91.3	90.6	Regional
Air Canada Jazz	6,354	128.5	89.0	90.5	Regional
Chautauqua	2,326	123.5	89.9	89.9	Regional
Pinnacle Airlines	1,288	120.8	89.0	89.7	Regional
Trans States Airlines	233	113.4	NA	89.7	Regional
Delta Connection/Atlantic SE	164	110.2	90.8	88.1	Domestic

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. Numbers for 2009 are provided as Delta Airlines (Northwest Airlines)
NA Airline had no operations at Logan Airport.

Table 6-11 provides the number of flight operations, the resulting CNI by airline for 2010 and the partial CNI by operation for 2009 and 2010. 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 2010 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 highest CNI per airline at 144.3, 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 143.7, or only 0.6 below 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 the majority 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 Airlines had 24.6 percent of its operations at night as compared to AirTran Airways, which had only 17.0 percent at night. JetBlue Airways also has a lower night percentages (17.9 percent) and operates a newer fleet than either American Airlines or United Airlines.

Dwell and Persistence Goals

Another 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 would be 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 would be 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.

As required by Massport's commitments for the Logan Airside Improvements Planning Project,[22] this *2010 EDR* 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.

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), and Boston Harbor
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

Figures 6-17 and 6-18 illustrate the annual hours of dwell and persistence by runway end for 2005 through 2010. In 2010, the largest contributor to dwell and persistence remained arrivals to Runway 27 and departures from Runway 9, although persistence and dwell both decreased when compared to 2009. Dwell and persistence increased for arrivals to Runway 33L and Runway 32 as well as arrivals to Runway 22L and departures from Runway 4R. Areas affected by departures from Runway 27 showed an increase in dwell and persistence while areas affected by Runway 33 departures showed a decrease.

22 *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, 2005 to 2010

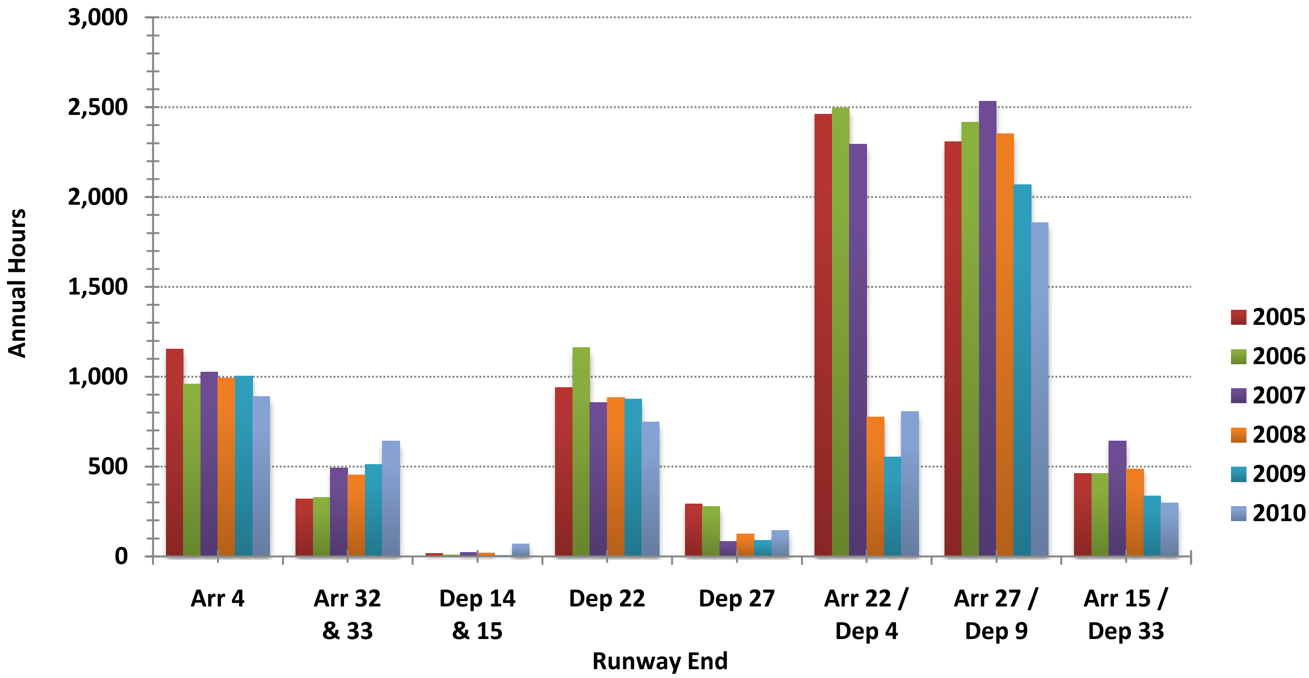
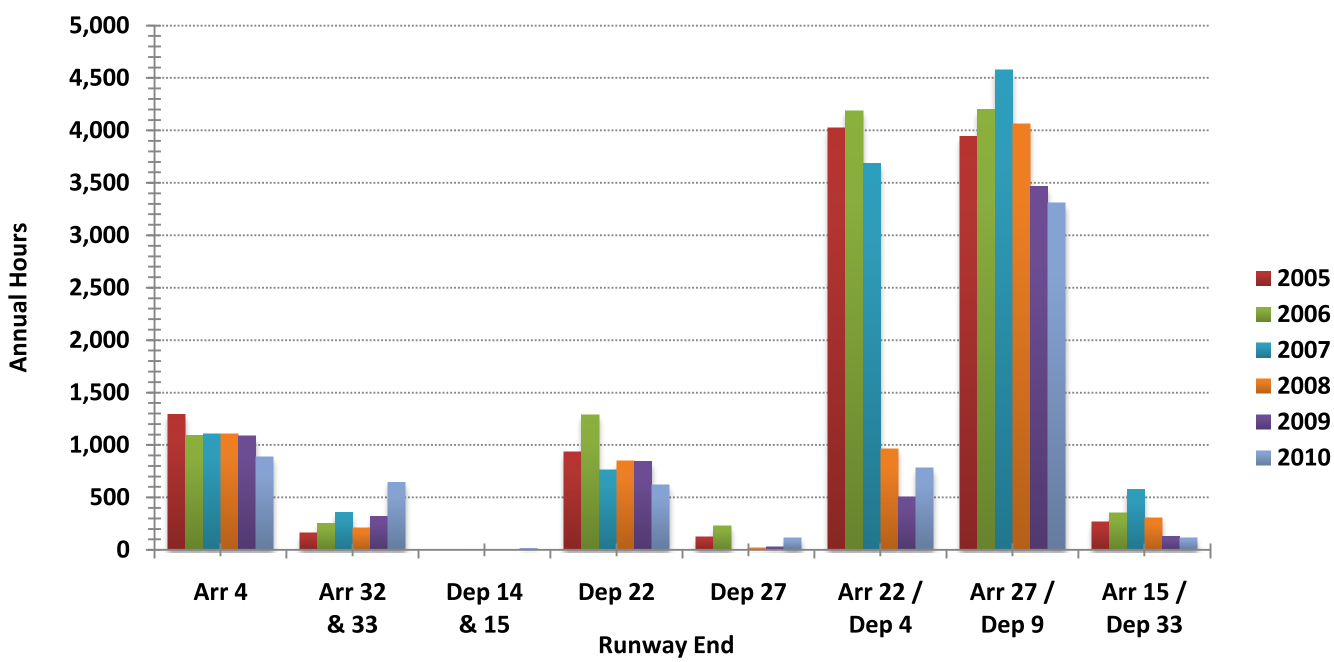


Figure 6-18 Comparison of Annual Hours of Persistence Exceedance by Runway End, 2005 to 2010



Notes: Arr – Arrivals
Dep – Departures

Time Above

The third supplemental noise metric reported in this *2010 EDR* 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 9-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. Table 6-13 and Table 6-14 present a summary of the calculated TA values for 2010.

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 2010), the 24 hour TA65 level increased from 9.6 minutes in 2009 to 14.2 minutes in 2010, however, the night only TA65 level decreased from 3.3 minutes to 0.1 minute suggesting the increase in departures on Runway 27 was primarily during the day.

Site 16, which is affected by arrivals to Runways 22L and 4R departures, experienced a decrease in the 24 hour TA65 and a small increase in the 24 hour TA85 levels. The TA65 decreased from 36.8 minutes in 2009 to 30.7 minutes in 2010 with the TA85 increasing from 1.3 minutes in 2009 to 1.9 minutes in 2010. The night only TA65 level decreased 15.7 minutes in 2009 to 6.3 minutes in 2010.

At Site 16 (Revere – Bradstreet and Sales), the TA65 decreased from 38.0 in 2009 to 30.7 minutes in 2010, which matches the measured decrease from DNL 68.2 dB in 2009 to DNL 67.5 dB in 2010.

The average 24 Hour TA results for 2010 decreased from 2009 for both TA65 and TA75. TA85 increased on average by 0.1 minute due to the increase at Site 4. The TA75 dropped by one minute and the TA65 dropped by 2.7 minutes. Table 6-14 contains the night only TA results and the average results also dropped for 2010. This result is consistent with the increased use of the noise abatement runway (Runway 15R-33L) at night which keeps flights over Boston Harbor.

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 2009			Minutes above Threshold 2010			2010 Modeled Day-Night Sound Levels[2]
			85dBA	75dBA	65dBA	85dBA	75dBA	65dBA	
Winthrop – Bayview and Grandview	4	1.6	8.3	44.7	103	11.5	41.0	91.0	72.1
Winthrop – Harborview and Faun Bar	5	1.9	0.8	14.7	77.5	0.3	10.6	72.4	62.7
Winthrop – Somerset near Johnson	6	0.8	0.0	3.5	89.7	0.0	3.5	79.9	61.3
Winthrop – Loring Road near Court	7	1.0	1.1	26.6	142.2	2.3	22.9	128.5	66.9
Winthrop – Morton and Amelia	8	1.6	0.2	4.6	56.7	0.1	3.0	46.9	60.7
East Boston – Bayswater near Annavoy	9	1.3	2.8	24.3	75.6	2.0	20.4	67.0	70.0
East Boston – Bayswater near Shawsheen	10	1.3	0.6	5.7	35.6	0.3	5.6	39.8	61.9
East Boston – Selma and Orient	11	1.8	0.0	1.7	22.1	0.0	1.4	20.5	57.3
East Boston Yacht Club	12	1.2	1.5	40.8	178.5	0.8	30.2	153.3	66.5
East Boston High School	13	1.9	0.6	6.7	29.8	0.3	6.1	29.4	61.8
East Boston – Jeffries Point Yacht Club	14	1.2	0.0	0.6	12.3	0.0	0.5	8.8	55.4
East Boston – Piers Park	30	1.5	0.0	0.3	6.2	0.0	0.3	4.2	53.0
Chelsea – Admiral's Hill	15	2.8	0.3	4.3	25.3	0.2	4.1	25.0	59.9
Revere – Bradstreet and Sales	16	2.4	1.3	12.4	36.8	1.9	12.4	30.7	67.7
Revere – Carey Circle	17	5.3	0.0	1.8	20.9	0.0	1.6	21.3	58.6
Nahant – U.S.C.G. Recreational Facility	18	5.9	0.0	0.0	1.1	0.0	0.0	0.7	44.4
Everett – Tremont near Prescott	21	4.5	0.0	0.4	8.3	0.0	0.2	6.6	52.1
Medford – Magoun near Thatcher	22	6.0	0.0	0.3	6.1	0.0	0.2	5.8	50.9
Swampscott – Smith Lane	19	8.7	0.0	0.1	2.1	0.0	0.0	1.7	45.6
Lynn - Pond and Towns Court	20	8.4	0.0	0.1	2.8	0.0	0.0	4.3	51.8
South End – Andrews Street	1	3.7	0.0	0.5	5.5	0.0	0.4	6.7	52.9
South Boston – B and Bolton	2	2.9	0.0	1.0	9.6	0.1	1.9	14.5	57.8
South Boston – Day Blvd. near Farragut	3	2.5	0.1	4.2	39.4	0.1	3.9	39.2	59.4
Roxbury – Boston Latin Academy	27	5.3	0.0	0.3	4.2	0.0	0.3	7.0	52.5
Jamaica Plain - Southbourne Road	28	7.7	0.0	0.0	1.5	0.0	0.0	2.2	48.7
Mattapan – Lewenburg School	29	7.3	0.0	0.0	0.7	0.0	0.0	0.8	46.3
Dorchester – Myrtlebank near Hilltop	23	6.3	0.0	0.1	9.2	0.0	0.0	8.5	52.9
Milton – Cunningham Park near Fullers	24	8.1	0.0	0.1	4.8	0.0	0.0	9.1	52.9
Quincy – Squaw Rock Park	25	4.2	0.0	0.0	0.9	0.0	0.0	0.7	46.2
Hull – Hull High School near Channel Street	26	6.0	0.0	0.2	9.8	0.0	0.2	11.7	55.5
Average Time Above Value			0.6	6.7	33.9	0.7	5.7	31.3	

Notes: Distance from Logan Airport calculated from the Airport Reference Point.

dBA A-weighted decibel

1 INMv7.0b for all of 2009 and 2010 (12 months) with adjusted database. (Database modifications as described in the *Logan Airport 2004 ESPR).*

2 Modeled using RealContours™ and RealProfiles™ using INM v7.0b.

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 2009			Minutes above Threshold During the Night 2010			2010 Modeled Day-Night Sound
Location	Site	(miles)	85dBA	75dBA	65dBA	85dBA	75dBA	65dBA	Levels[2]
Winthrop – Bayview and Grandview	4	1.6	1.0	5.7	17.4	0.6	2.4	5.9	72.1
Winthrop – Harborview and Faun Bar	5	1.9	0.1	2.0	14.1	0.0	0.6	4.4	62.7
Winthrop – Somerset near Johnson	6	0.8	0.0	0.5	14.0	0.0	0.4	10.2	61.3
Winthrop – Loring Road near Court	7	1.0	0.0	3.9	24.3	0.1	1.9	15.5	66.9
Winthrop – Morton and Amelia	8	1.6	0.0	0.5	9.7	0.0	0.3	6.4	60.7
East Boston – Bayswater near Annavoy	9	1.3	0.6	5.1	18.9	0.4	3.5	12.2	70.0
East Boston – Bayswater near Shawsheen	10	1.3	0.0	0.6	7.2	0.0	0.5	8.8	61.9
East Boston – Selma and Orient	11	1.8	0.0	0.1	3.2	0.0	0.1	3.1	57.3
East Boston Yacht Club	12	1.2	0.1	6.4	30.5	0.1	4.2	22.6	66.5
East Boston High School	13	1.9	0.1	1.3	11.1	0.1	0.8	3.3	61.8
East Boston – Jeffries Point Yacht Club	14	1.2	0.0	0.0	2.2	0.0	0.0	0.9	55.4
East Boston – Piers Park	30	1.5	0.0	0.0	1.0	0.0	0.1	3.2	53.0
Chelsea – Admiral's Hill	15	2.8	0.0	0.7	8.2	0.0	0.5	2.8	59.9
Revere – Bradstreet and Sales	16	2.4	0.3	3.5	15.7	0.5	2.7	6.3	67.7
Revere – Carey Circle	17	5.3	0.0	0.3	7.4	0.0	0.3	4.6	58.6
Nahant – U.S.C.G. Recreational Facility	18	5.9	0.0	0.0	0.1	0.0	0.0	0.0	44.4
Everett – Tremont near Prescott	21	4.5	0.0	0.1	1.6	0.0	0.0	1.2	52.1
Medford – Magoun near Thatcher	22	6.0	0.0	0.0	1.0	0.0	0.0	0.7	50.9
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	0.0	1.1	0.0	0.3	2.3	51.8
South End – Andrews Street	1	3.7	0.0	0.1	1.7	0.0	0.1	1.2	52.9
South Boston – B and Bolton	2	2.9	0.0	0.2	3.3	0.0	0.0	0.1	57.8
South Boston – Day Blvd. near Farragut	3	2.5	0.0	0.3	6.7	0.0	0.0	0.3	59.4
Roxbury – Boston Latin Academy	27	5.3	0.0	0.0	1.0	0.0	0.0	2.5	52.5
Jamaica Plain - Southbourne Road	28	7.7	0.0	0.0	0.3	0.0	0.0	1.2	48.7
Mattapan – Lewenburg School	29	7.3	0.0	0.0	0.1	0.0	0.0	0.4	46.3
Dorchester – Myrtlebank near Hilltop	23	6.3	0.0	0.0	1.8	0.0	0.0	0.6	52.9
Milton – Cunningham Park near Fullers	24	8.1	0.0	0.0	0.9	0.0	0.0	0.9	52.9
Quincy – Squaw Rock Park	25	4.2	0.0	0.0	0.1	0.0	0.0	1.1	46.2
Hull – Hull High School near Channel Street	26	6.0	0.0	0.0	3.6	0.0	0.0	0.0	55.5
Average Time Above Value			0.1	1.0	6.9	0.1	0.6	4.1	

Notes: Distance from Logan Airport calculated from the Airport Reference Point.
dBA A-weighted decibel
1 INMv7.0b for all of 2009 and 2010 (12 months) with adjusted database. (Database modifications as described in the *Logan Airport 2004 ESPR).*
2 Modeled using RealContours™ and RealProfiles™ using INM v7.0b.

Noise Abatement

Noise levels at Logan Airport have decreased in recent years due to both 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 for the purpose of identifying remaining causes of noise problems.

In 2008, the installation of a new noise operations monitoring system 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, 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.

The new noise and operations monitoring system obtains better quality flight tracking data (multilateration radar data) than available with the previous radar data source (used prior to 2009). All measured data and complaint information in this report were generated through the new NOMS system.

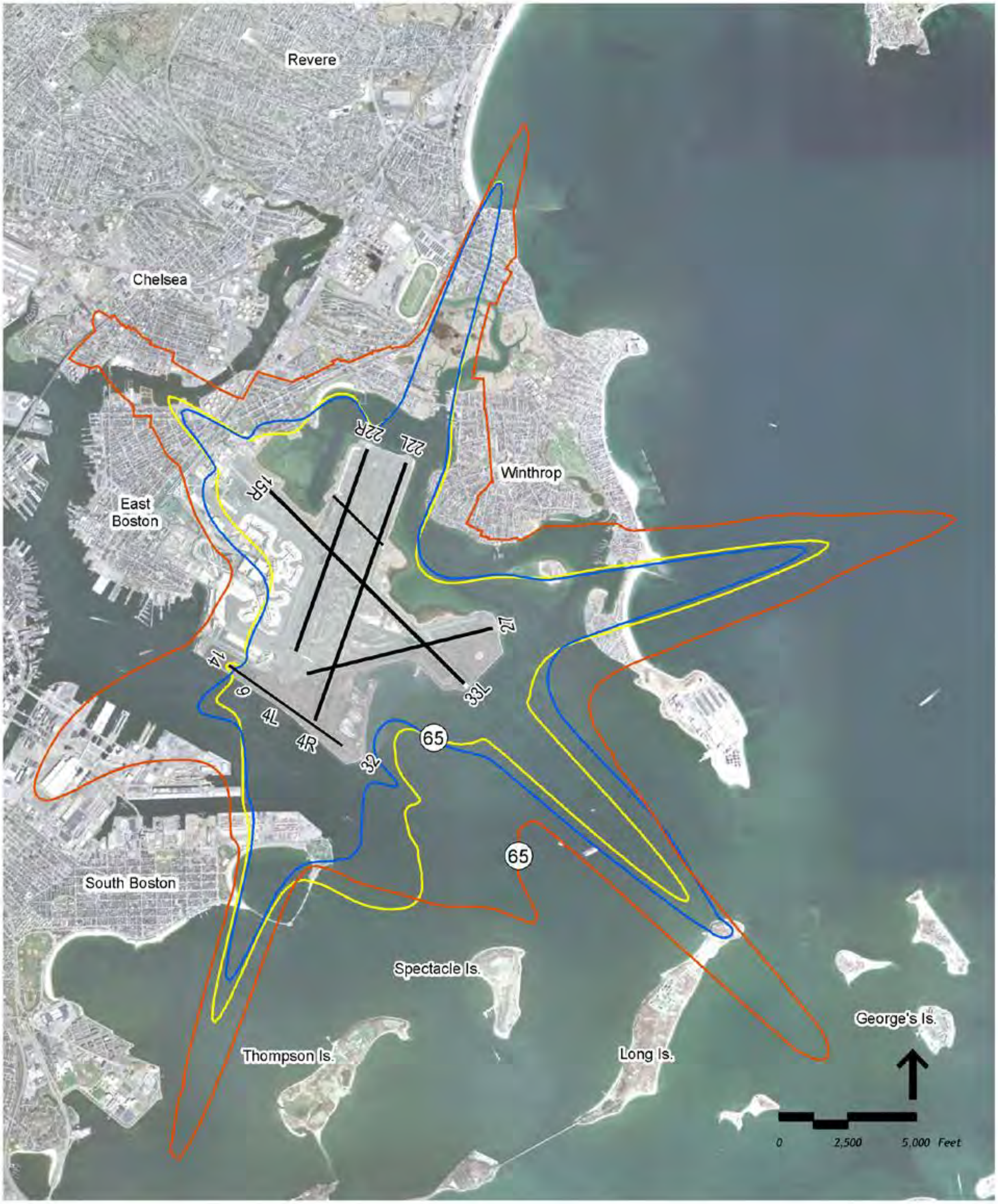
Other continuing elements of Massport's noise mitigation program include:

- The Massport Noise Abatement Office, which was initiated in 1977. The Noise Office also maintains the noise section of the Massport website. (www.massport.com/environment/environmental_reporting/Noise%20Abatement/overview.aspx)
- 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 5,312 residences, including 11,219 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 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.
- Figure 6-19 presents the DNL 65 dB contours for 2009 and 2010 and to provide context, the graphic also captures the DNL 65 dB Logan Airside Improvements Planning Project EIS Mitigation Contour. The mitigation contour is adjusted to reflect land use patterns and is the basis for Massport's sound insulation program currently underway.
- 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.

- 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; it 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.
- Tracking of noise complaints which can be entered on-line 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 6-14 summarizes each airline operator and the percentage of its fleet that were originally manufactured as Stage 3 or Stage 4 aircraft. In 2010, 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 slightly decreased its share from 83 to 82 percent, and DHL improved from 95 to 100 percent as it has been phasing out its fleet of older Boeing 727 aircraft.

Most of the charter operators remained similar to 2009 or increased their percentage of originally manufactured Stage 3 or Stage 4 aircraft operations. Only one major U.S. Airline, Delta/Northwest Airlines, 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's fleet, which caused the percentage to drop to 93 percent. Only Capitol Cargo International had a fleet operating below 50 percent of originally manufactured Stage 3 or Stage 4 aircraft operations in 2010 but had few operations (421 operations).



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

2010 DNL Contour (INM 7.0b)
2009 DNL Contour (INM 7.0b)
Airside Sound Insulation Mitigation Contour

Comparison of the 65 dB DNL Contour for 2009 and 2010 Operations and 65 dB DNL Logan Airside Improvements Planning Project EIS Mitigation Contour
Figure 6-19

Table 6-14 Percentage of Airline Operations in Original Stage 3 or 4 Aircraft, 2010

Airlines with more than 100 flights	Number of Flights 2010	Percentage of Original Stage 3 and 4 Operations[1]							100% Stage 3 or 4[2]
		2004	2005	2006	2007	2008	2009	2010	
JetBlue Airways	52,243	100%	100%	100%	100%	100%	100%	100%	✓
US Airways	37,345	100%	100%	100%	100%	100%	100%	100%	✓
Delta Air Lines[6]	30,552	100%	100%	100%	100%	100%	100%	93%	
American Airlines	23,735	100%	100%	100%	100%	100%	100%	100%	✓
American Eagle Airlines	17,771	100%	100%	100%	100%	100%	100%	100%	✓
United Airlines	16,316	100%	100%	100%	100%	100%	100%	100%	✓
AirTran Airways	13,744	100%	100%	100%	100%	100%	100%	100%	✓
Southwest Airlines	13,727	NA	NA	NA	NA	NA	100%	100%	✓
Continental	10,869	100%	100%	100%	100%	100%	100%	100%	✓
Delta Connection/Comair	10,397	100%	100%	100%	100%	100%	100%	100%	✓
Air Canada Jazz	6,354	100%	100%	100%	100%	100%	100%	100%	✓
AWAC - US Air Express	6,266	NA	NA	NA	NA	NA	100%	100%	✓
US Airways Express/Republic	5,757	100%	100%	100%	100%	100%	100%	100%	✓
Air Canada	3,917	100%	100%	100%	100%	100%	100%	100%	✓
Shuttle America Corp	3,605	NA	0%	0%	100%[5]	100%	100%	100%	✓
Virgin America	3,394	NA	NA	NA	NA	NA	100%	100%	✓
FedEx	3,033	70%	72%	70%	71%	79%	83%	82%	
Spirit Airlines	3,023	NA	NA	NA	NA	100%	100%	100%	✓
Chautauqua	2,326	100%	100%	100%	100%	100%	100%	100%	✓
British Airways	2,082	100%	100%	100%	100%	100%	100%	100%	✓
Alaska Airlines	1,733	100%	100%	100%	100%	100%	100%	100%	✓
Lufthansa	1,662	100%	100%	100%	100%	100%	100%	100%	✓
Delta Connection/Atlantic SE	1,517	NA	NA	NA	NA	NA	NA	100%	✓
United Parcel Service	1,372	94%	94%	98%	100%	100%	100%	100%	✓
Pinnacle Airlines	1,288	NA	NA	100%	100%	100%	100%	100%	✓
Aer Lingus	1,097	100%	100%	100%	100%	100%	100%	100%	✓
Mesaba Airlines	1,094	NA	NA	NA	NA	NA	NA	100%	✓
Compass Airlines	1,071	NA	NA	NA	NA	100%	100%	100%	✓
Air France	995	100%	100%	100%	100%	100%	100%	100%	✓
Icelandair	816	100%	100%	100%	100%	100%	100%	100%	✓
Swiss Air	720	100%	100%	100%	100%	100%	100%	100%	✓
Virgin Atlantic	707	100%	100%	100%	100%	100%	100%	100%	✓
Alitalia	625	100%	100%	100%	100%	100%	100%	100%	✓
Frontier Airlines	568	NA	NA	NA	NA	NA	NA	100%	✓
DHL Airways	513	0%	20%	1%[4]	1%	88%	95%	100%	✓
Iberia Air Lines Of Spain	435	NA	NA	100%	100%	100%	100%	100%	✓

Table 6-14 Percentage of Airline Operations in Original Stage 3 or 4 Aircraft, 2010 (Continued)

Airlines with more than 100 flights	Number of Flights 2010	Percentage of Original Stage 3 and 4 Operations[1] 2004	2005	2006	2007	2008	2009	2010	100% Stage 3 or 4[2]
Mesa Airlines	434	NA	0%	100%	100%	100%	100%	100%	✓
Capital Cargo International [3]	421	0%	0%	0%	7%	0%	0%	3%	
SATA International Airlines	403	100%	100%	100%	100%	100%	100%	100%	✓
Sun Country Airlines	313	NA	NA	NA	NA	NA	100%	100%	✓
TACV-Cabo Verde	240	NA	NA	NA	NA	NA	100%	100%	✓
Trans States Airlines	233	NA	NA	NA	NA	NA	NA	100%	✓
Bombardier Business Jet Solutions	223	NA	NA	NA	NA	NA	100%	100%	✓
Aeromexico	165	NA	NA	NA	NA	NA	NA	100%	✓
Miami Air	133	78%	98%	91%	100%	100%	100%	100%	✓

Source: Massport. 2011

1 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.

2 Original Stage 3 or 4 means originally manufactured as a certificated Stage 3 or 4 aircraft under FAR Part 36.

3 No aircraft used at the Airport were New Stage 3 aircraft.

4 In 2006, DHL airways took over Airborne which had no New Stage 3 aircraft.

5 In 2008, Shuttle America Corp. began operating for Delta Connections.

6 Delta acquired Northwest Airlines and 2010 is the first year of reported consolidated operations. Numbers for 2009 and prior are provided for Delta Airlines only. Separate data for Northwest Airlines for 2009 and prior are provided in the *2009 EDR*

Noise Complaint Line

In 2010, Massport received a total of 3,761 noise complaints from 53 communities, a decrease of 35.9 percent from 2009, when the Noise Abatement Office received 5,869 complaints. Table 6-15 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. Five communities had more than 100 complaints from an individual caller, and East Boston had more than 100 complaints from two callers. Among communities with more than 100 annual complaints, the greatest increases were Jamaica Plain (up from 93 in 2009 to 158 in 2010), Lynn (up from 154 to 339), Somerville (up from 325 to 385), and Weymouth (up from184 to 193). There were three communities that had an increase of at least 30 complaints but a total of less than 100: Milton (up from 54 in 2009 to 84 in 2010), Roslindale (up from 4 to 73) and South Boston (up from 26 to 59). Seven communities with more than 100 annual complaints in 2009 had a decrease in noise complaints for 2010: Cambridge (down from 471 in 2009 to 323 in 2010), Chelsea (down from 570 to 129), East Boston (down from 1,657 to 699), Marshfield (down from 228 to 13), Medford (down from 504 to 444), Nahant (down from 400 to 204), and Winthrop (down from 513 to 207).

Table 6-15	Noise Complaint Line Summary										
	2009		2010		Change (2009 to 2010)		2009		2010		Change (2009 to 2010)
Town	Calls	Callers	Calls	Callers		Town	Calls	Callers	Calls	Callers	
Jamaica Plain	93	8	158	15	65	Cambridge	471	29	323	38	(148)
Lynn	154	7	339	3	185	Chelsea	570	32	129	17	(441)
Milton	54	22	84	13	30	East Boston	1,657	55	699	52	(958)
Roslindale	4	4	73	5	69	Marshfield	228	6	13	1	(215)
Somerville	325	87	385	74	60	Medford	504	67	444	53	(60)
South Boston	26	15	59	26	33	Nahant	400	111	204	48	(196)
Weymouth	184	4	193	4	9	Winthrop	513	170	207	70	(306)

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 requires 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 EIR* directed Massport to work with the FAA and local communities on a review of the Logan Airport 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.[23]

The conventional and radar vectored[24] 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 on October 22, 2009 and were implemented in 2010.

Six new RNAV procedures were implemented in 2010 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.

Phase 2 of BLANS, which began in late 2007, included consideration of 53 proposed arrival, departure and ground

23 FAA Documented Categorical Exclusion Record of Decision, October 16, 2007.
24 Radar vector is the heading issued to aircraft to provide guidance by radar.

noise measures. After the first level of screening completed in 2009, 22 measures advanced to the next level of screening. Seven of these measures address ground noise issues, five are approach measures, and seven address departure measures. The remaining measures address local air traffic issues (such as helicopters and altitudes for Visual Flight Rules (VFR) flights).[25] Phase 2 is on-going and is expected to be completed by the end of 2011. Results of the BLANS will be reported on in greater detail in the *2011 ESPR.*

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.[26] 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 2010 exceeded 20 minutes during the 6:00 AM to 7:00 AM period and between 5:00 PM to 7:00 PM and for arrivals the average taxi-in time never exceeded 10 minutes. The total average departure taxi out time at Logan Airport for 2010 is 18.4 minutes and the average taxi-in time is 6.6 minutes.[27]

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 in *Appendix L, Demonstration of Reduced Airport Congestion through Pushback Rate Control*, of this *2010 EDR.*

25 FAA News, BLANS Update published November 5, 2009.
26 The full report was published in the *2009 EDR* in *Appendix L.*
27 FAA Aviation Performance Metrics: Airport Analysis – Internet report –accessed 5/27/2011.

Massport's noise abatement goals are achieved through the implementation of multiple elements. Table 6-16 lists these goals and the associated plan elements, and reports on progress toward achieving these goals.

Table 6-16 Noise Abatement Management Plan

Noise Abatement Goal	Plan Elements	2010 Progress Report
Limit total aircraft noise	Limit on Cumulative Noise Index (CNI)	The CNI value for 2010 was 151.9 EPNdB, well below the cap of 156.5 EPNdB.
	Stage 3 percentage Requirement in Noise Rules	In 2010, 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	83 dwelling units were sound insulated in 2010, bringing the total of treated dwelling units to 11,219 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 2010 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 2010, Massport's Noise Abatement Office responded to 3,761 calls from callers living in 53 communities. The Noise Abatement Office issued the 2010 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 is underway.

7

Air Quality/ Emissions Reduction

Introduction

This chapter describes the air quality conditions at Logan Airport in 2010 and compares them to air quality conditions in 2009. This information is based on an up-to-date emissions inventory of Airport-related volatile organic compounds (VOCs), oxides of nitrogen (NO_x), carbon monoxide (CO), and particulate matter (PM).[1] An inventory of greenhouse gases (GHGs) for 2010 is similarly included. This chapter also presents an update of air quality monitoring data for nitrogen dioxide (NO_2) collected by the Massachusetts Port Authority (Massport) and others in the vicinity of Logan Airport. 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 is gathering air quality data in the communities around Logan Airport before and after the centerfield taxiway became operational); and other Massport air quality and emissions reduction initiatives.

Key Findings

In 2010, the estimated emissions inventory results were driven principally by the small increase (2.1 percent) in the number of aircraft operations at Logan Airport compared to 2009 and use of the newest version of the Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS), v5.1.3. Changes in aircraft fleet mix, lower ground-based aircraft taxi times, overall decrease in stationary source fuel usage and an increase in on-airport vehicle miles traveled (VMT) also affected the modeling results.

Air quality conditions in 2010 are described below:

- Total emissions of VOC were 1,019 kilograms per day (kg/day), or 4 percent higher than 2009 levels, but still follow a long-term downward trend decreasing by almost 78 percent since 1990. This increase is primarily due to the increase in landing and takeoff operations (LTOs) when compared to 2009.

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.

- Total emissions of NO_x were 3,989 kg/day, or less than 1 percent higher than 2009 levels. In 2010, total NO_x emissions at Logan Airport (net total with reductions) were approximately 742 tons per year (tpy) lower than Massport's 1999 AQI benchmark. This represents a 32 percent decrease in NO_x emissions since 1999.
- Total emissions of CO were 7,160 kg/day, or 10 percent lower than 2009 levels.
- Mostly due to the decreased use of No. 6 fuel oil, total emissions of PM_{10}/$PM_{2.5}$ associated with Logan Airport heating and cooling decreased in 2010 by approximately 10 percent to 64 kg/day compared to 2009 levels.
- 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 2010 continued to be well within the National Ambient Air Quality Standards (NAAQS) for NO_2.
- Massport's two-phased Air Quality Monitoring Study is collecting data on a variety of ambient air pollutants over a two year period and assessing air quality changes attributable to the operation of the new centerfield taxiway. The second phase of the Study concluded in 2011; after the centerfield taxiway became fully operational. The findings from this Study will be submitted to MassDEP in late 2011/early 2012 and also will be reported in the *2011 Environmental Status and Planning Report* (ESPR).
- 2010 marks the fourth consecutive year in which Massport has voluntarily prepared a Massachusetts Environmental Policy Act (MEPA) GHG emissions inventory for the Environmental Data Report (EDR). The 2010 GHG emission inventory was updated incorporating guidance developed by the Transportation Research Board's (TRB) Airport Cooperative Research Program (ACRP). The ACRP guidance was published in April 2009 for airport operators developing an airport-specific GHG emissions inventory.[2] The 2010 inventory 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 owned or controlled by the airlines, airport tenants, and the general public (through emissions from motor vehicles). Massport sources contribute 12 percent of the total GHG emissions for the Airport. Total Logan Airport GHG emissions in 2010 were slightly lower (0.4 percent) than 2009 levels.

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.

Regulatory Framework

The federal Clean Air Act (CAA), the NAAQS, and similar state laws govern air quality issues 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 issues in Boston metropolitan area and state, and are discussed in the next section.

National Ambient Air Quality Standards

The United States (U.S.) Environmental Protection Agency (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 six 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.

Table 7-1 National Ambient Air Quality Standards

Pollutant	Averaging Time	Standard ppm	Standard μg/m³	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 Avg	—	0.15	Not to exceed this level. Effective January 12, 2009.
	Quarterly	—	1.5	Not to exceed this level.
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. Effective January 22, 2010.
	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. Effective May 27, 2008.
Particulate Matter with a diameter ≤ 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 ≤ 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	197	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, 2011 (www.epa.gov/air/criteria.html).
1 The 1997 NAAQS for ozone.
2 The 2008 NAAQS for ozone.
ppm Parts per million
μg/m³ Micrograms per cubic meter

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.[3] 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.

The entire Boston metropolitan area is currently designated as attainment for all the criteria pollutants except O_3, for which it is designated as "moderate" nonattainment for the 1997 eight-hour ozone standard (Table 7-2). The O_3 nonattainment area consists of ten counties in Massachusetts (Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester). Logan Airport is located in Suffolk County. The Boston area is also currently designated as attainment/maintenance for CO, indicating that it is in transition back to attainment for this pollutant.

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 (8-hr)	Nonattainment (Moderate)
Particulate matter (PM_{10})	Attainment
Particulate matter ($PM_{2.5}$)	Attainment
Sulfur Dioxide (SO_2)	Attainment
Lead (Pb)	Attainment

Source: EPA, 2011 (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.

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 above, the entire Boston metropolitan area is currently designated as "moderate" nonattainment for the 1997 eight-hour O_3 standard. MassDEP was required to submit an updated SIP to the EPA for the newer 2008 eight-hour O_3 standard by 2010. The current and future SIPs for the Boston area are summarized in Table 7-3.

3 Environmental Protection Agency, *The Green Book Nonattainment Areas for Criteria Pollutants* (www.epa.gov/air/oaqps/greenbk/).

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. Focuses on the control of NO_x and VOCs as precursors to ozone. This is the "currently approved" SIP for the Boston 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. (The EPA assessment of a new eight-hour NAAQS for ozone is scheduled for 2013.)[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. In 2009, EPA proposed to further tighten the ozone standard and MassDEP recommended that the entire state of Massachusetts be designated as non-attainment for this new standard when it is promulgated. On September 2, 2011, the President requested that the EPA withdraw regulations tightening the ozone standard until 2013 when the EPA, under the Clean Air Act, will be required to review, and if appropriate, revise the ozone standard.

2 The 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 remained the same in 2010.

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 EDR, 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 below.

- **Aircraft Emissions** — The FAA 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 2010 Logan Airport emissions inventory. Compared to the previous version (EDMS v5.1.2) used in the *2009 EDR*, the most notable change includes the upgrade from Base of Aircraft Data (BADA) v3.7 to v3.8, which contains updated aircraft performance data used to calculate thrust, fuel flow and rate of descent and the addition of several new aircraft types. These model changes in EDMS v5.1.3 generally had a small effect on aircraft emissions when compared to EDMS v5.1.2.

  As with recent ESPRs and EDRs, the actual aircraft fleet mix at Logan Airport in 2010 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-1 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: commercial air carriers, commuter aircraft, general aviation (GA), and cargo aircraft. The aircraft fleet mix for 2010 showed a decrease in the number of small and medium jets (e.g., A319, A310, B737, etc.) and an increase in the smaller regional and business jets (e.g., CRJ-100, ERJ-145, Cessna Citation etc.), as well as turboprop aircraft (e.g., Saab 340, Pilatus PC-12, Dash 8, etc.), when compared to 2009. Smaller aircraft use fewer ground service equipment (GSE) with less operating times than larger aircraft.

Each LTO consists of taxiing, queuing, takeoff, climb out, approach, and landing operations. From 2009 to 2010, total LTOs increased by approximately 2 percent overall with air carrier LTOs increasing by approximately 8 percent, commuter LTOs decreasing by 9 percent, air cargo LTOs decreasing by about 6 percent, and GA increasing by approximately 20 percent.

Aircraft taxi/delay times are based on data obtained from the FAA Aviation System Performance Metrics (ASPM) database for 2010.[4] According to this database, the average aircraft taxi/delay times at Logan Airport decreased from 25.3 minutes to 25.0 minutes from 2009 to 2010, or about 1 percent. The reduction in aircraft taxi/delay times is beneficial for air quality since this reduces the time the engines are running while on the ground.

- **Ground Service Equipment/Auxiliary Power Units —** Estimates of GSE emissions for 2010 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 an on-site GSE time-in-mode survey completed in 2004 at the Airport and annual information regarding GSE fuel use (e.g., gasoline, diesel, CNG, etc.) from the Logan Airport Vehicle Aerodrome Permit Application process.[5]

- **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 *2010 EDR* provides a discussion of the VMT data used for this analysis.

- **Other Sources —** Emissions associated with fuel storage and handling, the Central Heating and Cooling Plant, and other stationary sources at Logan Airport were based on annual fuel throughput records for 2010, 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 2009, No. 2 fuel oil, No. 6 fuel oil usages, deicing activities, and snow melter usage decreased approximately 22 percent, 98 percent, 55 percent, and 20 percent, respectively, while natural gas usage increased by approximately 4 percent because of rising fuel oil costs.

- **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 *2010 EDR*.

- **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

4 FAA Aviation System Performance Metrics (ASPM) database for 2010 (aspm.faa.gov/).
5 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, etc.).

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. The year 2010 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.[6] 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 control over a very small percentage of these GHG emissions and their sources (i.e., limited to Massport fleet vehicles, stationary sources, and electrical consumption within Massport buildings). 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).

Emissions Inventory in 2010

This section provides a summary of the 2010 Logan Airport emissions inventory for the pollutants VOC, 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 very small generators of these two compounds.

As stated above, the aircraft emissions inventory was computed based on the actual number of aircraft operations (i.e., LTOs), fleet mix, and operational times-in-mode (TIM) at the Airport in 2010. Correspondingly, emissions associated with GSE, motor vehicles, fuel storage and transfer facilities, and a variety of stationary sources (i.e., steam boilers, snow melters, live-fire training, emergency generators, etc.) associated with Logan Airport were also computed based on actual conditions.

As in preceding EDRs, the results of the 2010 emissions inventory are compared with the results for 2009 and other previous years extending back to 1990. For ease of comparison in this EDR, the summary figures now contain the previous results in five-year intervals for 1990, 1995, and 2000 and then annually for 2004 to 2010.[7] However, to show the most recent data and to be consistent with other sections of the EDR, the summary tables only contain the results for 2004 through 2010. In this way, the changes in Logan Airport air quality conditions can be evaluated in both the short- and long-term 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.*

Volatile Organic Compounds

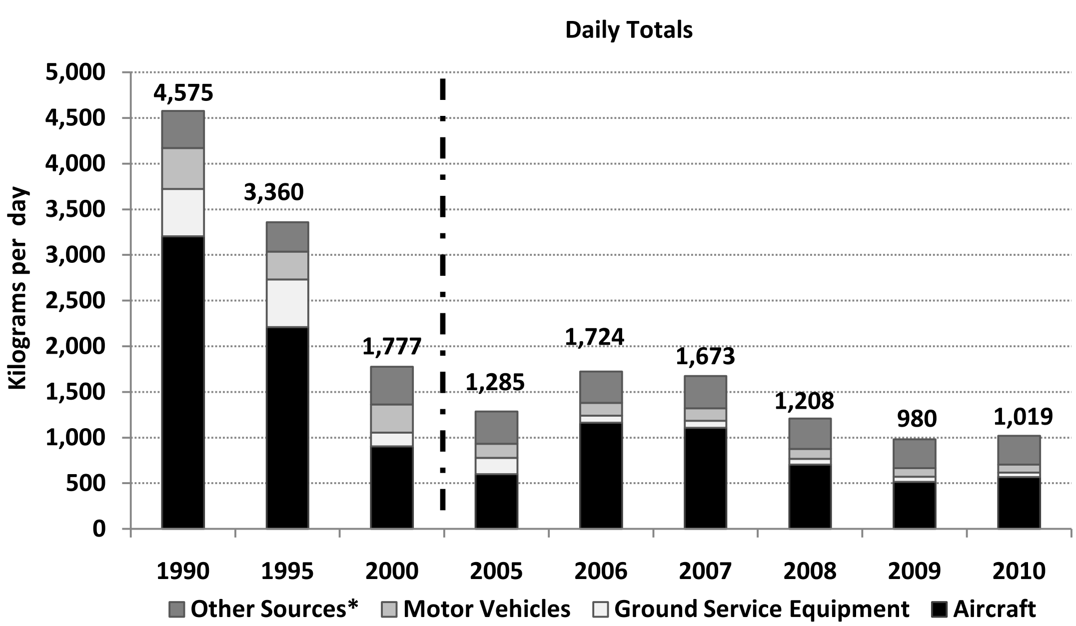
In 2010, total VOC emissions at Logan Airport were 410 tpy (1,019 kg/day); an estimated increase of approximately 4 percent from 2009 levels. This calculated small change is largely due to the increase in VOC emissions from aircraft engines associated with the additional operations. However, Figure 7-1 depicts an overall, long-term downward trend in VOC emissions at Logan Airport and Figure 7-2 shows the 2010 percent breakdown of these emissions by source category. Similarly, Table 7-4 shows the computed VOC emissions in kg/day for each emission source from 2004 to 2010. Other key findings include the following:

6 Following the guidance issued by the Airport Cooperative Research Program, ACRP Report 11, *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*.
7 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*.

- Total aircraft-related VOC emissions were approximately 10 percent higher in 2010, when compared to 2009. This increase was largely due to the increase in aircraft LTOs.
- GSE-related VOC emissions were approximately 13 percent lower in 2010 than in 2009. This decrease was largely due to the changes in the aircraft fleet mix which has an effect on the GSE fleet characteristics and usage. The aircraft fleet mix for 2010 showed a decrease in the number of small and medium jets and an increase in regional and business jets, when compared to 2009. Smaller aircraft use fewer GSE with shorter operating times than larger aircraft.
- Total VOC emissions from motor vehicles in 2010 declined by 8 percent from 2009 levels. The reduction in motor vehicle emissions is attributable mostly to lower emission factors of the 2010 motor vehicle fleet which are reflected in the MOBILE6 database, despite an increase in VMT.
- VOC emissions from stationary and other sources (e.g., fuel storage/handling, Central Heating and Cooling Plant, snow melter usage and firefighter training) increased by approximately 1 percent from 2009 to 2010; mostly due to the higher usage of jet fuel.

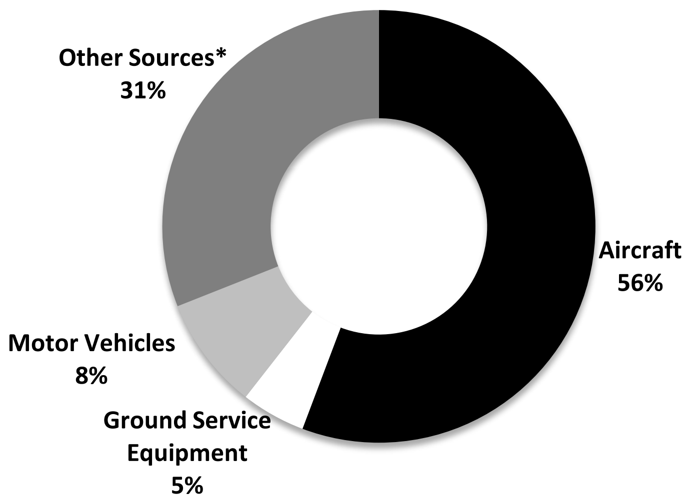
As Figure 7-2 shows, aircraft continue to represent the largest source (56 percent) of VOC emissions associated with Logan Airport, followed by stationary sources (31 percent), motor vehicles (8 percent), and GSE (5 percent). In summary, the 2010 results contained in Table 7-4 show a 4 percent increase of total emissions of VOCs when compared to 2009. However, the overall, long-term trend still shows a substantial decrease in these emissions at the Airport.

Figure 7-1 Emissions of VOC at Logan Airport



* 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, 2010



* 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]

Year	2005	2006		2007		2008		2009		2010	
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	MOBILE6.2.03										
Aircraft Sources											
Air carriers	271	227	511	435	381	324	286	237	235	292	**292**
Commuter aircraft	140	125	371	479	409	253	176	131	133	129	**125**
Cargo aircraft	41	19	46	129	112	107	70	71	71	70	**70**
General aviation	147	147	236	226	206	201	171	78	78	81	**81**
Total aircraft sources	599	518	1,164[2]	1,269	1,108	885	703	517	517	572	**568**
Ground Service Equipment[3]	178	167	77	78	78	66	66	56	56	49	**49**
Motor Vehicles											
Parking/curbside[4]	37	33	33	31	31	25	25	22	22	20	**20**
On-airport vehicles	118	106	106	104	104	82	82	71	71	66	**66**
Total motor vehicle sources	155	139	139	135	135	107	107	93	93	86	**86**
Other Sources											
Fuel storage/handling	340	336	336	338	338	320	320	307	307	311	**311**
Miscellaneous sources[5]	13	8	8	14	14	13	12	7	7	5	**5**
Total other sources	353	344	344	352	352	333	332	314	314	316	**316**
Total Airport Sources	1,285	1,168	1,724	1,834	1,673	1,391	1,208	980	980	1,023	**1,019**

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 2003 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 APUs as well as vehicles and equipment converted to alternative fuels.
4 Parking/curbside is based on VMT analysis.
5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Oxides of Nitrogen

In 2010, total NO_x emissions from all Airport-related sources were estimated to be 1,605 tpy (3,989 kg/day), which is an increase of less than 1 percent from 2009 levels; however, this observation is within the context of an overall decrease of 32 percent from 1999 levels. 1999 is the benchmark of the AQI which is discussed later in this chapter. Figure 7-3 depicts these short- and long-term trends in NO_x emissions and Table 7-5 shows the share for each emission source in 2004 through 2010.

Table 7-5 Estimated NO_X Emissions (in kg/day) at Logan Airport[1]

Year	2005	2006		2007		2008		2009		2010	
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	MOBILE6.2.03										
Aircraft Sources											
Air carriers	2,880	2,849	3,044	3,120	3,121	3,031	3,031	2,944	2,952	3,031	**3,037**
Commuter aircraft	225	195	256	353	354	319	319	309	234	203	**204**
Cargo aircraft	211	192	125	248	248	233	233	215	204	197	**197**
General aviation	50	49	60	56	56	43	43	27	23	29	**26**
Total aircraft sources	3,366	3,285	3,485	3,777	3,779	3,626	3,626	3,495	3,413	3,460	**3,464**
Ground Service Equipment[2]	312	280	300	299	299	257	257	219	219	198	**198**
Motor Vehicles											
Parking/curbside[3]	22	19	19	18	18	15	15	13	13	12	**12**
On-airport vehicles	269	238	238	233	233	182	182	153	153	149	**149**
Total motor vehicle sources	291	257	257	251	251	197	197	166	166	161	**161**
Other Sources											
Fuel storage/handling[4]	0	0	0	0	0	0	0	0	0	0	**0**
Miscellaneous sources[5]	218	109	109	128	128	124	124	181	181	166	**166**
Total other sources	218	109	109	128	128	124	124	181	181	166	**166**
Total Airport Sources	4,187	3,931	4,151	4,455	4,457	4,204	4,204	4,061	3,979	3,985	**3,989**

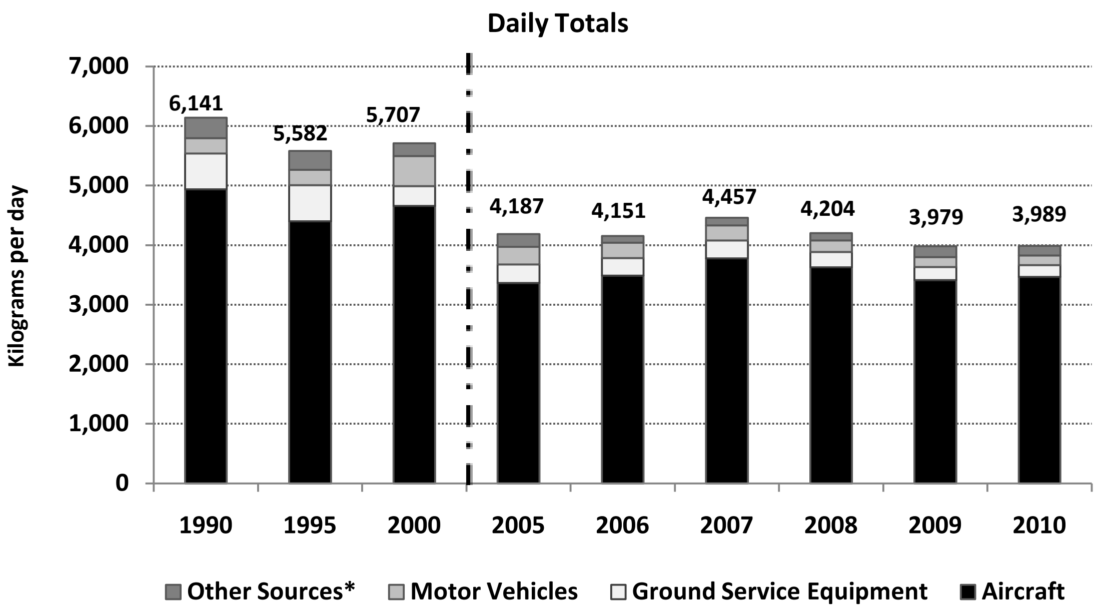
Notes: Years 2006 to 2010 were computed with previous years EDMS version to provide for a common basis of comparison.
kg/day - kilograms per day. 1 kg/day is approximately equivalent to 0.40234 tons per year (tpy).
1 See *Appendix I, Air Quality/Emissions Reduction* for 1993 to 2003 emission inventory results.
2 GSE emissions include APUs as well as vehicles and equipment converted to alternative fuels.
3 Parking/curbside data is based on VMT analysis.
4 Fuel storage/handling facilities are not a source of NO_x emissions.
5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Other findings related to NO_x emissions include the following:

- When compared to 2009 levels, total aircraft-related NO_X emissions were 1 percent higher in 2010. This increase is largely due to the overall increase in aircraft operations at Logan Airport, particularly in air carriers and GA operations. However, commuter and cargo aircraft emissions decreased due to fewer operations by those categories of aircraft in 2010.
- GSE emissions of NO_x decreased by 10 percent in 2010 compared to 2009, due mostly to the changes in aircraft fleet mix which has an effect on the GSE fleet characteristics and usage. The aircraft fleet mix for 2010 showed a decrease in the number of small and medium jets and an increase in regional and business jets, when compared to 2009. Smaller aircraft use fewer GSE with shorter operating times than larger aircraft.

- NO_x emissions from motor vehicles decreased by approximately 3 percent from 2009 levels. This reduction is attributable mostly to lower emission factors of the 2010 motor vehicle fleet which are reflected in the MOBILE6 database.
- Stationary sources show a decrease of approximately 8 percent in NO_x emissions in 2010 compared to 2009, largely due to the lower usage of No. 6 fuel oil. Additionally, the usage of No. 2 fuel oil, Tekflame, deicing chemicals, and snow melters also decreased over this time period.

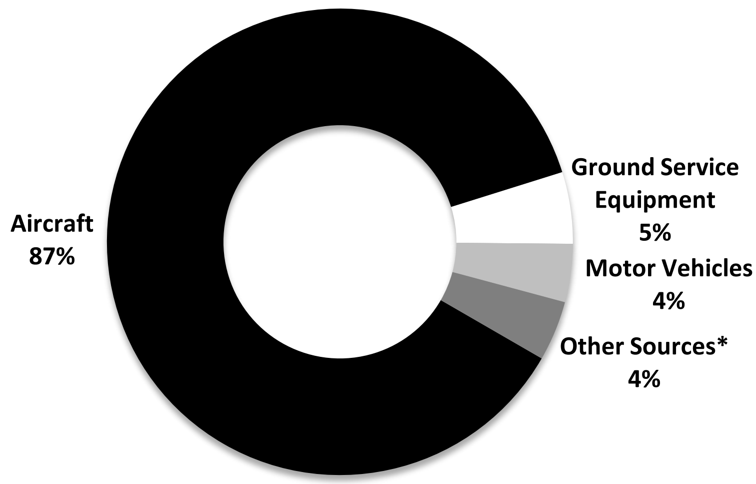
Figure 7-3 Emissions of NO_X at Logan Airport



* 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 2009, aircraft continued to represent the largest source (87 percent) of NO_x at Logan Airport, followed by GSE (5 percent), motor vehicles (4 percent), and stationary sources (4 percent).

Figure 7-4 Sources of NO_X Emissions, 2010



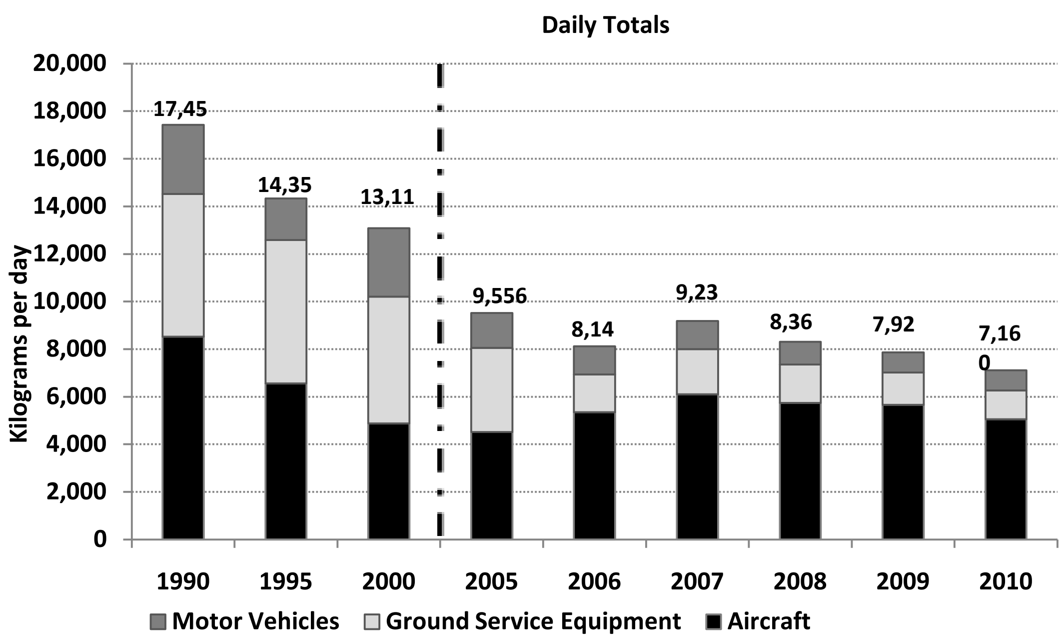
* Other sources include stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.). Values may not add to 100 percent due to rounding.

Carbon Monoxide

Total CO emissions at Logan Airport in 2010 were 2,881 tpy (7,160 kg/day), or approximately 10 percent lower than 2009 levels. Figure 7-5 depicts this long-term downward trend (59 percent overall reduction from 1990 to 2010) in CO emissions associated with airport activities. Table 7-6 also shows the breakdown of these emissions, by source category, for the years 2004 to 2010. The findings of the analysis reveal the following:

- Modeled aircraft-related CO emissions decreased in 2010 by approximately 11 percent compared to 2009 levels due mostly to changes in the EDMS and lower taxi/delay times at the airport. The differences between EDMS v5.1.2 and EDMS v5.1.3 particularly affected the modeled CO emissions of the Cessna 402 aircraft, which is the primary reason for the difference in commuter aircraft calculated emissions between the two model versions.
- Modeled GSE CO emissions also decreased by approximately 10 percent in 2010 compared to 2009. This is mostly due to changes in the aircraft fleet mix which has an effect on the GSE fleet characteristics and usage. The aircraft fleet mix for 2010 showed a decrease in the number of small and medium jets and an increase in regional and business jets, when compared to 2009. Smaller aircraft use fewer GSE with shorter operating times than larger aircraft.
- CO emissions from motor vehicles declined in 2010 by approximately 1 percent from 2009 levels. This reduction is attributable mostly to the lower emission factors of the motor vehicle fleet over this time period, which are reflected in the MOBILE6 database.
- CO emissions from stationary sources decreased approximately 4 percent in 2010 compared to 2009, largely due to the lower usage of No. 6 fuel oil.

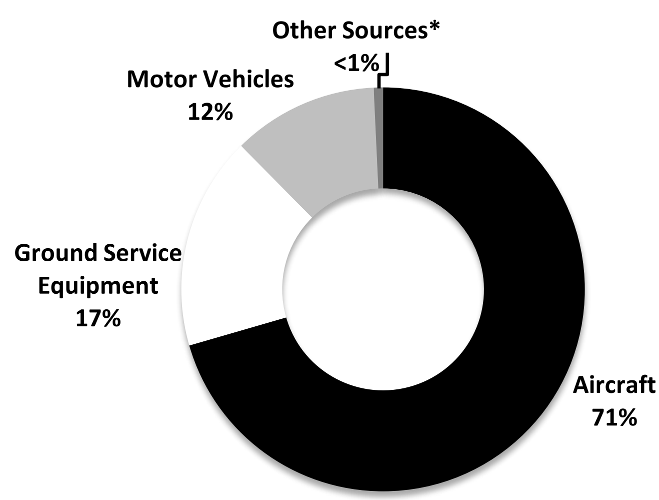
Figure 7-5 Emissions of CO at Logan Airport



Note: Other stationary sources not shown.

As shown in Figure 7-6, aircraft emissions continued to represent the largest source (71 percent) of CO at Logan Airport in 2010, followed by GSE (17 percent), motor vehicles (12 percent), and stationary sources (less than 1 percent).

Figure 7-6 Sources of CO Emissions, 2010



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

Table 7-6 Estimated CO Emissions (in kg/day) at Logan Airport[1]											
Year	**2005**	**2006**		**2007**		**2008**		**2009**		**2010**	
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	**MOBILE6.2.03**										
Aircraft Sources											
Air carriers	2,895	2,828	3,167	2,973	2,973	2,710	2,710	2,460	2,448	2,531	**2,531**
Commuter aircraft	1,010	950	1,587	2,484	2,484	2,436	2,436	2,364	2,795	2,629	**2,086**
Cargo aircraft	174	138	158	241	241	255	255	256	266	248	**259**
General aviation	437	398	442	401	403	345	345	145	150	177	**173**
Total aircraft sources	4,516	4,314	5,354	6,099	6,101	5,746	5,746	5,225	5,659	5,585	**5,049**
Ground Service Equipment[2]	3,531	3,409	1,586	1,904	1,904	1,609	1,609	1,364	1,364	1,222	**1,222**
Motor Vehicles											
Parking/curbside[3]	179	144	144	139	139	117	117	107	107	107	**107**
On-airport vehicles	1,290	1,036	1,036	1,038	1,038	834	834	740	740	729	**729**
Total motor vehicle sources	1,469	1,180	1,180	1,177	1,177	951	951	847	847	836	**836**
Other Sources											
Fuel storage/handling[4]	0	0	0	0	0	0	0	0	0	0	**0**
Miscellaneous sources[5]	40	24	24	51	51	55	55	55	55	53	**53**
Total other sources	40	24	24	51	51	55	55	55	55	53	**53**
Total Airport Sources	9,556	8,927	8,144	9,231	9,233	8,361	8,361	7,491	7,925	7,696	**7,160**

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 2003 emission inventory results.
2 GSE emissions include APUs as well as vehicles and equipment converted to alternative fuels.
3 Parking/curbside information is based on VMT analysis.
4 Fuel storage/handling facilities are not a source of CO emissions.
5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Particulate Matter

Table 7-7 shows that total estimated $PM_{10}/PM_{2.5}$ emissions at Logan Airport in 2010 were 26 tpy (64 kg/day), or approximately 10 percent lower than 2009 levels. Other key findings of the analysis include the following:

- Modeled aircraft-related $PM_{10}/PM_{2.5}$ emissions decreased approximately 7 percent in 2010 compared to 2009 levels. Part of this decrease is due to lower aircraft ground-based taxi/delay times at Logan Airport.
- $PM_{10}/PM_{2.5}$ from GSE/APU emissions decreased 7 percent in 2010 mostly due to changes in the aircraft fleet mix which has an effect on the GSE fleet characteristics and usage. The aircraft fleet mix for 2010 showed a decrease in the number of small and medium jets and an increase in regional and business jets, when compared to 2009. Smaller aircraft use fewer GSE with shorter operating times than larger aircraft.
- $PM_{10}/PM_{2.5}$ emissions from motor vehicles remained approximately the same in 2010 when compared to 2009 levels. This is attributable mostly to slightly lower emission factors of the motor vehicle fleet offsetting the increased VMT over this time period.

- Stationary source emissions of $PM_{10}/PM_{2.5}$ decreased by approximately 60 percent in 2010 compared with 2009, which is attributable to the lower No. 6 fuel oil usage over this time period. Stationary sources represent only 3 percent of the overall total of $PM_{10}/PM_{2.5}$ emissions at Logan Airport.

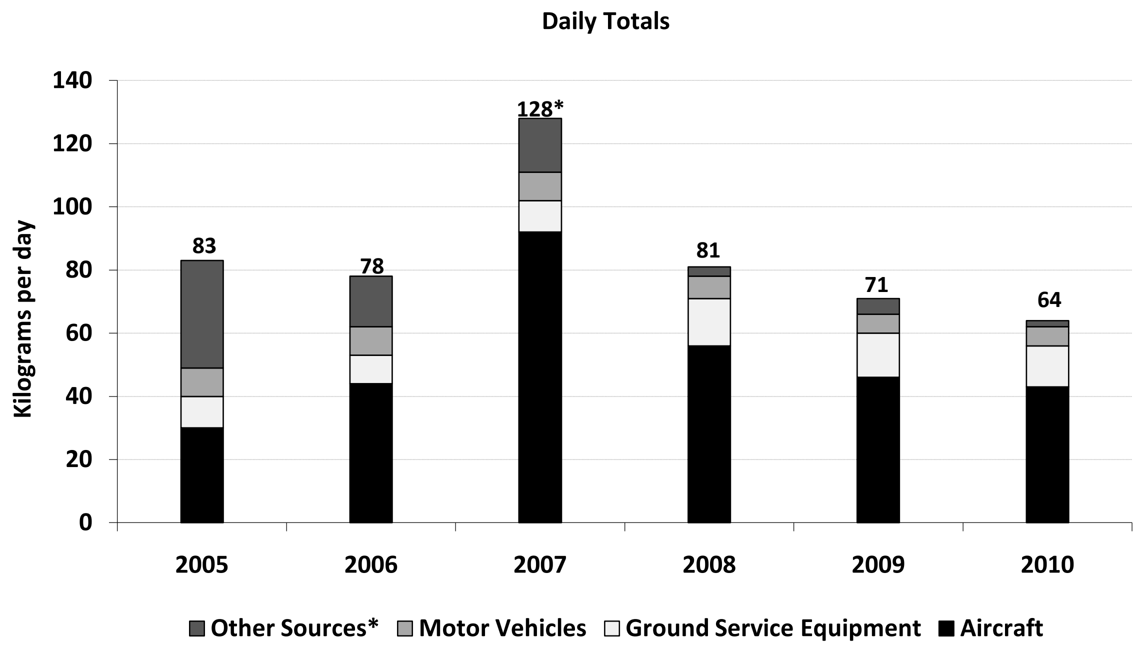
Table 7-7 Estimated $PM_{10}/PM_{2.5}$ Emissions (in kg/day) at Logan Airport[1]

Year	2005[2]	2006	2006	2007	2007	2008	2008	2009	2009	2010	2010
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	MOBILE6.2.03										
Aircraft Sources											
Air carriers	25	25	38	35	67	63	42	43	36	34	**34**
Commuter aircraft	1	1	2	6	14	11	6	5	5	4	**4**
Cargo aircraft	2	3	2	3	6	5	4	4	3	3	**3**
General aviation	2	2	2	2	5	5	4	2	2	2	**2**
Total aircraft sources	30	31	44	46	92	84	56	54	46	43	**43**
Ground Service Equipment[3]	11	9	9	10	10	8	15	14	14	13	**13**
Motor Vehicles											
Parking/curbside[4]	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**
Total motor vehicle sources	9	9	9	9	9	7	7	6	6	6	**6**
Other Sources											
Fuel storage/handling[5]	0	0	0	0	0	0	0	0	0	0	**0**
Miscellaneous sources[6]	34	16	16	17	17	3	3	5	5	2	**2**
Total other sources	34	16	16	17	17	3	3	5	5	2	**2**
Total Airport Sources	84	65	78	82	128	102	81	79	71	64	**64**

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 Parking/curbside is based on VTM analysis.
5 Fuel storage and handling facilities are not sources of PM emissions.
6 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 (67 percent) source of $PM_{10}/PM_{2.5}$ followed by GSE (20 percent), motor vehicles (9 percent), and stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.) (3 percent).

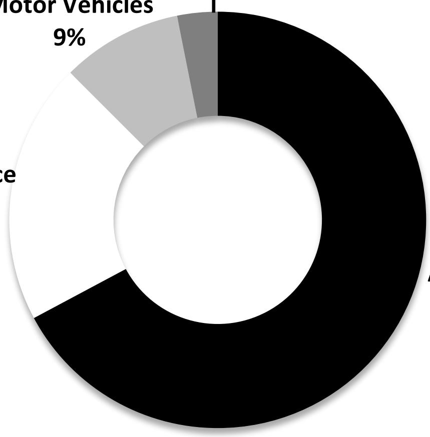
Figure 7-7 Emissions of $PM_{10}/PM_{2.5}$ at Logan Airport



* 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, 2010



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

Measured NO_2 Concentrations

This section presents the results of Massport's ongoing ambient (i.e., outdoor) air quality monitoring program for NO_2, a pollutant associated with aircraft activity and other fuel combustion sources. Since 1982, Massport has collected NO_2 concentration data at numerous locations both on the Airport and in neighboring residential communities. The purpose of this monitoring program is to track long-term trends in NO_2 levels and to compare the results to the NAAQS for this pollutant.

The protocol for this monitoring program calls for sample collection using 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 7-9). The samples, along with Quality Assurance/Quality Control (QA/QC) samples, are then analyzed in a laboratory for levels of NO_2.

Table 7-8 presents the 2010 NO_2 monitoring data and Figure 7-9 depicts the locations of the 27 sites currently in the Massport NO_2 monitoring network. For comparative purposes, historical data from 1999 to 2009 are also shown in Table 7-8. The table also includes NO_2 data collected separately by MassDEP using continuous monitors at four Boston-area locations (Figure 7-9).

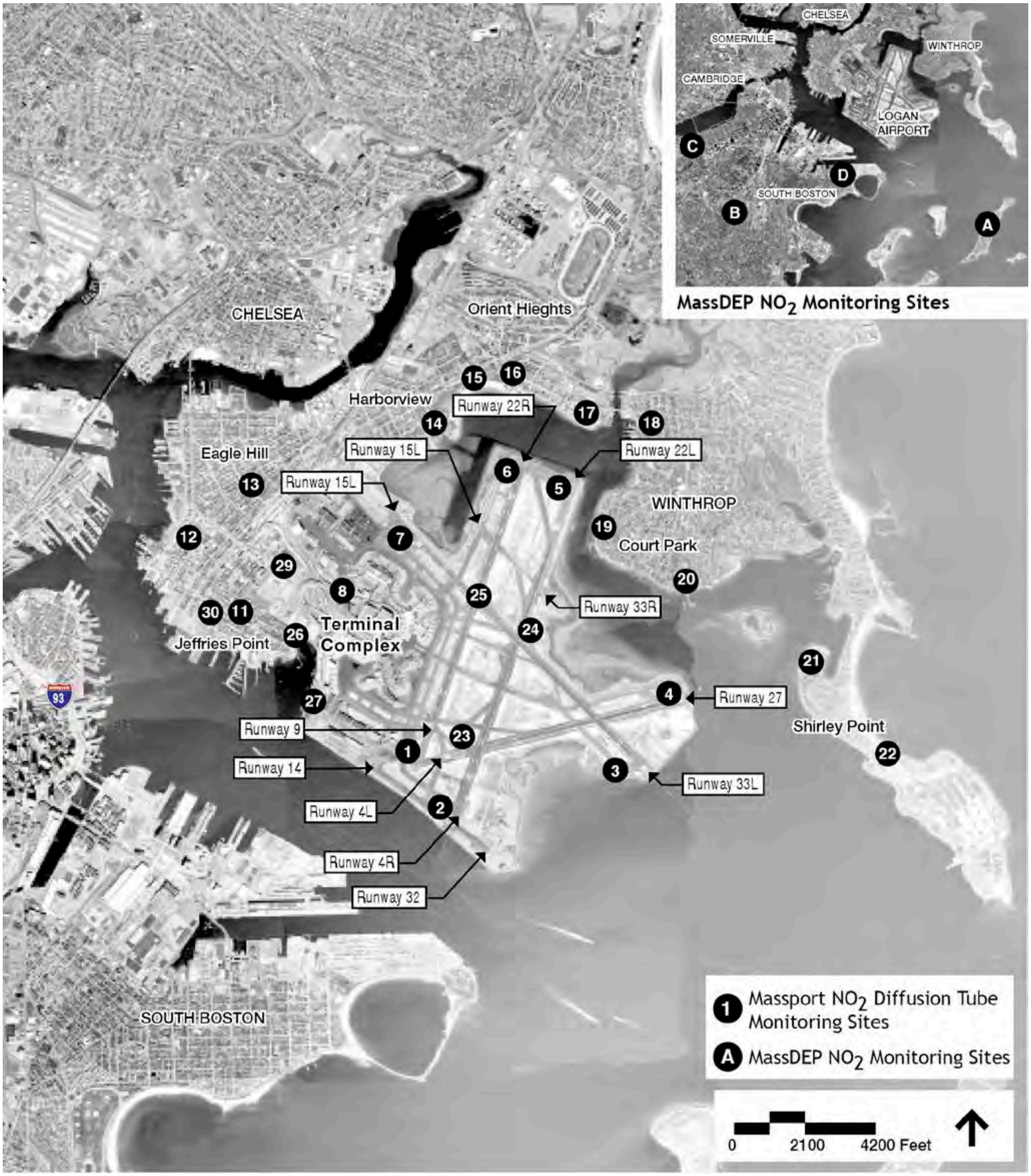
Table 7-8 Massport and MassDEP Annual NO_2 Concentration Monitoring Results ($\mu g/m^3$)

Monitoring Site	Site No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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**
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
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
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
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

Notes: The NAAQS is 100 $\mu g/m^3$.
The site identification labels in Figure 7-9 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 7-9 Massport NO_2 Monitoring Sites



As shown on Table 7-8, 2010 NO_2 levels were generally higher than in 2009. This is consistent with the cyclic trend of the average levels over the past several years. 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 2010 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 in 2010.
- The highest NO_2 concentrations in 2010 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]).
- The average NO_2 concentration of all monitoring sites in 2010 was the fourth lowest since 1999 (the lowest average occurred in 2007).

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.

Greenhouse Gas 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 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.[8,9]

In May 2010, the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) revised the *Massachusetts Environmental Policy Act (MEPA) Greenhouse Gas Emissions Policy and Protocol*.[10] Under the revised policy, all projects requiring an Environmental Impact Report (EIR) need to comply. These guidelines require certain projects (specifically not this EDR) undergoing review under MEPA to:

- Quantify the GHG emissions generated by proposed projects; and
- Identify measures to avoid, minimize, or mitigate such emissions.[11]

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

8 Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, New York City, NY. 2007.
9 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.
10 Revised *MEPA Greenhouse Gas Emissions Policy and Protocol*, Massachusetts Executive Office of Energy and Environmental Affairs, effective May 5, 2010.
11 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.

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 is also 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 report had originally been scheduled to be issued by EEA in December 2010 and has been delayed.

With respect to the GHG emissions inventory conducted for 2010, the following information is noteworthy:

- Even though the *2010 EDR* 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*. For this assessment, the 2010 GHG emissions inventory includes 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 very small percentage of these GHG emissions and their 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, and the general public.

This work was accomplished following the EEA guidelines and uses widely-accepted emission factors that are considered appropriate for this application, including International Organization for Standardization (ISO) New England electricity-based values. The analysis of GHG emissions presented is also consistent with the April 2009 guidance issued by the ACRP with the exception that aircraft cruise mode emissions above 3,000-foot LTO cycle were not included.

For the EDR, 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 7-9) 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 guidelines, once the ownership categories are determined, the operational boundaries are also set, reflecting the Scope of the emission source (refer to Table 7-9) and include:

- 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.
- 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 7-9 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

Note: Follows Airport Cooperative Research Program (ACRP) guidance.
LTO Landing and Takeoff

As required by MassDEP, Massport submitted a 2010 GHG emissions inventory for the Massachusetts GHG Emissions Reporting Program on June 15, 2011. This inventory included those sources meeting the criteria for Category 1 and Scope 1 (i.e., only those sources under the direct ownership and control of Massport). The GHG emissions inventory included in this *2010 EDR* is consistent with the data provided to MassDEP. However, the *2010 EDR* 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 - consistent with ACRP guidance.[12] Additionally, the EPA GHG Reporting Program (for which Massport is required to comply and submit) covers only stationary sources (Category 1 and Scope 1).

Table 7-10 presents the 2010 GHG emissions inventory reported in CO_2 equivalent values.[13] Massport-related emissions represent only 11.5 percent of total GHG emissions at the Airport. Tenant-based emissions represent

12 However, aircraft cruise mode emissions above the 3,000-foot LTO cycle were not included.
13 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.*

69.2 percent, electrical consumption from both Massport and tenants represents 13.3 percent, and passenger vehicle emissions represent 6.0 percent of total GHG emissions. Aircraft represents the largest source of emissions followed by motor vehicles and electricity generation. Total 2010 GHG emissions were slightly lower (down 0.4 percent) than 2009 levels. Massport plans to update the GHG Emissions Inventory for Logan Airport annually.

Table 7-10 Estimated Greenhouse Gas Emissions Inventory (in MMT of CO_2eq) at Logan Airport, 2010[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 (11.5%)			**0.07**	**<0.01**	**<0.01**	**0.07**
Tenant Emissions						
Aircraft – Ground[6]	2	3	0.18	<0.01	<0.01	0.18
Aircraft - Ground to 3000 feet[7]	2	3	0.16	<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 (69.2%)			**0.38**	**<0.01**	**<0.01**	**0.39**
Massport/Tenant Emissions						
Purchased Electricity[8]	1 & 2	2	0.07	<0.01	<0.01	0.07
Total Airport/Tenant Emissions (13.3%)			**0.07**	**<0.01**	**<0.01**	**0.07**
Passenger Vehicle Emissions						
Off-Airport Roadways[4]	3	3	0.03	<0.01	<0.01	0.03
Total Passenger Vehicle Emissions (6.0%)			**0.03**	**<0.01**	**<0.01**	**0.03**
Total Logan Airport Emissions[9]			**0.56**	**<0.01**	**<0.01**	**0.56**
Percent of Statewide Totals[10]			<1.0%	<1.0%	<1.0%	<1.0%

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 60.2 miles (2003 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 occur 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).

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

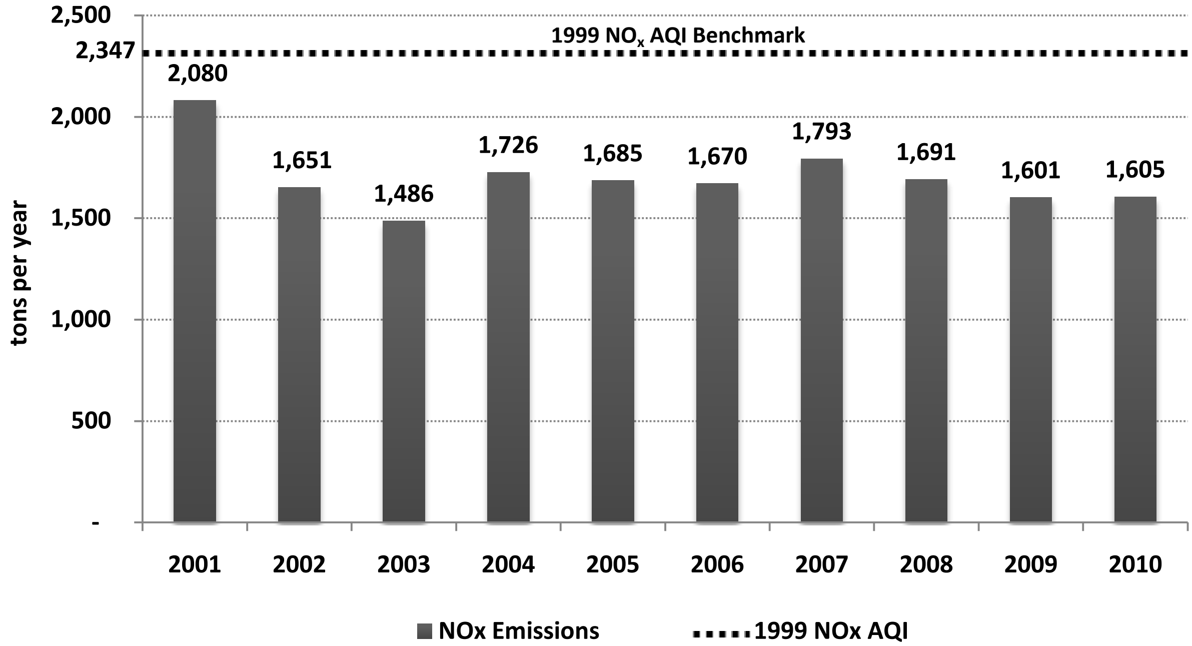
Massport developed the AQI as a 15-year voluntary program with the overall goal to maintain NO_x emissions associated with Logan Airport at, or below, 1999 levels. The AQI has four primary commitments, shown below, along with Massport's progress in meeting the AQI commitments.

- **Expand on the initiatives already in-place at Logan Airport.** See Table 7-11 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 7-10 presents the updated emissions inventory and shows that, in 2010, 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 7-11).
- **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 American Association of Airport Executives (AAAE), and Airports Council International (ACI).

As shown in Table 7-11, NO_x emissions at Logan Airport in 2010 (net total with reductions) were approximately 742 tpy lower than the 1999 AQI benchmark. This represents a 32 percent decrease since 1999. Between 1999 and 2010, the greatest reductions of NO_x emissions were associated with aircraft, GSE, and on-Airport motor vehicles: 25 percent, 55 percent, and 69 percent reductions, respectively.

Figure 7-10 compares the 1999 threshold level of 2,347 tpy of NO_X emissions to modeled NO_x emissions for 2001 through 2010. Cumulatively, as of December 31, 2010, NO_x emissions at Logan Airport were approximately 6,558 tons below the benchmark set by the AQI. As shown in Table 7-11, 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 of 2015.

Figure 7-10 NO_x Emissions Compared to AQI[1]



1 Includes emission reductions from the use of alternative fuel vehicles, shuttle buses, and ground service equipment. See Table 7-9.

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 7-12 shows the estimated amounts of NO_x air emissions generated by each airline in units of tpy and tons per LTO.

Table 7-11 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	1,610	1,991	2,026	2,061	2,096	2,131
Above (Below) 1999 Levels Before Reductions	NA	(32)	(250)	(682)	(848)	(602)	(644)	(659)	(541)	(646)	(738)	(737)	(356)	(321)	(286)	(251)	(216)
Potential Reductions/Increases[6]																	
Alternative Fuel Vehicles/Shuttle Bus	(11)	(4)	(4)	(3)	(3)	(10)	(9)	(8)	(7)	(5)	(4)	(2)	(3)	(2)	(1)	0	1
Alternate Fuel Ground Service Equipment[7]	(14)	(14)	(13)	(11)	(10)	(9)	(9)	(10)	(6)	(5)	(4)	(3)	(10)	(10)	(11)	(11)	(11)
Total Potential Reductions	(25)	(19)	(17)	(14)	(13)	(19)	(18)	(18)	(13)	(10)	(8)	(5)	(13)	(13)	(12)	(11)	(10)
Above (Below) 1999 Levels After Reduction	(25)	(51)	(267)	(696)	(861)	(621)	(662)	(677)	(554)	(656)	(746)	(742)	(370)	(334)	(298)	(262)	(226)
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	1,605	1,977	2,013	2,049	2,085	2,121

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 NO_x 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 analysis was completed using EDMS v5.1.3 and MOBILE6.2.03.
3 The years 2011 through 2015 were interpolated using the 2020 analysis provided in Table 7-9 of the *2004 ESPR*. These emission estimates will be updated in the next ESPR based on up-to-date operational forecasts for the Airport. Actuals are expected to be lower and will be reflected in the next ESPR.
4 The year 1999 is the "baseline" year for the AQI. Thus, 2,347 tons/year is considered the AQI threshold for NO_x 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 NO_x 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 in 2007.
8 Since the AQI threshold is not exceeded in 2009, 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 7-12 Contribution of NO_X Air Emissions by Airline, 2010 (Estimated)							
	Total Emissions (tons/year)		Normalized Emissions (tons/LTO)		Total Emissions (tons/year)		Normalized Emissions (tons/LTO)
Air Carrier, by Airline	LTOs	NO_x	NO_x per LTO	Air Carrier, by Airline	LTOs	NO_x	NO_x per LTO
Aer Lingus	548	17.00	0.031	JetBlue Airways	26,121	220.79	0.008
Air Canada[1]	5,492	14.95	0.003	Key Air	22	0.04	0.002
Aeromexico	82	0.80	0.010	Korean Air	12	0.65	0.054
				Lufthansa	830	34.36	0.041
				Mesa	217	0.68	0.003
Air France	498	22.59	0.045	Miami Air	67	0.80	0.012
				Mountain Air Cargo	2	<0.01	0.001
				Northwest Airlines	419	4.76	0.011
Airnet	466	0.02	<0.001	Other Air Carrier	29	0.25	0.009
Airtran Airways	6,872	54.09	0.008	Other International	35	2.03	0.058
Alaska Airlines	866	10.96	0.013				
Alitalia	313	8.73	0.028	Porter Airlines	1,434	1.34	0.001
American Airlines[2]	20,753	189.32	0.009	Royal Air Freight	8	0.01	0.001
Astar Air Cargo	257	5.16	0.020	SATA International	202	3.89	0.019
Atlantic Southeast	758	2.31	0.003				
Bombardier Business Jet	348	0.46	0.001	Shuttle America	1,802	6.04	0.003
British Airways	1,041	73.64	0.071	Southwest Airlines	6,863	67.94	0.010
Business Air Freight	2	<0.01	<0.001	Spirit	1,511	16.04	0.011
Capital Cargo	211	1.96	0.009	Sun Country	156	1.75	0.011
Cargolux	2	0.10	0.050	Swift Air	27	0.22	0.008
Chautaugua	1,163	3.55	0.003	Swiss International	360	12.36	0.034
Colgan	5,532	3.71	0.001				
Continental[3]	6,223	61.96	0.010	TACV-Cabo Verde	120	2.13	0.018
Contract Air Cargo	4	0.04	0.009	Trans States	117	0.36	0.003
Delta Air Lines[4]	21,784	199.66	0.009	United Airlines	8,158	115.65	0.014
FedEx	1,517	62.52	0.041	UPS Airlines	686	17.59	0.026
				US Airways[5]	25,164	171.72	0.007
Frontier	284	2.56	0.009	Virgin	354	14.19	0.040
GA	6,315	7.94	0.001	Virgin America	1,697	17.03	0.010
Hyannis Air Service	17,952	0.69	<0.001				
Iberia	218	7.44	0.034				
Icelandair	408	8.39	0.021				
				Total	**176,322**	**1,473.19**	**0.008**

Notes: Other International may include: Air Jamaica, 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: Airnet, Business Air Freight, Capital Cargo, Cargolux, Contract Air Cargo, Astar, FedEx, Mountain Air Cargo, 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.

Based on Table 7-12, international carriers are the higher NO_x emitters per LTO because their longer stage lengths require aircraft equipped with larger and/or additional engines. Overall, international carriers emit 15 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 53.0 percent of the total aircraft NO_x emissions;
- Commercial airlines (excludes cargo and GA) accounted for 93.3 percent of total aircraft NO_x emissions;
- Cargo aircraft operators accounted for 5.9 percent of total aircraft NO_x emissions; and
- GA aircraft accounted for 0.7 percent of total aircraft NO_x emissions.

Alternative Fuel Vehicles 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. For the past 16 years, Massport has provided a privately operated CNG station on site (located on the north side of the Airport near the Economy Parking Lot). This station is the largest CNG station in New England, primarily supports Massport's fleet of 26 shuttle buses and CNG fleet cars, and is open to the public. In 2010, the Logan Airport CNG station dispensed approximately 24,200 gallon-equivalents per month for Massport vehicles only. The CNG station dispensed approximately 8,700 gallon-equivalents per month for other non-Massport vehicles. Table 7-13 shows the number of Massport AFVs by vehicle type and the number of vehicles Massport added to and removed from its fleet in 2010.

Table 7-13 Massport's Alternative Fuel Vehicle Fleet Inventory at Logan Airport as of December 31, 2010

Fuel Type	Vehicle	Number
Electric	On-road vehicles	2
	Segways	2
Compressed Natural Gas (CNG)	Ford Crown Victoria	1
	Van	2
	Pick-Up Truck	6
	Honda Civic	9
	Shuttle Bus	26
Gasoline/Electric Hybrid	Ford Escape	8
Propane	Non-Road Vehicles (Forklifts)	2
E85 Flex Fuel	Crown Victoria	1
	Total	**59**
	Total acquired in 2010	**1**

Source: Massport.

One Ford Escape powered by gasoline and electricity was acquired in 2010. Massport now operates 59 vehicles powered by CNG, propane, electricity, E85 flex fuel, or operates hybrids powered by gasoline and alternative power sources. Massport established a vehicle procurement policy in 2006 that requires consideration of AFVs when purchases are made. Beginning in 2013, as part of the Southwest Service Area (SWSA) redevelopment, the existing fleet of diesel rental car shuttles will be replaced by CNG or clean diesel-electric hybrid buses.

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 2010 milestones are presented in Table 7-14.

Table 7-14 Air Quality Management Plan Status

Air Quality Emissions Reduction Goals	Plan Elements	2010 Status
Reduce emissions from Massport fleet vehicles	Convert Massport fleet vehicles to electricity or CNG by retrofitting or procurement.	Massport procured one alternative fuel vehicle/alternative power vehicle (AFV/APV) in 2010. 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. Public safety vehicles are excluded from this requirement. There were a total of 4 accrued banked EPAct credits in 2010, down from 12 in 2009, due to the purchase of non-AFV/APV light-duty vehicles.
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 largest compressed natural gas (CNG) station, which is open to the public. In 2010, the CNG station dispensed approximately 32,900 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. For example, the consolidated rental car facility (ConRAC) under construction in the Southwest Service Area (SWSA) will include the infrastructure necessary to accommodate future plug-in stations for electric vehicles.
	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.	100 percent of the contact gates have PCA and/or 400-Hz power. This reduces the need for APUs and, consequently, reduces associated emissions.

Table 7-14 Air Quality Management Plan Status (Continued)

Air Quality Emissions Reduction Goals	Plan Elements	2010 Status
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 to and from Logan Airport,* 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).
	Expand the Logan TMA for Airport employees.	The Logan TMA continues to provide commuting information to all Airport employees.
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/Environmental Compliance and Management*. 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*.
	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.

In addition to measures described in Table 7-14, 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.

Updates on Other Air Quality Initiatives

This section highlights other air quality initiatives at Massport in 2010.

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 section of the city 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 DPH with Airport operational data in support of the assessment. DPH had anticipated completing this report in late 2008, but it has been delayed due to funding limitations. Recently, Massport agreed to provide funding towards the completion of this study. In the spring of 2011, Massport also gave technical assistance in support of the DPH study by providing GIS analysis of the roadway network in and around Logan Airport in a format compatible with the FAA's EDMS.

Massport Air Quality Monitoring Study

Massport is undertaking 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 gathers air quality data in the communities around Logan Airport before and after the centerfield taxiway is operational, with an emphasis on ambient (i.e., "outdoor") levels of particulate matter and hazardous air pollutants (HAPs). The intent of the study is 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. This monitoring study is independent of, and in addition to, the long-term Measured NO_2 Concentrations Program discussed earlier in this chapter.

Air monitoring commenced in 2007 at ten different stations located on and off the Airport. The monitoring is comprised of both "real-time" and "time-integrated" monitoring methods, and includes measurement of fine particulates, VOC, carbonyls, black carbon, and polynuclear aromatic hydrocarbons (PAHs). Massport meets 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 2011 following the completion of the centerfield taxiway which is now fully operational. The findings from this Study will be submitted to MassDEP in late 2011/early 2012 and also reported in the *2011 ESPR.* Massport issued the Air Quality Monitoring Study Baseline Year Report in August 2010. This report documents the first (baseline) year of the monitoring including the planning, execution, and data reporting. The baseline year of monitoring ran from October 1, 2007, through September 30, 2008. The full results of the study will be given to MassDEP and reported upon in the *2011 ESPR*. For details on the study and baseline 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.*

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.[14] 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 [15], 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

14 *Logan International Airport Energy Strategic Plan*, prepared for Massport, prepared by Source One, February 2008.
15 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.

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 proposed 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 transportation and air quality impacts on-Airport and off-Airport in the surrounding neighborhoods. The ConRAC is designed and will be 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.[16]

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 EEA issued a Certificate that determined that the project adequately and properly complies with MEPA. *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. Initial site preparation projects are underway at the time of this EDR filing.

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.

16 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.

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 2010: (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 below.

- **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.[17] 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.

17 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 response to the GWSA, the Commonwealth established 12 working groups, including five with a transportation focus. The working groups were tasked with outlining strategies to achieve statewide GHG reductions and developing cost-effective approaches. Advisory committees on mitigation and adaptation were formed. Massport is participating in meetings primarily focused on reducing energy demand (mitigation) through transportation and building energy efficiencies, incentives to increase passengers per vehicle, and opportunities for alternative (low-emitting) fuels for use within the transportation sector.

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.

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Water Quality/ Environmental Compliance and Management

Introduction

The Massachusetts Port Authority's (Massport) approach to environmental management and compliance is a key component of its commitment to sustainability 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 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. 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 United States (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 operators in an effort to improve their 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 2010:

- In 2010, there were 15 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 during April and November 2010, respectively, as required.
- Massport's SWPPP addresses stormwater pollutants in general, and also addresses deicing and anti-icing chemical, potential bacteria, fuel and oil, and other sources of stormwater pollutants. The 2010 Annual Certificates of Compliance were submitted to EPA and MassDEP on December 21, 2010, for Massport and each tenant co-permittee.

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

- 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:
  - Release Tracking Number (RTN): 3-10027: A Phase IV Remedy Operations Plan was submitted on March 3, 2010, and the first Status Report was submitted on September 29, 2010.
  - RTN: 3-23493: A RAO-A3 was submitted on January 4, 2010, a Release Abatement Measure Plan for the Economy Parking Structure was submitted on May 21, 2010, the first Release Abatement Measure Status Report was submitted on September 21, 2010, and an AUL Amendment was recorded on December 9, 2010.
  - RTN: 3-28199: A Release Abatement Measure Plan was submitted on August 6, 2010, and a Phase II Scope of Work was submitted on January 18, 2011.
  - RTN: 3-1287: A Release Abatement Measure Completion Statement for the fuel hydrant system was submitted on February 1, 2010 and revised in March 2010, and inspection and monitoring reports were submitted between September 2009 and September 2010.
  - RTN 3-28792: A Class B-1 Response Action Outcome Statement was submitted on October 18, 2010, which states that no further response actions are required.

- 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, 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.

Stormwater Management in 2010

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.

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

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 were also taken quarterly from these four outfalls during wet weather to test for eight different polycyclic aromatic hydrocarbons (PAHs). 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.

Figure 8-1 Logan Airport Outfalls

Monitoring Results

A stormwater sample taken at the Maverick Street Outfall on April 16, 2010, exceeded the 100 milligrams per liter (mg/L) daily maximum limit for TSS established in the NPDES permit. The analytical results for the sample indicated a concentration of 370 mg/L for TSS. As indicated in the Discharge Monitoring Report dated May 17, 2010, the exceedance in the TSS discharge limit at the Maverick Outfall may have resulted from a rupture in a 16-inch diameter water main that occurred on March 20, 2010. The water main break undermined a section of roadway and caused sediment to be deposited in the stormwater drainage system. Drainage structures in the area of the water main break were cleaned and approximately 2 cubic yards of sediment were removed and transported off the Airport for disposal.

A stormwater sample taken on November 12, 2010, at the North Outfall also exceeded the 100 mg/L daily maximum limit for TSS. The analytical results for the sample indicated a concentration of 140 mg/L for TSS. This was the first permit limit exceedance at the North Outfall following issuance of the NPDES permit, dated July 2007. Review of conditions within the North Outfall drainage area did not identify any construction or airport operations that would have resulted in a discharge of sediment to the stormwater drainage system.

There were no TSS exceedances reported at the West Outfall. The highest concentration of TSS observed at the West Outfall was 28 mg/L (January 7, 2010). The highest TSS concentration observed at the Porter Street Outfalls was 130 mg/L of TSS (January 7, 2010). There were no 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 5.7 mg/L of oil and grease (December 12, 2010) and 180 mg/L of TSS (December 12, 2010). The highest concentrations observed at the airfield outfalls were 13 mg/L of oil and grease and 330 mg/L of TSS on December 12, 2010.[6] Deicing sampling at the North, West, Porter Street, and airfield outfalls occurred in January and February 2010 (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 (www.massport.com/logan/airpo_water_outfa.html), 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 2010 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.

6 The 2008 NPDES permit does not set maximum daily discharge limitations for the Runway/Perimeter Stormwater Outfalls.

Stormwater and Sanitary Sewer System Inspections and Repairs

Since 2006, Massport has 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 these surveys, the Boston Water and Sewer Commission replaced a total of 950 linear feet of sanitary sewer along Frankfort Street and 1,175 linear feet of sanitary sewer along Prescott Street in 2009, and replaced an additional 120 linear feet of sanitary sewer along Frankfort Street in 2010.

Massport is in the process of preparing construction documents for repairing sections of the sanitary sewer system. The total estimated cost of the repairs is approximately $300,000 and the completion of the work is anticipated in 2012. Beginning in May 2010, Massport directed its term contractor to conduct 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 NPDES Permit, the inspection and cleaning activities focused on structures within 100 yards of aircraft, vehicle, and equipment maintenance facilities. A total of 163 manhole and catch basin structures were accessed and their conditions were documented. Sediment depths were recorded and the sediment was then removed from the structures. A total of approximately 35 cubic yards of sediment was removed during cleaning of the structures.

To address the April 2010 TSS exceedance at the Maverick Street Outfall, Massport conducted inspection and cleaning of catch basins and manholes within the drainage area. Massport's term contractor inspected and cleaned drainage structures, removing a total of approximately 2 ½ cubic yards of sediment. A significant portion of this material was removed from two catch basins immediately adjacent to the location of a water main break that occurred on March 20, 2010. Massport also required the tenants located within the Maverick Outfall drainage area to conduct inspections, clean structures, and replace filter inserts as needed.

Bacteria Source Tracking

In accordance with Part I.B.9 of the NPDES Permit, Massport has implemented a Stormwater Pollution Prevention Plan 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 is currently conducting technologically advanced analyses of the samples using DNA data to identify potential bird markers in the stormwater. The stormwater samples are also being analyzed for human markers and fluorescent whitening agents. The results of the laboratory analyses will be reported in the *2011 ESPR*.

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

7 NPDES Permit No. MA0032751 - *Logan International Airport Fire Training Facility*. Issued November 1, 2006.

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 NPDES permit. Discharge monitoring reports are submitted monthly to EPA. In 2010, Massport reused all of the wastewater at the Fire Training Facility. The results of the laboratory analyses of wastewater indicated that all tested parameters were below the NPDES permit discharge limits.

Fuel Use and Spills in 2010

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 clean-up 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 2010, five of the spills entered the storm drainage system; three spills were confined to the catch basin sump. Massport keeps records of all spills, including those less than the reporting threshold. In 2010, of the 87 oil and hazardous material spills reported to the Massport Fire Rescue Department, 15 spills (17 percent) were reportable. Of the 15 reportable spills, four commercial airlines were responsible for six of the spills; four fixed-based operators were responsible for eight spills; and one spill was the result of a motor vehicle accident. By volume, jet fuel spills accounted for 76 percent of total fuel spilled; diesel fuel accounted for 12 percent; hydraulic oil accounted for 11 percent; and gasoline, motor oil and other fuels accounted for one percent. A summary of Logan Airport jet fuel usage and spill records from 1990 to 2010, and greater detail pertaining to type and quantity of the spills can be found in *Appendix J, Water Quality/Environmental Compliance and Management*.

In addition to the discrete spills that are described above, Massport investigated a release of jet fuel that was contained within the pollution control equipment located at the North Outfall. In October 2010, approximately 236 gallons of jet fuel/water mixture were removed from the skimmer and oil/water separator components of the pollution control equipment. Massport investigated the storm drain system within the drainage area of the North Outfall and found traces of jet fuel in the drain leading back to the jet fuel storage facility. Corrective actions were taken to address potential releases from the oil/water separator located at the facility, and the facility operator is conducting investigations to determine the extent of any impacts.

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**

Source: Massport Fire Rescue Department and MPA Environmental Management.
1 Materials include: jet fuel, hydraulic oil, diesel fuel, gasoline, and other materials such as glycol and paint.
Oil and hazardous material spills and jet fuel handling data from1990 through 2010 is presented in *Appendix J, Water Quality/Environmental Compliance and Management.*

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 upgrade older tanks and to monitor tank systems.

Massport and its tenant tank owners spent much time and effort in 2010 complying with new State storage tank regulations. These new regulations transferred jurisdiction of all USTs from the Department of Fire Services (DFS) to MassDEP. Jurisdiction of all above ground storage tanks (ASTs) with greater than 10,000-gallon volume remains with the DFS, and those ASTs with less than 10,000-gallons capacity are now under local (Massport Fire Department) jurisdiction. Compliance with the new tank regulations included the following:

- Third party inspections of UST systems in August 2010, and then once every three years, except heating oil USTs;
- Responses to MassDEP audits of third party inspection submittals;
- Re-permitting all ASTs using a newly created Massport Fire Department permit; and
- Development of a permit 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 2010, of 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 re-route them to the station's storage tank(s). Testing included replacement of defective hoses and/or nozzles, as needed.

- Annual 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 the 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.
- Massport also provides tenants with revised storage tank regulatory requirements and assists with 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 the 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 2010 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 (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 historic 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 separate phase hydrocarbons (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 than1/2 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 the operator of the FDS, BOSFUEL, 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 exists at the FDS and a permanent solution is not currently feasible. Massport is coordinating with BOSFUEL who are preparing construction documents for replacing a portion of the FDS. Construction will be 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 is approximately 90 percent complete, and is expected to be completed in 2009.
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 Status Report for the BOSFUEL Project was submitted in February, and the report was revised in March 2010.*
2. North Outfall (3-4837)	
Phase II and Phase III Reports filed in March 1997	Indicated petroleum contamination present at the site is 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 are completed.
	Massport has initiated site evaluation to document the reduction of petroleum contamination following the decommissioning of the North Fuel Farm and fuel distribution system.
Post RAO C evaluation report submitted in December 2002	Massport has eliminated substantial hazards at this site and has 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 is scheduled for 2007.
2004	Evaluation report indicated that a "Condition of No Significant Risk" has not been achieved at this site. Massport will conduct 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.*
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 is due on September 30, 2011.*
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 RAO-A3 was submitted on January 4, 2010, corresponding with the recording of an AUL. On May 21, 2010, a Release Abatement Measure Plan for the Economy Parking Structure was submitted. The first Release Abatement Measure Status Report was submitted on September 21, 2010. An AUL Amendment was recorded on December 9, 2010. A RAM Completion Statement was submitted on March 15, 2011. No additional response actions are required.*
5. Tomahawk Drive (3-27068)	
2007	Release notification form submitted in August 2007.
2008	A RAO-B1 was submitted to MassDEP on January 9, 2009. No further response actions required.
2009	No further response actions required.
2010	*No further response actions required.*

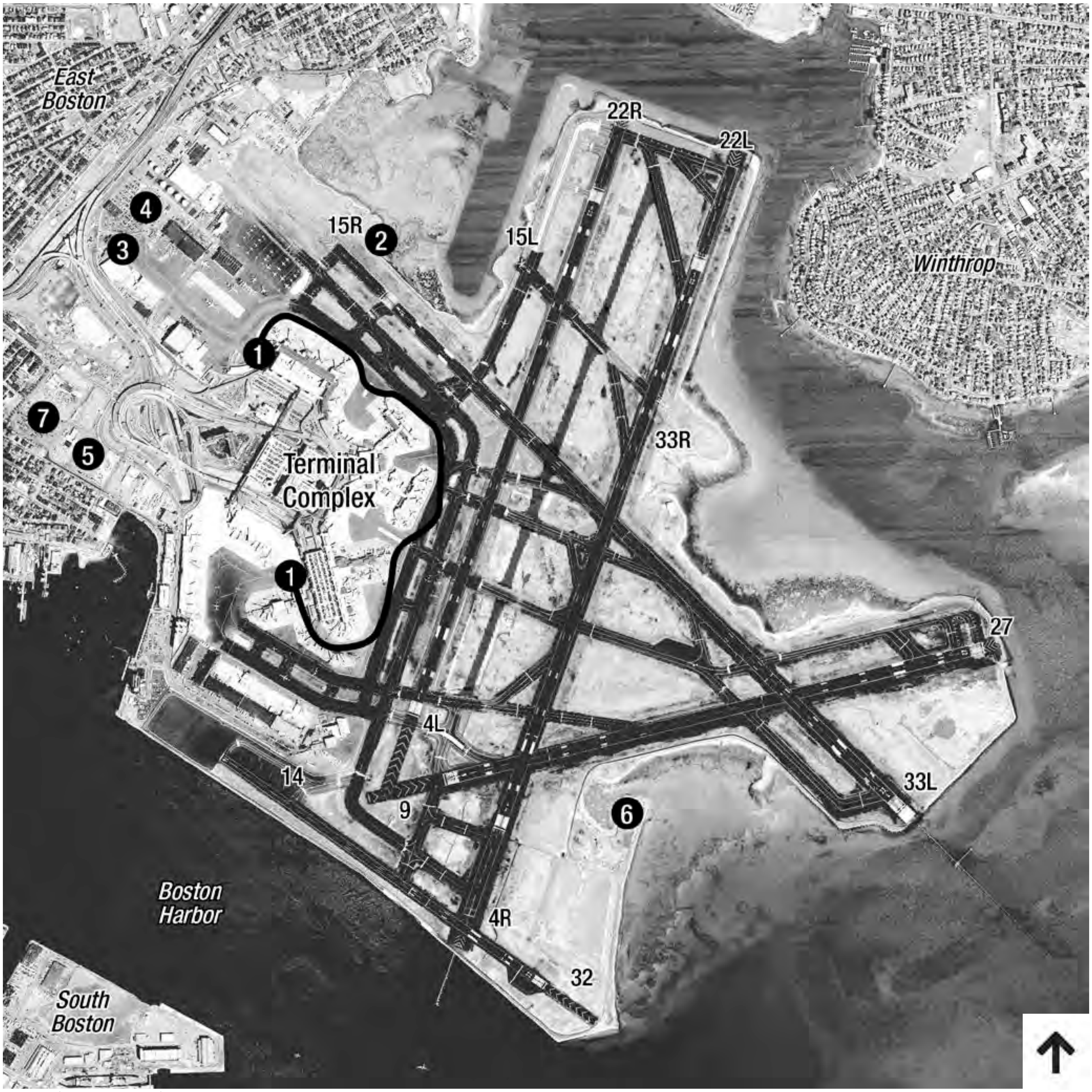
Table 8-3 MCP Activities Status of Massport Sites at Logan Airport (Continued)

Location (Release Tracking Number) and MassDEP Reporting Status	Action/Status
6. Fire Training Facility (3-28199)	
2008	Oral notification of release made 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. The RAM Completion Report was submitted on April 25, 2011.*
	A Phase II Scope of Work was prepared and submitted to MassDEP on January 18, 2011.
7. Southwest Service Area (3-28792)	
2009	Release notification form submitted to MassDEP/BWSC on October 8, 2009.
2010	*A RAO-B1 was submitted to MassDEP on October 18, 2010. No further response actions required.*

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		

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 2010.

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). Executive Order 484 supersedes Executive Order 438 which established the State's 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. Massport worked to identify, evaluate, and correct matters of environmental noncompliance. In 2009, Massport completed replumbing of stormwater/sanitary piping work in the Terminal B garage.
- 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.*

Table 8-4 Progress Report for Environmental Compliance and Management	
Plan Elements	**Progress Report for 2010**
Environmental Compliance Inspections	In 2010, Massport performed tenant inspections at a number of its 26 National Pollutant Discharge Elimination System (NPDES) co-permittees' (Logan Airport tenants) leaseholds and made recommendations suggesting how to rectify issues identified during the inspections. Massport conducted quarterly inspections of its facilities, NPDES co-permitted leaseholds, and car rental facilities.
Environmental Management System (EMS) and International Organization for Standardization (ISO) 14001	ISO 14001certification 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 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.
Tenant Technical Assistance	Massport continued publication of *EnviroNews*, a quarterly newsletter that informs tenants of regulatory calendar milestones, permitting requirements, pollution prevention, and BMPs. It recommends use of sustainable materials and provides information on Massport and other environmental requirements (2010 newsletters provided in *Appendix J, Water Quality/Environmental Compliance and Management).*
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 all 27 co-permittees (currently there are 26 co-permittees and tenants were required to develop SWPPPs. Massport completed their 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 2010 Annual Certificates of Compliance were submitted to EPA and MassDEP in December 2010 for Massport and each of its co-permittees.
Construction	In 2009, Massport developed Sustainable Design Standards and Guidelines (SDSG) for use by architects, engineers, and planners working on capital improvement projects for Massport. The SDSG 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 requires construction BMPs to be included in contracts. 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 Countermeasure and Control (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.

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Project Mitigation Tracking

Introduction

This *2010 Environmental Data Report* (*2010 EDR*) provides a status report on the Massachusetts Port Authority's (Massport) mitigation commitments under the Massachusetts Environmental Policy Act (MEPA) for various Logan Airport projects. Each of the projects completed the state and federal environmental review processes and adopted a mitigation plan (Section 61 Findings).[1] Massport has a tracking program in place, the goal of which is to monitor Massport's 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 construction phases, its mitigation plan is implemented with an ongoing tracking system to ensure compliance. This chapter provides Section 61 mitigation commitment updates in 2010 for projects for which mitigation is nearing completion or is ongoing (Tables 9-1 through 9-7). Projects for which mitigation has been completed will not be reported on in future EDRs and Environmental Status and Planning Reports (ESPR). 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 (EEA) #9790 (Phase I complete. Phase II construction commenced in 2004 as an expansion to the Central Garage and was completed in early 2007). The status of continuing requirements are 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 until after 2010). The status of continuing requirements for Phases I and II are documented.
- Replacement Terminal A Project, EOEA #12096 (Terminal A opened March 16, 2005). The status of continuing requirements are documented.
- Logan Airside Improvements Planning Project, EOEA #10458 (Runway 14-32 opened on November 23, 2006. The centerfield taxiway improvements were completed and the taxiway became fully operational in 2009).

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 EEA issued a Certificate that determined that the Final Environmental Impact Report (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 2015.

Recently Approved Project with Upcoming Mitigation Conditions/Requirements

- Logan Airport Runway Safety Areas (RSA) Project, EOEA #14442; on March 18, 2011, the Secretary of EEA issued a Certificate that determined that the Final Environmental Assessment/EIR adequately and properly complied with MEPA and its implementing regulations. Construction on the Runway 33L RSA began in June 2011. Construction on the Runway 22R Inclined Safety Area (ISA) has not yet commenced. The *2011 ESPR* will report on further progress in meeting the Section 61 requirements.

Projects with Ongoing 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

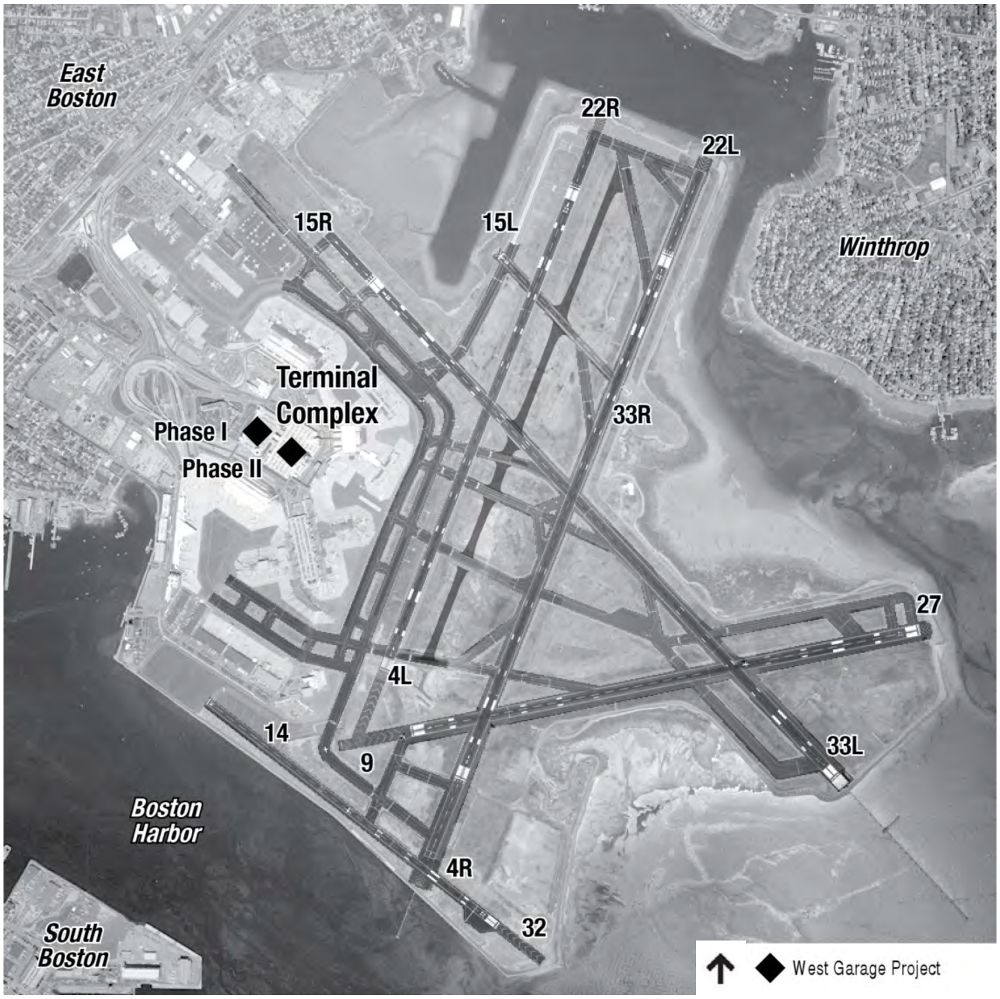
Project Status

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 provides 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.

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, 2010)

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 has changed since the first-hour free rate was rescinded in 1998. In June 2007, rates increased to $3 for the first half-hour. These parking rates were temporarily increased to $4 for the first half-hour between February 1 to March 5, 2009. After public input, the Board voted to rescind these increases. The current rates are the same rates that were in effect prior to February 1, 2009.
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 the ground transportation section, 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.

Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2010) (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 their 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 effective TDM strategies including discounts on HOV services.
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* of this *2010 EDR*.
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 EDRs provide information on the Logan TMA, its services, membership, and employee commuter choices (via the Logan Airport Employee Survey). Logan TMA information is provided in *Chapter 5, Ground Access to and from Logan Airport* of this *2010 EDR*.
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.** Massport completed its market-based analysis for a North Shore Logan Express in March 2000. 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, 2010) (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 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.
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 recommends budgetary appropriations for ground access services on an annual basis.
Enhancement of Existing HOV Services	
Expand Logan Express hours of service.	**Implemented.** Service is offered from Braintree as early as 3:15 AM and as late as 11:00PM; from Framingham as early as 4:00 AM and as late as 11:00 PM; from Woburn as early as 3:30 AM and as late as 11:00 PM; and from Peabody as early as 4:15 AM and as late as 11:15 PM. Buses leave every hour or half hour. 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. Through MassRides, Logan TMA members still benefit from this service.

**Table 9-1 West Garage Project Status Report (EOEA #9790)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2010) (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 2010, 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.
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. However, in 2004, annual ridership levels at Peabody continued to be low, approaching 77,000 as compared to 527,000 at Braintree, 379,000 at Framingham, and 283,000 at Woburn. In 2010 annual ridership levels at Peabody, Braintree, Framingham, and Woburn were approximately 51,800, 482,900, 334,400, and 242,400, respectively.
In conjunction with the MBTA, Massport will pursue joint ticketing opportunities for the Hingham Commuter Boat and the Logan Airport Water Shuttle.	**Implemented.** As reported in the *1999 ESPR* and the *2000 EDR*, 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 accommodated water taxi services, enhanced the dock as described above, provided communication links for passengers to call the taxi, and allowed taxi passengers to use the free water shuttle buses to access the terminals from the dock. Water taxi information was 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, 2010) (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 website, 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 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, 2010) (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 EA and Major Investment Study for the Logan Airport Inter-modal Transit Connector (AITC). The AITC evolved out of the People Mover EIR/MIS 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 United States (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 for the People Mover from the Secretary of EOEA 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). In 2005, Massport and MBTA initiated planning to provide automated fare collection/Charlie Card equipment in each of the Logan Airport terminals. Charlie Card ticketing opened at Logan Airport in November 2006.
Alternative Fuels program. Massport is carrying out an extensive program to convert existing Massport-owned service vehicles to environmentally preferable sources. Table IV-2 summarizes the elements of the alternative fuels program and the schedule for their implementation.	**Implemented.** Table 9-3 of this *2010 EDR* 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, 2010) (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.** The Logan ATMS uses technologies that detect vehicle movement: inductive loop lines, acoustic sensors, and canoga cards. 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, Massport prepared a long-range ATMS plan that will provide 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. This project was bid and a contractor selected in 2008. 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 Lot 2 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 described in *Chapter 5, Ground Access to and from Logan Airport* of this *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 modeshare 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 an (unfunded) "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 2010 details.

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, 2010)

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 2010, the station pumped approximately 32,900 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 will include 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, which are still in service.
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.** There are 26 CNG shuttle buses in the current fleet.
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.

International Gateway Project (Terminal E) – EOEA #9791

Permitting History:

- Certificate on the Final EIR issued on December 2, 1996
- Section 61 Findings submitted to EOEA June 26, 1997

Project Status

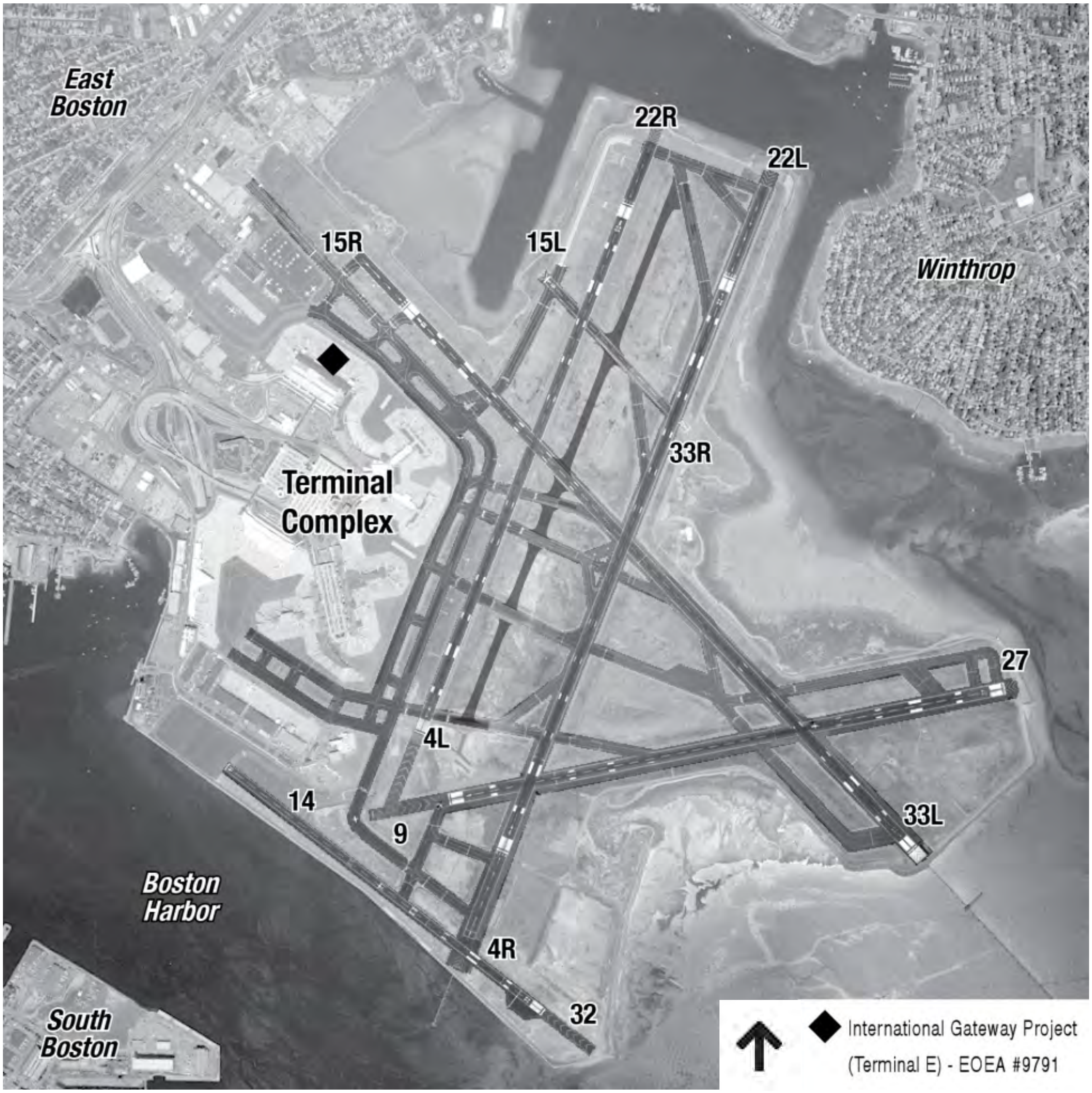
The International Gateway Project (Figure 9-2) expands and upgrades Terminal E to provide better service to international passengers. The original Terminal E was opened in 1974 and over time became outdated and too small to accommodate the growth in international travel. This project is being constructed 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 until after 2010. 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 2010. 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, 2010)

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, 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 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 two events.
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.
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.
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 new Blue Line Airport Station and in each of the Logan passenger terminals. Massport continues to offer free service to Airport Station and the water shuttle dock with its compressed natural gas (CNG) bus fleet.

Note: Text in italics detailing the mitigation measures is excerpted from the Section 61 Findings submitted to the EOEA, 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 EOEA on August 31, 2001

Project Status

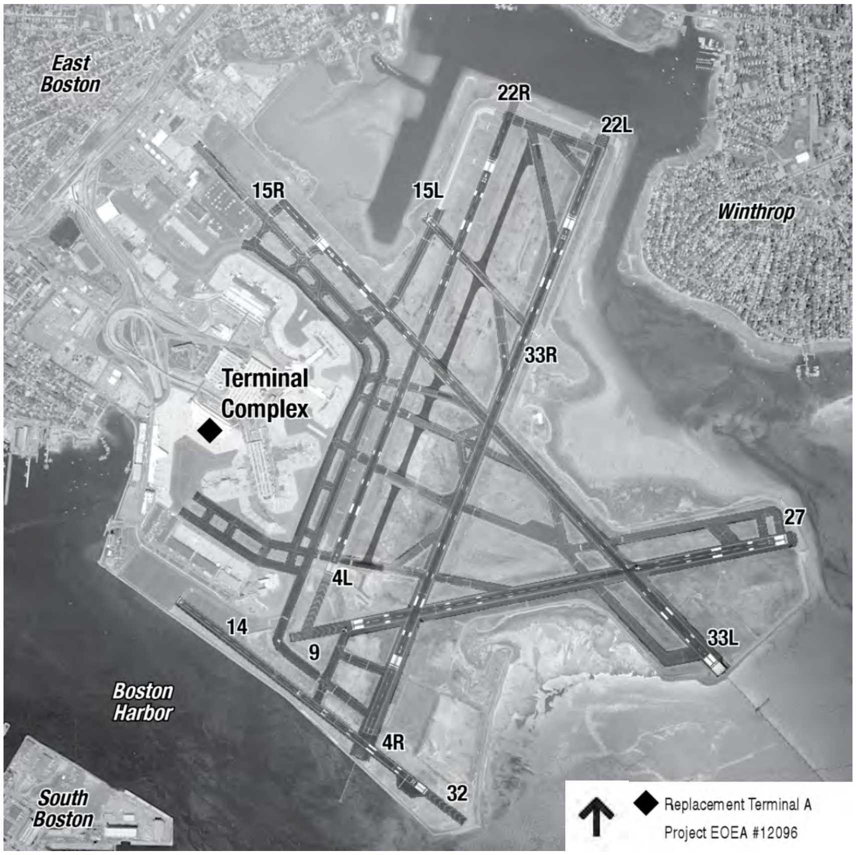
The Replacement Terminal A Project (Figure 9-3) involved the complete demolition of the pre-existing Terminal A and construction of a new facility by Delta Air Lines, consisting of a main terminal linked to a satellite concourse. The old Terminal A was closed in May 2002 and demolition commenced shortly 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.
- 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 2010.

Interior of Terminal A (Source: Massport).

Table 9-4 Replacement Terminal A Project Status Report (EOEA #12096) Section 61 Mitigation Measures (as of December 31, 2010)

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 and MassRides.
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 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.	**Implemented.** High occupancy vehicle (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 inner-most curb of [the arrivals level] will be designated exclusively for HOVs and taxis, similar to the departures level.	The Airport Silver Line service has a dedicated stop at Terminal A on the inner-most curb.
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 using 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.
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, 2010) (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 ESPR.	**Implemented.** Terminal A includes 32 electric charging stations for Delta Air Lines' electric ramp vehicles. Delta Air Lines is studying 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 PM and 7 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 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 to better understand the use of single engine taxiing. MIT completed its survey and issued a paper in March 2010 (provided in *Appendix L, Survey of Airline Pilots Regarding Fuel Conservation Procedures for Taxi Operations*.) 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 user community encouraging them to consider the use of single engine taxiing when safe to do so.
Testing alternative de-icing methods to reduce the amount of glycol usage.	**Ongoing.** Delta Air Lines will continue to investigate de-icing alternatives.

Note: Text in italics detailing the mitigation measures is excerpted from the Section 61 Findings submitted to the EOEA, 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 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 EEA'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.

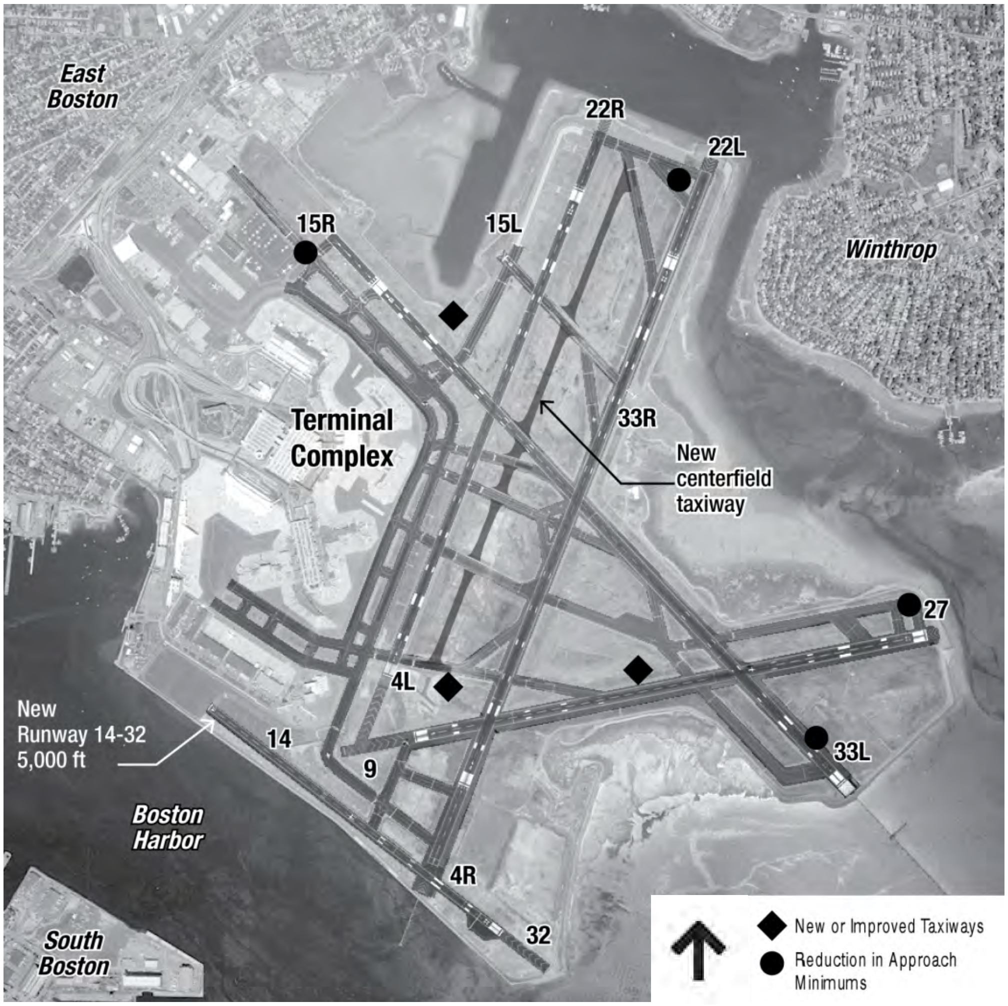
Project Status

- 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.
- Construction of taxiway improvements was completed and fully operational in 2009.
- Realignment of the southwest corner taxiway system was completed in 2007.

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 depends upon realignment of the Instrument Landing System (ILS) localizer. The construction impacts of relocating the ILS localizer are being considered in the environmental review of the RSA enhancements for Runway 33L.

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. Documentation on design and construction measures are 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, 2010)

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, 2010) (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 FAA's effort. The FAA implemented 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.
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 and more recently (2009), legislation was passed requiring Massport to assume ownership of Worcester Regional Airport. Massport 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. That service continues to operate and has expanded from its initial Florida destinations to include South Carolina.
Traveler and air service awareness will be provided to Worcester Regional Airport via marketing campaigns.	**Implemented.** In 2010, Massport continued marketing of Worcester Regional Airport following the beginning of Direct Air commercial service at the airport in November 2008.

**Table 9-5 Logan Airside Improvements Planning Project (EOEA #10458)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2010) (Continued)**

Mitigation Measure	Status
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).
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.
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 continued support was instrumental in the 2001 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 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 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, 2010) (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 requested noise study. Runway utilization, dwell and persistence reports continue to be included in Environmental Status and Planning Reports (ESPR) and EDR filings with the Massachusetts Environmental Policy Act (MEPA) Office.
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. Federal funding for Phase 2 was requested early to ensure seamless continuation of the study and transition. Phase 2, the Boston Logan Airport Noise Study (BLANS), now underway, is addressing additional noise abatement alternatives that will require detailed analysis to meet FAA environmental requirements. FAA has begun implementing new RNAV procedures that were designed in Phase 1. The noise study currently underway is expected to continue and if required the FAA may undertake a final phase environmental review. 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, 2010) (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. *Appendix K, 2010 Peak Period Pricing Monitoring Report* includes a copy of Massport's Peak Period Pricing Monitoring Report for 2010.
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 to better understand the use of single engine taxiing. MIT completed its survey and issued a paper in March 2010 (provided in *Appendix L*). 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 Boston Logan. 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.*
Report on Progress of Logan TMA	**Implemented.** *Chapter 5, Ground Access to and from Logan Airport* of the *2010 EDR* discusses the status of the Logan Transportation Management Association (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.

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, EEA # 14137

Permitting History

- Certificate on the Final EIR issued on May 28, 2010
- Section 61 Findings submitted to EEA on June 29, 2010

Project Status

Massport is redeveloping the SWSA at Logan Airport and will construct 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 some enabling projects commenced in late summer 2010 as final design of the facility proceeded. 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 garage's utilities and foundation will be constructed in 2012. The first rental car companies are expected to move into QTA1 in mid-2013 and the balance by early 2014. By early 2015, 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.

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2010)

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.	These stormwater design features are being included in the final project design.
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.	
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.	This element is being included in the ongoing final design.
Develop a Soil Management Plan and submit to the MassDEP prior to construction for the Activity and Use Limitations (AUL) areas.	Massport will develop a soil management plan and submit it to MassDEP prior to construction.
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).	During construction, the soil and groundwater issues surrounding the existing rental car operations will be addressed in compliance with the MCP.

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2010) (Continued)

Mitigation Measure	Status
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.	Massport has contracted for purchase of the new unified bus fleet
Incorporate noise reduction strategies into site design, such as solid fences/walls, gateway signs/walls, and landscaped berms.	This element is being included in the ongoing final design.
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.	This element is being included in the ongoing final design.
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.	This element is being included in the ongoing final design.
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.	This element is being included in the ongoing final design.
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).	This element is being included in the ongoing final design.
Conduct a third-party commissioning process to ensure the effectiveness of building systems (as required by MA LEED Plus).	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.	This element is being included in the ongoing final design.
Reduce water use demand and wastewater generation by reclaiming and reusing car washing water.	This element is being included in the ongoing final design.

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2010) (Continued)

Mitigation Measure	Status
Potential collection of and reuse of stormwater runoff for irrigation of landscaped areas.	This element is being considered as part of the final design.
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.	This element is being included in the ongoing final design.
Transportation and Parking	
Roadway Improvements	
Reconstruct Porter Street, including turnaround for exiting taxis.	This element is being included in the ongoing final design.
Reconfigure SR-14 and new alignment of Ramp 1A-S.	This element is being included in the ongoing final design.
Construct new dedicated Unified Bus System access and ramp off of SR-14.	This element is being included in the ongoing final design.
Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Porter Street intersection.	This element is being included in the ongoing final design.
Reconstruct, widen and convert Jeffries Street to one-way northbound, between Harborside Drive and Tomahawk Drive.	This reconfiguration is underway.
Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Jeffries Street intersection.	This element is being included in the ongoing final design.
Construct the extension of Tomahawk Drive –a one-way westbound roadway connecting Harborside Drive with the Maverick Street Gate and Garage Structure.	This element is being included in the ongoing final design.
Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Hotel Drive intersection.	This element is being included in the ongoing final design.
Reconfigure inbound lane of the Maverick Street Gate to provide additional queue storage.	This element is being included in the ongoing final design.
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.	Massport has contracted for purchase of the new unified bus fleet

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137)
Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2010) (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 has contracted for the new unified bus fleet.
Utilize clean- and low-emission fuel for the Unified Bus System to further reduce emissions.	To be implemented upon project opening; Massport has contracted for the new unified bus fleet.
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 has contracted for the new unified bus fleet.
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 being included in the ongoing final design.
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.	This element is being included in the ongoing final design.
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.	This element is being included in the ongoing final design.
Provide street and pedestrian-level lighting and advanced warning signals and/or systems at crosswalks.	This element is being included in the ongoing final design.
Transportation Demand Management (TDM) Plan	
Provide limited SWSA employee parking on-site.	This element is being included in the ongoing 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.	This element is being included in the ongoing final design.
Require rental car companies to participate in the Logan Transportation Management Association (TMA).	This requirement will be included in new consolidated car rental facility (ConRAC) tenant leases.
Alternative-Fuel Vehicles	
As presented under 'Rental Car Company-Related Environmental Commitments' below, the rental car companies would provide fuel-efficient and/or alternative-fueled rental vehicles (quantity to be determined by the rental car companies).	

Table 9-6 Southwest Service Area (SWSA) Redevelopment Program (EEA # 14137) Details of Ongoing Section 61 Mitigation Measures (as of December 31, 2010) (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).	This project is under construction.
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.	Preconstruction residential survey completed. Construction underway.

Recently Approved Projects with Upcoming Mitigation Requirements

Logan Airport RSA Project – EOEA #14442

Permitting History

- Certificate on the Final Environmental Assessment (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 EEA on May 27, 2011, and published in the *Environmental Monitor* on June 8, 2011.

Project Status

- Construction of the Runway 33L RSA commenced in June 2011.

As described in previous EDRs, 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, though 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. The Draft EA/EIR was submitted to FAA and EEA on July 15, 2010, and the Final EA/EIR was submitted to FAA and EEA on January 30, 2011. Figure 9-5 indicates the status of RSA projects at Logan Airport.

The Runway 33L RSA improvements include constructing a 600-foot long RSA with an EMAS bed, portions of which will be 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 began in July 2011 after eelgrass from within the footprint of the deck was harvested and transplanted at the mitigation sites in Hull and Boston.

The Runway 22R improvements will enhance the existing RSA by constructing an inclined safety area (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 not commence before 2013.

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

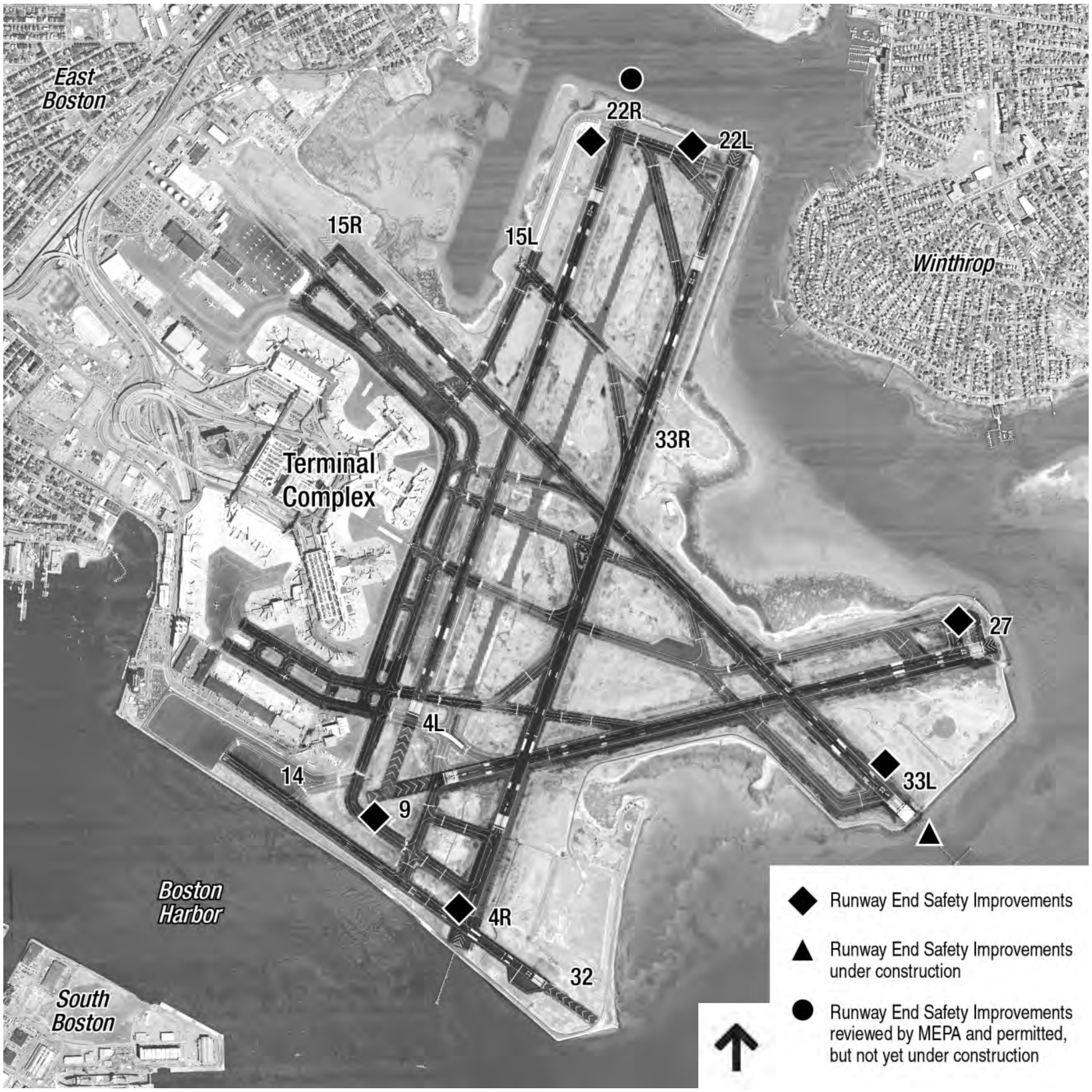


Table 9-7 Logan Airport Runway Safety Area Improvement Program (EEA # 14442) Section 61 Mitigation Commitments to be Implemented

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.** All eelgrass needed to meet 3:1 mitigation ratio has been relocated to Hull or Boston. Monitoring is underway.
Implement sediment control measures.	**Implemented.** Sedimentation control measures have been installed and are being fully maintained.
Store construction barges outside of any eelgrass beds overnight.	**Implemented.** There is no barge storage in or immediately adjacent to eelgrass beds.

Table 9-7 Logan Airport Runway Safety Area Improvement Program (EEA # 14442) Section 61 Mitigation Commitments to be Implemented (Continued)

Mitigation Measure	Status
Restrict barge movement to designated construction corridors outside of the eelgrass bed.	**Implemented.** There is 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.	**To be implemented post-construction.**
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 post-construction.**
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.	The MA Division of Marine Fisheries (MassDMF) has identified a risk of shellfish disease in the Logan flats, including 22R. Accordingly, MassDMF 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 is pending as of this filing.
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.	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.
Construction Management	
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.
Apply water to dry soil to prevent dust production.	**Implemented.** Ongoing 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.** Ongoing 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.** Ongoing for Runway 33L construction; pending for future Runway 22R construction.
Maintain equipment to prevent oil and fuel leaks.	**Implemented.** Ongoing 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.** Ongoing for Runway 33L construction; pending for future Runway 22R construction.

Table 9-7 Logan Airport Runway Safety Area Improvement Program (EEA # 14442) Section 61 Mitigation Commitments to be Implemented (Continued)

Mitigation Measure	Status
Contain and pump slurry and/or silty water to a containment area on a construction barge in order to contain runoff	**Implemented.** Ongoing for Runway 33L construction; pending for future Runway 22R construction.
Noise	
Maintain mufflers on construction equipment.	**Implemented.** Ongoing for Runway 33L construction; pending for future Runway 22R construction.
Keep truck idling to a minimum in accordance with Massachusetts anti-idling regulations.	**Implemented.** Ongoing for Runway 33L construction; pending for future Runway 22R construction.
Fit any air-powered equipment with pneumatic exhaust silencers.	**Implemented.** Ongoing for Runway 33L construction; pending for future Runway 22R construction.
Do not allow nighttime construction.	**Implemented.** Ongoing 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.** Ongoing for Runway 33L construction; pending for future Runway 22R construction.
Retrofit appropriate diesel construction equipment with diesel oxidation catalyst and/or particulate filters.	**Implemented.** Ongoing 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.** Ongoing for Runway 33L construction; pending for future Runway 22R construction. Contractors assemble offsite and access Logan in shared vans. Contractors have access to 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.** Ongoing 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.** Ongoing for Runway 33L construction; pending for future Runway 22R construction. Contractors assemble offsite and access Logan Airport in shared vans. Contractors have access to TMA services through MassRides.

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MEPA Appendices

- Appendix A – MEPA Certificate and Responses
- Appendix B – Comment Letters and Responses
- Appendix C – Proposed Scope for the *2011 ESPR*
- Appendix D – Distribution

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A

MEPA Certificates and Responses to Comments

- Secretary of the Executive Office of Energy and Environmental Affairs Certificate on the *Logan Airport 2009 Environmental Data Report (2009 EDR)* and Massport's Responses to Comments raised in the Certificate.
- Copies of the Secretary's Certificates on the EDRs issued for the reporting years 2004, 2005, 2006, 2007 and 2008.
- Copies of the Secretary's Certificates issued for Logan Airport projects during 2010.

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Secretary of the Executive Office of Energy and Environmental Affairs Certificate on *2009 EDR* and Massport's Responses to Comments Raised in the Certificate

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The Commonwealth of Massachusetts

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November 12, 2010

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS ON THE 2009 LOGAN AIRPORT ENVIRONMENTAL DATA REPORT

PROJECT NAME	: 2009 Environmental Data Report
PROJECT MUNICIPALITY	: Boston / Winthrop
PROJECT WATERSHED	: Boston Harbor
EOEA NUMBER	: 3247
PROJECT PROPONENT	: Massachusetts Port Authority
DATE NOTICED IN MONITOR	: October 6, 2010

As Secretary of Energy and Environmental Affairs (EEA), I hereby determine that the Environmental Data Report submitted on this project **adequately and properly complies** with the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62I) and with its implementing regulations (301 CMR 11.00). The Proponent, the Massachusetts Port Authority (Massport) should submit an Environmental Data Report containing 2010 data no later than October 15, 2011. A-1

The environmental review process at Logan Airport has been structured to occur on two levels: airport-wide and project-specific. With respect to airport-wide impacts, the periodic Environmental Status and Planning Report (ESPR) process has evolved from a largely retrospective status report on airport operations to a broader analysis that also provides a prospective assessment of long range plans. It has thus become part of Massport's long range planning (consistent with the objectives of the MEPA regulations), and a vehicle for analyzing cumulative impacts associated with airport operations. The ESPR provides a "big picture" analysis of environmental impacts associated with current and anticipated levels of activities, and presents an overall mitigation strategy aimed at avoiding increases in such impacts. The ESPR analysis is supplemented by (and ultimately incorporates) the detailed analyses and mitigation commitments made by Massport in the context of project-specific environmental impact review. In addition, between preparation of each ESPR, Massport also provides more frequent (annual) Environmental Data Reports (EDRs) that contain data for the prior year's airport operations and impacts. EDRS also provide an updating on the status of outstanding mitigation commitments for all airport projects. The EDR addressing airport operations during 2009 is the subject of this Certificate.

In general, the EDR has fulfilled its purpose of providing a "snapshot" of year 2009 passenger and impact levels at Logan Airport. The technical studies in the 2009 EDR included reporting on and analysis of key indicators of airport activity levels, airport planning, the regional transportation system, ground access, noise, air quality, environmental management, and project mitigation tracking. Most environmental parameters showed improvement in calendar year
A-2 2009. However, mitigation of noise impacts and air quality remain key concerns both of this office and the commenters. In addition, there appears to be a trend of increased parking demand
A-3 at the airport that should be carefully monitored by Massport, and which requires a corresponding
A-4 focus on increasing public transit use. Finally, assessing the cumulative changes in airport operations and impacts associated with several recent Massport projects (e.g., the Consolidated Car Rental Facility, the Green Bus Depot, the East Boston-Chelsea Bypass and the parking consolidation in the North Cargo Area/Robie parcel) should be a priority of the airport-wide impact assessment reports moving forward. I expect that these topics will be addressed by
A-5 Massport in the 2010 EDR (to be filed by October 15, 2011) as outlined further below. The next ESPR document containing farther-reaching planning and assessment measures will need to be submitted the following year.

Environmental Data Reporting Process

In 1979, the Secretary of the Executive Office of Environmental Affairs 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 the submission of interim Annual Updates to provide data on conditions for the years between the GEIRs. The GEIR provided projections of environmental conditions where the cumulative effects of individual projects could be understood. The Secretary's Certificate on the *1997 Annual Update* proposed a revised environmental review process for Logan Airport. As a result, Massport evaluates the cumulative impacts associated with airport activities through preparation of periodic ESPR documents (typically every five years) and provides data updates annually through the EDRs.

The last Logan ESPR was filed for calendar year 2004. However, due to the current economic downturn, as described in this 2008 EDR submitted in the October, 2009, activity levels at Logan Airport and associated environmental impacts continued to remain well below historic levels. Therefore it was anticipated that in 2009, near-term activity levels and associated environmental effects were also expected to remain well below levels previously analyzed for

Logan Airport. As a result, the forecasted aviation growth presented in the 2004 ESPR, the predicate upon which the ESPR schedule was initially established, had not occurred. Therefore, I allowed Massport to prepare a 2009 EDR in lieu of the scheduled ESPR.

Massport has indicated in the 2009 EDR that in 2010, near-term activity levels and associated environmental effects continue to remain well below levels previously analyzed for Logan Airport. Because the forecasted aviation growth presented in the 2004 ESPR has not occurred, Massport has requested to delay filing of the next ESPR until 2011. In addition, Massport is also currently in the process of updating its passenger and operations forecast for the next twenty years. Significantly, this data will allow Massport to more accurately project passenger and operation needs that will directly influence planning for future projects at Logan Airport. The data from this forecasting process will not be available in time for filing the next A-6
annual report. Therefore, I will allow Massport to prepare a 2010 EDR followed by a 2011 ESPR (which will be filed in 2012, containing data for 2011 as well as more comprehensive analysis of future plans). Given the two-year extension of the original filing deadline for the ESPR document, I expect Massport to ensure that the 2011 ESPR will not be delayed any further.

REVIEW OF THE 2009 EDR AND SCOPE FOR THE 2010 EDR

General

The 2010 EDR must provide an annual update on conditions at Logan Airport for A-7
calendar year 2010. It should address the activity levels observed in 2010 in comparison with those predicted in the 2004 ESPR and should also report on the cumulative effects of Logan Airport operations and activities compared to 2009. The 2010 EDR should continue to serve as a background/context against which projects at Logan Airport can be evaluated. Where appropriate, Massport must continue to identify and address any longer term aviation and environmental trends that will impact airport impacts or planning.

The 2010 EDR must respond to those issues explicitly noted in this Certificate and the A-8
comments received in the next EDR. The EDR should provide a "snapshot" of the 2010 A-9
operations and impacts, while more substantial analysis and longer-range planning are expected to be presented in the next ESPR. Massport should file the 2010 EDR no later than October 15, A-10
2011.

A distribution list for the 2010 EDR (indicating those receiving documents, CDs, or A-11
Notices of Availability) should be provided in the document. This section must also include A-12
copies of all ESPR and EDR Certificates issued since the 2004 Logan Environmental Status and Planning Report (issued on August 16, 2006) to provide context for reviewers. In addition, the A-13
document should contain copies of any MEPA Certificates issued for projects at Logan airport in 2010. Supporting technical appendices should be provided as necessary.

Activity Levels

The Activity Levels chapter provides a solid analysis of major activity issues and the technical appendix contains useful and detailed information. This chapter presents aviation activity statistics for Logan Airport in 2009 and compares activity levels to the prior year including air passengers, aircraft operations, fleet mix, and cargo/mail volumes. The total number of air passengers at Logan Airport during 2009 dropped to 25.5 million, compared to 26.1 million in 2008. The decrease in the total number of air passengers was 2.3 percent, compared to a decrease of 7.1 percent in the previous year. In addition, the total number of aircraft operations declined from 371,604 in 2008 to 345,306 in 2009, a decrease of 7.1 percent. The 2009 EDR also reports that the passenger aircraft operations decreased by 3.8 percent and operations by general aviation (GA) aircraft also declined by a dramatic 48.6 percent in 2009. Also the 2009 EDR reports that the cargo operations decreased by 23.2 percent in 2009, compared to 2008.

The EDR presents data indicating that the number of air passengers per aircraft operation increased, from an average of 70.2 passengers per aircraft operation in 2008 to an average of 73.9 passengers per aircraft operation in 2009. The passenger load factor (the percentage of seats occupied by revenue passengers) also increased slightly from 72.8 to 72.9. This reflects greater air carrier efficiency. While legacy airlines, such as Delta Air Lines, Continental Airlines, and US Airways, reduced aircraft operations significantly at Logan Airport, low-cost carriers (LCCs) operations increased by 12.3 percent. In addition to a continuing expansion in service offerings by JetBlue Airways, Logan Airport saw operations for two new LCCs, Southwest Airlines and Virgin America, begin in 2009. In addition, the 2009 EDR reports that the air cargo volumes declined 12.1 percent from 621 million pounds in 2008 to 546 million pounds in 2009. The largest volume decrease occurred in the express/small packages segment.

A-14

For the 2010 EDR, the Activity Levels chapter should include:

- Aircraft operations, including fleet mix and scheduled airline services at Logan Airport;
- Passenger activity levels;
- Cargo and mail activities;
- A comparison of the 2010 aircraft operations, cargo/mail operations, and passenger activity levels to 2009 activity levels; and
- A report on national aviation trends in 2010 and a comparison to trends at Logan Airport.

A-15

In addition to reporting the analysis of major activity issues, I advise Massport to consider and attempt to address all comments related to activity levels in the 2010 EDR.

Planning

The Airport Planning chapter provides an overview of planning, construction, and permitting activities that occurred at Logan Airport in 2009. It also describes known future planning, construction, and permitting activities. Construction of a 9,300-foot long centerfield taxiway (Taxiway M) was completed and opened in summer of 2009. Also in 2009 Massport continued the permitting for redevelopment of the Southwest Service Area (SWSA) at Logan Airport which includes consolidation of the rental car operations and their shuttle buses into a single coordinated operation that will result in reduced vehicle miles traveled and the associated air emissions. A Final EIR for the project was filed in March 2010, and a Certificate that determined that the EIR adequately and properly complies with MEPA. In addition, in 2009, Massport began the MEPA review process for the proposed Logan Runway Safety Area (RSA) Improvements at Runway ends 33L and 22R. A Draft EIR was submitted on that project in 2010. Preliminary design of a proposed Green Bus Depot for bus maintenance in the North Service Area (NSA) began in 2009 and an expanded ENF for the Green Bus Depot was filed in 2010.

During 2009 Massport published the Sustainable Design Standards and Guidelines (SDSG) for use by architects, engineers, and planners working on capital improvement projects for Massport facilities. The 2009 EDR reports multiple projects in the planning and design phase. Planning commenced for two hangar upgrades. Massport also commenced with Terminal B Garage repair and rehabilitation where solar panel "trees" were installed on the roof. An extension to Taxiway D was completed and the Taxiway G realignment construction commenced.

Planning for the North Service Area (NSA) Roadway Corridor project began. The NSA Roadway Corridor Project coordinates the roadway and urban design vision for North Service Road and Frankfort Street with ongoing design and construction efforts in the NSA. The 2009 EDR reports that the planning commenced for the Logan Airport Parking Deck Project on the Robie Parcel within the North Cargo Area (NCA) with the construction beginning in spring 2010. The NSA Roadway Corridor project will coordinate the NCA Logan Airport Parking Deck Project, East Boston-Chelsea Bypass Project, the SWSA Redevelopment Project, and the NSA Buffer Project to develop a unified utility, roadway, and landscape vision for the NSA roadway corridor between Prescott Street and Neptune Road. Massport has also begun planning for the East Boston-Chelsea Bypass Project, to develop a limited access roadway between Logan Airport and the new Chelsea Street Bridge. An ENF for this project is currently under review by the MEPA Office.

For the 2010 EDR, the Airport Planning chapter should describe the status of planning initiatives for the: A-16

- Roadway Corridor Projects;
- Airport Parking;
- Terminal Area;
- Airside Area;
- Service and Cargo Areas; and
- Airport Buffers and Landscaping.

A-17 I expect that this chapter will contain a comprehensive discussion about the coordination of parking efforts at Logan in light of the construction of the Parking Deck Project on the Robie Parcel, beyond what was presented in the 2009 EDR (or that such information will be presented elsewhere in the document). The discussion should include information on the use of the new Parking Deck (or a schedule for implementing use) and the corresponding changes in use (e.g., uses that have been shifted or eliminated) of other parking areas at Logan.
A-18 I understand that data will also be available about parking patterns as a result of ongoing passenger surveys being undertaken by Massport and the results of these surveys should inform the discussions about airport-wide parking operations.

A-19 I also note that several of the projects described in the planning chapter of the 2009 EDR are designed, at least in part, to consolidate and direct airport-related traffic to centralized locations and to minimize airport-related traffic on external streets in adjacent neighborhoods. The 2010 EDR should report, to the extent possible, on the status and effectiveness of these cumulative efforts.

A-20 The EDR should also report on the status of public works projects implemented by other agencies within the boundaries of Logan Airport.
A-21 Massport should continue to assess planning strategies for improving Logan Airport's operations and services in a, safe, secure, efficient, and environmentally sensitive manner.

Regional Transportation

In general, the 2009 EDR has met the requirements with respect to regional transportation issues. The directives in the ESPR Certificate were laid out to have Massport look at potential diversions, and explain how its planning and coordination with other agencies could impact potential diversions. The 2009 EDR has performed this task.

The chapter describes activity levels at New England's regional airports in 2009 and updates recent planning activities. Massport has demonstrated that it is coordinating its planning with other transportation agencies, and that this planning effort is aimed at minimizing cumulative impacts from Logan Airport operations. The 2009 EDR includes estimates of potential passenger diversions from Logan, and outlines how Massport planning encourages those diversions.

The decreases in passenger traffic and aircraft operations at New England airports reflect national trends in the face of volatile fuel prices and a worsening global economy. Specifically, of the total number of air passengers utilizing New England's primary commercial service airports, including Logan Airport, decreased from 44.4 million in 2008 to 42 million in 2009. This represents a passenger traffic decline of 5.4 percent. In the region, activity levels as measured by the number of aircraft operations fell by 14.2 percent, from 1.21 million operations in 2008 to 1.03 million operations in 2009. In addition, air passenger traffic at the regional airports in New England declined, as the challenging operating environment for airlines affected smaller communities disproportionately. Airlines introduced major reductions in operations throughout the year, eliminating less profitable routes and cutting frequencies in smaller markets. LCCs, such as Southwest Airlines and JetBlue Airways, also stopped expanding their operations at regional airports in recent years, and are now instead focusing on expansion in larger air service markets with a strong business travel portfolio.

Massport also reported in the 2009 EDR that there were continued negotiations with the City of Worcester to purchase Worcester Regional Airport. In June 2010, the City of Worcester transferred the airport to Massport for $17 million.

Massport should continue the directive from the ESPR Certificate for the 2010 EDR. In addition, for 2010 EDR the chapter on Regional Transportation should describe Logan Airport's role in the region's intercity transportation system by reporting on the following related to Regional Airports and Regional Transportation System: A-22

Regional Airports A-23

- 2010 regional airport operations, passenger activity levels, and schedule data within an historical context;
- Status of plans and new improvements as provided by the regional airport authorities;
- Ground Access improvements to the regional airports; and
- The role that Worcester Regional Airport and Hanscom Field play in the regional aviation system and Massport's efforts to promote these airports.

Regional Transportation System A-24

- Massport's efforts in strengthening the regional transportation system;
- Massport's cooperation with other transportation agencies to promote efficient regional highway and transit operations; and
- Report on metropolitan and regional rail initiatives and ridership.

<u>Ground Transportation</u>

The 2009 EDR serves its purpose of updating 2009 ground access conditions on the airport, and has also adequately addresses the updating of the three new programs to support employees' use of alternative transportation options.

This chapter reports on transit ridership, roadways, traffic volumes, and parking for 2009. Specifically, ground transportation activity levels associated with Logan Airport generally decreased for all surface transportation modes from 2008 to 2009 as a result of a 2.3 percent decline in the annual number of air passengers. The 2009 EDR reports that the average daily traffic on airport roadways decreased by 7 percent from 2008 to 2009, while vehicle miles traveled decreased by 5 percent.

Data in the 2009 EDR reports that Massachusetts Bay Transportation Authority (MBTA) transit ridership to the Airport, including the Blue Line and the Silver Line, increased in 2009. Silver Line boardings at the Airport continued to grow, increasing by 11 percent in 2009 (compared to a 5 percent increase in 2008). In contrast, air passenger ridership on Logan Express bus, by water transportation, and by limousine decreased in 2009. From 2008 to 2009, Logan Express air passenger ridership decreased by 8 percent, ridership on water transportation decreased by 8 percent, limousine ridership decreased by 11 percent, and taxi dispatches decreased 7 percent. The 2009 EDR reports that over the past several years, transit services, including Logan Express, have experienced substantial increases in employee use. In 2009, employee use of Logan Express increased 4 percent over 2008 levels.

Despite improvements in use of the MBTA's Blue Line and Silver Line, the number of vehicles parked on-Airport increased by 11 percent in 2009 compared to 2008. The EDR states that Massport continued to comply with the Logan Airport Parking Freeze, and the document contained copies of Massport's bi-annual Parking Space Inventory reports that are submitted to the Massachusetts Department of Environmental Protection to document Massport's compliance with the Parking Freeze.

A-25 The 2010 EDR should continue to update 2010 ground access conditions on the airport and report on the use of the three new programs to support employees' use of alternative A-26 transportation options. The chapter should also report on 2010 conditions and provide a comparison of 2010 findings to those of 2009 for the following:

- Detailed description of compliance with the Logan Airport Parking Freeze;
- High occupancy vehicle (HOV) ridership (including Blue Line, Silver Line, Scheduled, Unscheduled, Water Transportation, and Logan Express);
- Logan Airport Employee Transportation Management Association (Logan TMA) membership and services;
- Logan Airport gateway volumes;
- On-airport traffic volumes;
- On-airport vehicle miles traveled (VMT). VMT will be calculated using the updated model created in 2004 that is based on the full build roadway network;
- Parking demand and management (including rates and duration statistics); and
- Ground access management strategy.

A-27 I am troubled by the increased demand for vehicle parking at Logan demonstrated by the 2009 data reported in the EDR, a concern that I understand is shared by Massport. Although Massport has already dedicated significant resources to encouraging transit use, the increased parking demand data suggest that greater efforts are warranted. The 2010 EDR should report on Massport's efforts in this regard. In addition, I expect that this will be a significant component of the long-range planning efforts Massport is currently undertaking.

Noise

The Noise Abatement chapter updates the status of the noise environment at Logan Airport in 2009, and describes Massport's efforts to reduce noise levels. The technical appendix contains useful and detailed information, while the main text provides a solid analysis of major noise issues. Many of the issues raised in the noise analysis are ongoing and require continuous monitoring. The future 2010 EDR represents an appropriate forum to serve this updating function.

The decrease in the number of aircraft operations in 2009 resulted in changes in the noise environment. The 2009 Day-Night Sound Level (DNL) contours were smaller in many locations compared to 2008. The 65 dB DNL contour decreased in size in East Boston. The contour reduced in size over Winthrop and towards South Boston from Runway 27, but increased slightly north of the Airport over Revere due to an increase in departures from Runway 4R. The contour also increased south of the Airport over South Boston due to an increase in arrivals to Runways 4L and 4R. These changes are due to extended closings of Runway 9-27 for resurfacing in 2009.

In 2009 Massport completed installation of an improved Noise Monitoring System (NOMS). The Era Systems Corporation's (ERA) flight tracking system and all new noise monitors were operational in 2009. Combined with new noise monitor software, the system has an improved capability of correlating measured noise events with individual flight tracks.

The 2009 EDR reports that the overall number of people exposed to DNL values greater than 65 decibels (dB) decreased by 43 percent in 2009 compared to 2008. An estimated 4,335 people were exposed to DNL levels greater than 65 dB, as depicted in the 2009 contour, compared to 7,579 in 2008. This is the first time that the number of people exposed to the 65 dB noise level has been fewer than 5,000 since reporting this data in the EDR format. The total population exposed to noise levels greater than DNL 70 dB decreased from 249 in 2008 to 243 in 2009. There was a reduction of noise for 73 people in Winthrop but an increase of noise for 67 people exposed to greater than DNL 70 dB in Boston. The EDR reports that all of the residences exposed to DNL levels greater than 65 dB in 2009 that have chosen to participate in the soundproofing program have been sound-insulated by Massport. In 2009, Massport provided sound insulation to 83 homes, nearly half of which were in Chelsea. The focus of this 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 sound insulation program, 11,136 homes have been sound-insulated in East Boston, South Boston, Winthrop, Revere, and Chelsea.

The information in this chapter is very informative and I encourage Massport to continue this format in the 2010 EDR. I also strongly advise Massport to consider and address the comments received that have raised noise related concerns. Commenters have requested further explanation of the reasons for the increased use of Runway 33L for jet aircraft departures and corresponding decrease in use of Runway 27. The comments from the City of Cambridge, as well as from individuals such as Ms. Timmerman, P.E., have raised a number of concerns and

A-28

A-29

A-29 suggestions related to noise that Massport should incorporate into the 2010 EDR.

A-30 For 2010 the Noise Abatement chapter should provide an overview of the environmental regulatory framework affecting aircraft noise, the changes in aircraft noise, and the updates in noise modeling.

A-31 The chapter should report on 2010 conditions and compare 2010 conditions to those of 2009 for the following:

- Fleet Mix, including Stage II, Recertified (Hushkitted) Stage III, newly manufactured Stage III, and any qualifying Stage IV aircraft;
- Nighttime operations;
- Runway utilization (report on aircraft and airline adherence with runway utilization goals);
- Preferential runway advisory system (PRAS) compliance; and
- Flight tracks, including a discussion of the update on the Standard Terminal Automation Replacement System (STARS) radar and consolidation of the Boston Terminal Radar Approach Control (TRACON) at Merrimac, plus Massport's installation and use of PASSUR data.

A-32 The chapter should also report on 2010 conditions and compare those to 2009 conditions for the following noise indicators:

- Using the Federal Aviation Administration's (FAA) most current version of the Integrated Noise Model (INM), and RealContours and RealProfiles, produce an accurate set of Day-Night Sound Level (DNL) noise contours. Adjustments made to account for over-water sound propagation and the propagation of sound to areas of higher terrain will be reported;
- Noise-impacted population;
- Measured versus modeled noise values, including reasons for differences and any improvements attributable to the use of RealContours and RealProfiles;
- Cumulative Noise Index (CNI);
- Times-Above for 65, 75, and 85 dBA threshold values;
- Installation and benefits of the new noise monitoring system; and
- Flight track monitoring noise quarterly reports.

A-33 The chapter should also report on noise abatement efforts and provide a status update on the new noise and operations monitoring system.

<u>Air Quality</u>

The Air Quality/Emissions Reduction chapter provides an overview of airport-related air quality issues in 2009 and efforts to reduce emissions. The modeled emissions inventory results were driven principally by the lower number of aircraft operations at the Airport compared to 2008, and continual refinements to the FAA Emissions and Dispersion Modeling System

(EDMS). The 2009 EDR reports that the total emissions of volatile organic compounds (VOC) were 980 kg/day, or 19 percent lower than 2008 levels. Total emissions of oxides of nitrogen (NOX) were 3,979 kg/day, or 5 percent lower than 2008 levels. In 2009, total NOx emissions at Logan Airport (net total with reductions) were approximately 746 tons per year (tpy) lower than the 1999 Massport's Air Quality Initiative (AQI) benchmark. This represents a 32 percent decrease in NOx emissions since 1999. Total emissions of carbon monoxide (CO) were 7,925 kg/day, or 5 percent lower than 2008 levels. Because of the refinements to the EDMS model and decreased air traffic, total emissions of particulate matter (PM) PM10/PM2.5 associated with operations at Logan Airport have decreased by approximately 12 percent to 71 kilograms per day (kg/day) compared to 2008 levels. By comparison, using the earlier EDMS v5.1 total emissions of PM10/PM2.5 would have decreased by approximately 2 percent to 79 kg/day. This variation is attributed to differences in the EDMS versions.

As part of the Section 61 findings for the centerfield taxiway component, the first phase of a two-phase Massport Air Quality Monitoring Study was initiated in September 2007 at ten locations on- and off-airport using both real time and time-integrated methods to measure fine particulates, volatile organic compounds (VOC), carbonyls, black carbon, and polynuclear aromatic hydrocarbons (PAHs). The 2009 EDR reports that since 1999 there has been a continuing trend of decreasing nitrogen dioxide (NO2) concentrations at both the Massport and Massachusetts Department of Environmental Protection (MassDEP) monitoring sites located in the general vicinity of Logan Airport. In addition, the annual NO2 concentrations at all monitoring locations in 2009 were well within the National Ambient Air Quality Standards (NAAQS) for NO2. The first phase of a two-phase Massport Air Quality Monitoring Study commenced in September 2007, and was completed September 2008, and a final report will be issued summarizing the findings. The study is collecting ambient data on a variety of air pollutants over a two-year period and will assess air quality changes attributable to the operation of the new centerfield taxiway. The second phase of the study will begin in September 2010 now that the centerfield taxiway is completed and fully operational.

Massport prepared an emission inventory of greenhouse gas (GHG) emissions directly and indirectly associated with Logan Airport. The 2009 GHG emission inventory has been updated incorporating guidance developed by the Transportation Research Board's (TRB) Airport Cooperative Research Program (ACRP). The ACRP guidance was published in April 2009 to be used by airport operators developing an airport specific GHG emissions inventory. While not including emissions from the cruise phase of flight above 3,000 feet, in a change from previous EDRs, the 2009 inventory assigns emissions based on ownership and control boundaries (i.e., emissions and sources associated with Massport, airport tenants and the general public). The vast majority of the emission sources at Logan Airport are owned or controlled by the airlines, other airport tenants, and passenger vehicles. Massport operations contribute only 11 percent of the total GHG emissions for the Airport. Total Logan Airport GHG emissions in 2009 were 14 percent lower than 2008 levels.

Massport has also made attempts to reduce aircraft emissions by working 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 other taxiway improvements. Runway 14-32 became operational in November 2006 and the centerfield taxiway was fully opened in summer 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
A-34 March 2010 which was included in Appendix L. Commenters on the 2009 EDR have requested that Massport increase efforts to encourage the use of single engine taxiing. An update of these efforts should be reported in the 2010 EDR.

A-35 The 2010 EDR should continue updates on the information presented in the 2009 EDR and
A-36 address comments received related to air quality. For 2010 the Air Quality/Emissions Reductions chapter should include an overview of the environmental regulatory framework affecting aircraft emissions, changes in aircraft emissions, and the changes in air quality
A-37 modeling. The chapter should also discuss analysis methodologies and assumptions and report on 2010 conditions using the most recent versions of the Emissions Dispersion Modeling System
A-38 (EDMS) and MOBILE motor vehicle emissions. The chapter should also include:

- Emissions inventory for carbon monoxide (CO);
- Emissions inventory for oxides of nitrogen (NOx);
- Emissions inventory for volatile organic compounds (VOCs);
- Emissions inventory for particulate matter (PM);
- Nitrogen dioxide (NO2) monitoring; and
- NOx emissions by airline.

This chapter should also report on the following air quality initiatives (AQI) for 2010:

- Air Quality Initiative Tracking;
- Massport's and Tenant's Alternative Fuel Vehicle Programs; and
- The status of other Logan Airport air quality studies undertaken by Massport or others.

A-39 The Air Quality Chapter should also include an inventory of GHG emissions from Logan Airport in 2010. GHG emissions should be quantified for aircraft, GSE, motor vehicles and stationary sources using emission factors and methodologies outlined in the Greenhouse Gas Emissions Policy and Protocol issued by EEA. The results of the 2010 GHG emissions inventory should be compared to the 2009 results.

Water Quality/Environmental Compliance

This chapter describes Massport's ongoing environmental management activities including NPDES compliance, stormwater, fuel spills, activities under the Massachusetts Contingency Plan, and tank management. In accordance with the requirements of the current

NPDES permit for Logan Airport that was issued on July 31, 2007, Massport and all 27 co-permittees and tenants began preparation of updated Stormwater Pollution Prevention Plan (SWPPP). Massport completed its SWPPP in December of 2007 and tenant SWPPPs were completed in March 2008. Massport's SWPPP addresses stormwater pollutants in general, and also addresses deicing and anti-icing chemical, potential bacteria, fuel and oil, and other sources of stormwater pollutants. The 2009 Annual Certificates of Compliance were submitted to the U.S. Environmental Protection Agency (EPA) and MassDEP on December 28, 2009, for Massport and each co-permittee.

In accordance with the Massachusetts Contingency Plan (MCP), the 2009 EDR reports that Massport continues to assess, remediate, and bring to regulatory closure areas of subsurface contamination. The 2009 EDR states that Massport is working towards achieving regulatory closure of the remaining MCP sites. In addition, preparation of the Environmental Management System (EMS) for facilities, where fleet and field maintenance activities are conducted, was on-going in 2009.

In 2009, there were six reportable oil and hazardous material spills detailed in the 2009 EDR. Massport received a Notice of Noncompliance (NON) from the MassDEP on September 18, 2009. The NON listed a total of 13 stormwater discharge samples that exceeded permit limits in the period since the NPDES permit was issued in July 2007. In response to the NON, Massport implemented corrective actions throughout the Airport directed at specific issues identified in the NON, as well as generally reviewing and updating standard practices at the Airport. One of the outfall samples out of a total of 72 samples at the Maverick Street Outfall exceeded the regulatory limits of the NPDES permit for the North, West and Maverick Street outfalls which was reported.

In accordance with the requirements of the NPDES permit for Logan Airport, Massport conducted a water quality study to evaluate the potential biological, chemical, and toxicological impacts of de-icer discharges on Boston Harbor. The study concluded that de-icer discharges do not negatively impact dissolved oxygen levels in the harbor, do not contain materials in concentrations over water quality criteria or toxicological benchmarks, and do not adversely affect the designated uses of the receiving waters.

For 2010 the Water Quality/Environmental Compliance and Management chapter should report on the 2010 status of: A-40

- National Pollutant Discharge Elimination System (NPDES) Permit and monitoring results for Logan Airport's outfalls and the Fire Training Facility
- Jet fuel usage and spills
- Massachusetts Contingency Plan (MCP) Activities
- Tank Management
- Update on the environmental management plan
- Fuel spill prevention

A-40

- Future stormwater management improvements (if any)
- Future MCP and tank management activities

Massport should continue to report in the 2010 EDR how Massport will assess, remediate, and bring to regulatory closure areas of subsurface contamination.

Sustainability at Logan Airport

This chapter describes Massport's airport wide sustainability goals. 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. In October 2004, the Massport Sustainability Team produced the *Massachusetts Port Authority Sustainability Plan* (Sustainability Plan). The Environmental Management Policy is incorporated in the Sustainability Plan as Massport's long-term sustainability goal or vision.

A-41

This chapter describes Massport's continued efforts including Massport-wide sustainability and details how sustainability is incorporated into many aspects of Massport's activities: Planning and Design; Construction; Operations, Maintenance and Management; and Monitoring of Environmental Performance which are detailed in this chapter. The information in this chapter is very informative and I encourage Massport to continue with its updates in the 2010 EDR.

The 2009 EDR outlines how Massport is committed to sustainable practices to help reduce impacts associated with construction. For example, Massport requires contractors to comply with construction guidelines regarding demolition waste recycling, soil reuse, and air emissions from construction equipment. In 2009, Massport undertook the 2010 Environmental Benchmarking Survey sponsored by Airport Council International North America (ACI-NA) to assess solar power, purchase of renewable energy, availability of low emission ground transportation, recycling and "green" purchasing.

The new Signature Flight Support GA Facility in the North Cargo Area, opened in 2007, the first LEED certified GA facility in the United States. This GA Facility 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. The 2009 EDR also reports on the International Standards Organization (ISO) 14001 standard certification for Massport's Logan Airport Facilities II (vehicle maintenance, landscaping, and snow removal) that was completed in December 2006 and was recertified in December 2009. ISO Certification for Facilities I (Central Heating and Cooling Plant) and Facilities III (Electrical and Structural) is scheduled for 2010.
Massport began construction in 2010 on the new Consolidated Rental Car Facility (ConRAC). It will meet the Commonwealth of Massachusetts "LEED Plus" requirements and strive for LEED Silver level certification or better. The ConRAC will include the infrastructure necessary to accommodate future plug-in stations for electric vehicles and other alternative fuel sources such

as E-85 (ethanol). The ConRAC could accommodate car sharing services, such as ZipCar, at a later date. The ConRAC design includes pedestrian and bicycle accommodations including secure bicycle storage. The facility will include efficient water systems including water reclamation for vehicle wash water, and use of stormwater for non-potable uses such as vehicle washing and landscaping irrigation. 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. Rental car companies have pledged to maintain rental car fleets which include hybrid or alternativefuel/ low-emitting vehicles.

In 2009, Massport began a four-year rehabilitation of the Terminal B parking garage, which includes the installation of solar panels on the top parking deck and high efficiency Light-Emitting-Diode (LED) lighting throughout the structure. The use of motion-detecting LED fixtures will use approximately 50 percent less electricity than the existing lighting, reducing existing usage by 2,261,218 killowatt-hours (kWhs) of electricity per year. This, along with other energy conservation measures, will reduce 1,307 metric tons of carbon dioxide (CO2) the equivalent of not using 3,040 barrels of oil or 148,385 gallons of gasoline annually. The Airport expects a savings of $3.8 million in electrical usage over the next 20 years based on costs of $0.12 per kWh. Additionally, the installation of 16 solar panel trees is expected to produce 83,980 kWhs of electricity, or 2.5 percent of the total garage annual consumption. This is equal to the reduction of 50 metric tons of CO2 the equivalent of not using 115 barrels of oil or 5,637 gallons of gasoline annually. Each solar panel is a single structure design with a stem and steel frame that uses solar panels as a roof over parked cars. The design has the added benefit of collecting rainwater that will be used for landscaping and cleaning projects on the Airport. Each solar array is mounted on an air ventilation unit on the roof of the garage and does not affect parking operations or the number or spaces available to travelers.

For 2010, this chapter should report on the status of mitigation commitments for specific Massport and tenant projects at Logan Airport that have commenced construction. The mitigation commitments were made in the Section 61 Findings for the following projects which should be reported: A-42 A-43

- West Garage/Central Garage;
- International Gateway;
- Runway Ends 22R and 33L Safety Improvements;
- Replacement Terminal A;
- The Consolidated Rental Car Facility; and
- Logan Airside Improvements Planning.

This chapter should also update the status of Massport's mitigation commitments and identify projects for which mitigation is complete.

Responses to Comments

A-44 The 2010 EDR must include Responses to Comments which addresses all of the substantive comments from the letters listed at the end of this Certificate. The Response to Comments included in this EDR is well-constructed and cross-referenced. Massport may follow the same format in addressing comments in the next EDR, although the Responses to Comments should pay particular attention to increased specificity, where necessary.

A-45 The majority of comments received on the 2009 EDR focused on noise related issues, including measurement of noise, modeling of noise contours, and noise abatement, and emission reduction issues. In addition to responding to these comments, the 2010 EDR should continue to report on the refinements to noise tracking and abatement efforts. Massport should consult directly with individual commentors where appropriate.

Conclusion

I have determined that the 2009 EDR for Logan Airport has adequately compiled with MEPA and that Massport may prepare a 2010 EDR in lieu of a multi-year ESPR for submission in 2011.

November 12, 2010
Date

Ian A. Bowles

Comments Received:

11/04/10	Darryl Pomicter (email)
11/05/10	Nancy Timmerman
11/05/10	City of Cambridge, Executive Department
11/09/10	Jerome Falbo

IAB/ACC/acc

Comment #	Author	Topic	Comment	Response
A.1	Ian A. Bowles. Secretary	MEPA	The Proponent, the Massachusetts Port Authority (Massport), should submit an Environmental Data Report containing 2010 data no later than October 15, 2011.	The *2010 Environmental Data Report (EDR)* has been submitted in October 2011.
A.2	Ian A. Bowles. Secretary	Mitigation	However, mitigation of noise impacts and air quality remain key concerns both of this office and the commenters.	Chapter 6, *Noise Abatement,* and Chapter 7, *Air Quality/Emissions Reduction,* describe mitigation efforts for noise impacts and air quality impacts.
A.3	Ian A. Bowles. Secretary	Ground Access	In addition, there appears to be a trend of increased parking demand at the airport that should be carefully monitored by Massport, and which requires a corresponding focus on increasing public transit use.	Chapter 5, *Ground Access to and from Logan Airport,* of this *2010 EDR* provides information on increased parking demand at Logan Airport as well as efforts to increase public transit use at the Airport.
A.4	Ian A. Bowles. Secretary	Airport Planning	Finally, assessing the cumulative changes in airport operations and impacts associated with several recent Massport projects (e.g., the Consolidated Car Rental Facility, the Green Bus Depot, the East Boston-Chelsea Bypass and the parking consolidation in the North Cargo Area/Robie parcel) should be a priority of the airport-wide impact assessment reports moving forward. I expect that these topics will be addressed by Massport in the 2010 EDR (to be filed by October 15, 2011) as outlined further below.	Cumulative changes of recent Massport projects are addressed in Chapter 3, *Airport Planning.*
A.5	Ian A. Bowles. Secretary	MEPA	The next ESPR document containing farther-reaching planning and assessment measures will need to be submitted the following year.	Massport proposes to file the *2011 Environmental Status and Planning Report (ESPR)* in 2013. Please refer to the *2010 EDR* cover letter.
A.6	Ian A. Bowles. Secretary	MEPA	The data from this forecasting process will not be available in time for filing the next annual report. Therefore, I will allow Massport to prepared a 2010 EDR followed by a 2011 ESPR (which will be filed in 2012, containing data for 2012 as well as more comprehensive analysis of future plans). Given the two-year extension of the original filing deadline for the ESPR document, I expect Massport to ensure that the 2011 ESPR will not be delayed any further.	Please refer to the response to comment A.5.
A.7	Ian A. Bowles. Secretary	MEPA	The 2010 EDR must provide an annual update on conditions at Logan Airport for calendar year 2010. It should address the activity levels observed in 2010 in comparison with those predicted in the 2004 ESPR and should also report on the cumulative effects of Logan Airport operations and activities compared to 2009. The 2010 EDR should continue to serve as a background/context against which projects at Logan Airport can be evaluated. Where appropriate, Massport must continue to identify and address any longer term aviation and environmental trends that will impact airport impacts or planning.	As requested, the *2010 EDR* provides an annual update on conditions at Logan Airport for calendar year 2010. The 2010 data, including operations and activity levels, in the *2010 EDR* is compared to the levels predicted in the *2004 ESPR* and is reported cumulatively compared to 2009. Where it is helpful, multiple-year data are presented in tabular form. In addition, the *2010 EDR* provides 2010 census data for the noise assessment. See Chapter 2, *Activity Levels* .

Comment #	Author	Topic	Comment	Response
A.8	Ian A. Bowles. Secretary	MEPA	The 2010 EDR must respond to those issues explicitly noted in this Certificate and the comments received in the next EDR.	Individual responses to comments are provided in this Appendix to the *2010 EDR.*
A.9	Ian A. Bowles. Secretary	Activity Levels	The EDR should provide a "snapshot" of the 2010 operations and impacts, which more substantial analysis and longer-range planning are expected to be presented in the next ESPR.	As requested, this *2010 EDR* provides a "snapshot" of the 2010 operations and impacts. Comparisons are made to 2009 activity levels.
A.10	Ian A. Bowles. Secretary	MEPA	Massport should file the 2010 EDR no later than October 15, 2011.	The *2010 EDR* has been submitted in October 2011.
A.11	Ian A. Bowles. Secretary	MEPA	A distribution list for the 2010 EDR (indicating those receiving documents, CDs, or Notices of Availability) should be provided in the document.	The distribution list for the *2010 EDR* is provided in *Appendix D, Distribution.*
A.12	Ian A. Bowles. Secretary	MEPA	This section must also include copies of all ESPR and EDR Certificates since the 2004 Logan Environmental Status and Planning Report (issued on August 16, 2006) to provide context for reviewers.	The ESPR and EDR certificates for previous reporting years back to 2004 are provided in *Appendix A, MEPA Certificates and Responses to Comments.*
A.13	Ian A. Bowles. Secretary	MEPA	In addition, the document should contain copies of any MEPA Certificates issued for projects at Logan Airport in 2010.	MEPA certificates issued for projects at Logan Airport in 2010 are provided in *Appendix A, MEPA Certificates and Responses to Comments.*
A.14	Ian A. Bowles. Secretary	Activity Levels	For the 2010 EDR, the Activity Levels chapter should include: aircraft operations, including fleet mix and scheduled airline services at Logan Airport; passenger activity levels; cargo and mail activities; a comparison of the 2010 aircraft operations, cargo/mail operations, and passenger activity levels to 2009 activity levels; and a report on national aviation trends in 2010 and a comparison to trends at Logan Airport.	This *2010 EDR* includes a report on national aviation trends in 2009 and compares these to trends at Logan Airport. See Chapter 2, *Activity Levels.*
A.15	Ian A. Bowles. Secretary	Activity Levels	In addition to reporting the analysis of major activity issues, I advise Massport to consider and attempt to address all comments related to activity levels in the 2010 EDR.	For 2010, Massport reports on aircraft operations (including fleet mix and scheduled airline service at Logan), passenger activity levels, cargo and mail activities, and compare these to 2009 activity levels. See Chapter 2, *Activity Levels.*
A.16	Ian A. Bowles. Secretary	Airport Planning	For the 2010 EDR, the Airport Planning chapter should describe the status of planning initiatives for the: Roadway Corridor Projects; Airport Parking; Terminal Area; Airside Area; Service and Cargo Areas; and Airport Buffers and Landscaping.	Updates on the status of the Roadway corridor Projects, Airport Parking, Terminal Area, Airside Area, Service and Cargo Areas, and Airport Buffers and Landscaping are provided in *Chapter 3, Airport Planning.*

Comment #	Author	Topic	Comment	Response
A.17	Ian A. Bowles. Secretary	Airport Planning	I expect that this chapter will contain a comprehensive discussion about the coordination of parking efforts at Logan in light of the construction of the Parking Deck Project on the Robie Parcel, beyond what was presented in the 2009 EDR (or that such information will be presented elsewhere in the document). The discussion should include information on the use of the new Parking Deck (or a schedule for implementing use) and the corresponding changes in use (e.g., uses that have been shifted or eliminated) of the parking areas at Logan.	*Chapter 5, Ground Access to and from Logan Airport,* of this *2010 EDR* provides details on the coordination of parking in relation to parking-related projects at Logan Airport. Table 5-4 includes information on the use of parking areas at Logan Airport.
A.18	Ian A. Bowles. Secretary	Ground Access	I understand that data will also be available about parking patterns as a result of ongoing passenger surveys being undertaken by Massport and the results of these surveys should inform the discussions about airport-wide parking operations.	See Chapter 5, *Ground Access to and from Logan Airport*, of this *2010 EDR* for a report on parking demand at Logan Airport. As noted in Chapter 5, with the aid of the recent Logan Airport Air Passenger Ground-Access Survey, Logan Express passenger survey, an Economy Parking user survey, and analysis of recent Logan Express parking promotions, Massport is evaluating the sensitivity of travelers to parking rates and bus fares, and the potential mode shifts that might occur under different service and pricing scenarios.
A.19	Ian A. Bowles. Secretary	Airport Planning	I also note that several of the projects described in the planning chapter of the 2009 EDR are designed, at least in part, to consolidate and direct airport-related traffic to centralized locations and to minimize airport-related traffic on external streets in adjacent neighborhoods. The 2010 EDR should report, to the extent possible, on the status and effectiveness of these cumulative efforts.	Chapter 3, *Airport Planning*, of this *2010 EDR* describes the efforts to consolidate and direct airport-related traffic to centralized locations and minimize airport-related traffic on external streets in adjacent neighborhoods.
A.20	Ian A. Bowles. Secretary	Airport Planning	The EDR should also report on the status of public works projects implemented by other agencies within the boundaries of Logan Airport.	The *2010 EDR* reports on the status of relevant public works projects.
A.21	Ian A. Bowles. Secretary	Airport Planning	Massport should continue to assess planning strategies for improving Logan Airport's operations and services in a safe, secure, efficient, and environmentally sensitive manner.	As part of planning for the safe and efficient operation of Logan Airport, Massport is mindful of environmental concerns and seeks to reduce the environmental impacts associated with Logan Airport activities.
A.22	Ian A. Bowles. Secretary	Ground Access	Massport should continue the directive from the ESPR Certificate for the 2010 EDR.	The *2010 EDR* describes Massport collaboration with other regional transportation organizations in planning for the region's transportation needs. See *Chapter 4, Regional Transportation.*

Comment #	Author	Topic	Comment	Response
A.23	Ian A. Bowles. Secretary	Activity Levels	[The] 2010 EDR the chapter on Regional Transportation should describe Logan Airport's role in the region's intercity transportation system by reporting on the following related to Regional Airports and Regional Transportation System: *Regional Airports* : 2010 regional airport operations, passenger activity levels, and schedule data within an historical context; status of plans and new improvements as provided by the regional airport authorities; ground access improvements to the regional airports; and the role that Worcester Regional Airport and Hanscom Field play in the regional aviation system and Massport's efforts to promote these airports.	The *2010 EDR* reports on regional airport operations, passenger activity levels and schedule data within a historical context. The status of plans and new improvements; ground access improvements; the role of Worcester Airport and Hanscom Field in the regional aviation system, and Massport's efforts to promote them are documented in *Chapter 4, Regional Transportation.*
A.24	Ian A. Bowles. Secretary	Ground Access	[The] 2010 EDR the chapter on Regional Transportation should describe Logan Airport's role in the region's intercity transportation system by reporting on the following related to Regional Airports and Regional Transportation System: *Regional Transportation System:* Massport's efforts in strengthening the regional transportation system; Massport's cooperation with other transportation agencies to promote efficient regional highway and transit operations; and report on metropolitan and regional rail initiatives and ridership.	The *2010 EDR* reports on Massport's efforts to strengthen the regional transportation system, the agency's cooperation with other transportation agencies to promote efficient regional highway and transit operations; and metropolitan and regional rail initiatives and ridership. See *Chapter 4, Regional Transportation.*
A.25	Ian A. Bowles. Secretary	Ground Access	The 2010 EDR should continue to update 2010 ground access conditions on the airport and report on the use of the three new programs to support employees' use of alternative transportation options.	The *2010 EDR* provides an update on 2010 ground access conditions and employees' use of alternative transportation programs. See *Chapter 5, Ground Access to and from Logan Airport.*
A.26	Ian A. Bowles. Secretary	Ground Access	The chapter should also report on 2010 conditions and provide a comparison of 2010 findings to those of 2009 for the following: detailed description of compliance with the Logan Airport Parking Freeze; high occupancy vehicle (HOV) ridership (including Blue Line, Silver Line, Scheduled, Unscheduled, Water Transportation, and Logan Express); Logan Airport Employee Transportation Management Association (Logan TMA) membership and services; Logan Airport gateway volumes; on-airport traffic volumes; on-airport vehicle miles traveled (VMT). VMT will be calculated using the updated model created in 2004 that is based on the full build roadway network; parking demand and management (including rates and duration statistics); parking demand and management (including rates and duration statistics; and ground access management strategy.	*Chapter 5, Ground Access to and from Logan Airport,* reports on 2010 conditions and compares 2010 findings to those of 2009: for parking levels, high-occupancy vehicles (HOV) ridership, Logan Transportation Management Association (TMA), Logan gateway volumes, on-airport traffic volumes, on-airport vehicle miles traveled (VMT), parking demand and management, and ground access management strategy.

Comment #	Author	Topic	Comment	Response
A.27	Ian A. Bowles. Secretary	Ground Access	I am troubled by the increased demand for vehicle parking at Logan demonstrated by the 2009 data reported in the EDR, a concern that I understand is shared by Massport. Although Massport has already dedicated significant resources to encouraging transit use, the increased parking demand data suggest that greater efforts are warranted. The 2010 EDR should report on Massport's efforts in this regard. In addition, I expect that this will be significant component of the long-range planning efforts Massport is currently undertaking.	*Chapter 5, Ground Access to and from Logan Airport,* reports on transit use and parking demand. Massport fully supports encouraging transit use and is mindful of the need for long-range planning for ground access. The *2011 ESPR* will focus on long-range planning efforts including reporting on the results of Massport's Ground Access study, which is currently underway.
A.28	Ian A. Bowles. Secretary	Noise	The information in [the Noise chapter] is very informative and I encourage Massport to continue with its updates in the 2010 EDR. I also strongly advise Massport to consider and address the comments received that have raised noise related concerns.	Information on noise is provided in Chapter 6, *Noise Abatement* of this *2010 EDR.* All comments have been addressed in Appendices A and B of the *2010 EDR.*
A.29	Ian A. Bowles. Secretary	Noise	Commenters have requested further explanation of the reasons for the increased use of Runway 27. The comments from the City of Cambridge, as well as from individuals such as Ms. Timmerman, P.E., have raised a number of concerns and suggestions related to noise that Massport should incorporate into the 2010 EDR.	As in previous years, there are annual variations in runway use due to seasonal variation in wind and weather patterns, operational fleet mix, and Federal Aviation Administration (FAA) day-to-day operational decision making. There were no changes in FAA procedures with regard to Runways 27 and 33L in 2010. The implementation of the Area Navigation (RNAV) procedures affect the other runways and do not alter FAA's preference for using any of the runways.
A.30	Ian A. Bowles. Secretary	Noise	The noise abatement chapter should provide an overview of the environmental regulatory framework affecting aircraft noise, the changes in aircraft noise, and the updates in noise modeling.	Chapter 6, *Noise Abatement,* provides information on the requested topics.
A.31	Ian A. Bowles. Secretary	Noise	The chapter should report on 2010 conditions and compare 2010 conditions to those of 2009 for the following: fleet mix, including Stage II, Recertified (Hushkitted) Stage III, newly manufactured Stage III, and any qualifying Stage IV aircraft; nighttime operations; runway utilization (report on aircraft and airline adherence with runway utilization goals; Preferential runway advisory system (PRAS) compliance; flight tracks, including a discussion of the update on the Standard Terminal Automation Replacement System (STARS) radar and consolidation of the Boston Terminal Radar Approach Control (TRACON) at Merrimac, plus Massport's installation and use of PASSUR data.	Massport reports on 2010 conditions and compares them to those of 2009 for the following: fleet mix including: Stage II, Recertified Stage III, newly manufactured Stage III, and qualifying Stage IV aircraft; nighttime operations; runway utilization; PRAS compliance; and flight tracks. See Chapter 6, *Noise Abatement.*

Comment #	Author	Topic	Comment	Response
A.32	Ian A. Bowles. Secretary	Noise	The chapter should also report on 2010 conditions and compare those to 2009 conditions for the following noise indicators : Using FAA's most current version of the Integrated Noise Model (INM) and RealContours and RealProfiles, produce an accurate set of Day-Night Sound Level (DNL) noise contours. Adjustments made to account for over-water sound propagation and the propagation of sound to areas of higher terrain will be reported; noise-impacted population; measured versus modeled noise values, including reasons for differences and any improvements attributable to the use of RealContours and RealProfiles; Cumulative Noise Index (CNI); Times-Above for 65,75,85 dBA threshold values; installation and benefits of the new noise monitoring system; and flight track monitoring noise quarterly reports.	The *2010 EDR* reports on 2010 conditions and compares them to those of 2009 for the following noise parameters: DNL noise contours, noise impacted population, measured versus modeled noise values, CNI, Times-Above for 65,75, 85 dBA threshold values, installation and benefits of new noise monitoring system, and flight track monitoring noise quarterly reports. See Chapter 6*, Noise Abatement.*
A.33	Ian A. Bowles. Secretary	Noise	The chapter should also report on noise abatement efforts and provide a status update on the new noise and operations monitoring system.	An update on noise abatement efforts and new noise and operations monitoring system can be found in Chapter 6*, Noise Abatement.*
A.34	Ian A. Bowles. Secretary	Air Quality	Commenters on the 2009 EDR have requested that Massport increase efforts to encourage the use of single engine taxiing. An update of these efforts should be reported in the 2010 EDR.	The *2010 EDR* provides an update on the efforts that Massport has undertaken to encourage the use of single engine taxiing.
A.35	Ian A. Bowles. Secretary	Air Quality	The 2010 EDR should continue to updates on the information presented in the 2009 EDR and address comments received related to air quality.	An update of the 2009 data is described in Chapter 7, *Air Quality/Emissions Reduction,* of this *2010 EDR.*
A.36	Ian A. Bowles. Secretary	Air Quality	For 2010, Air Quality/Emissions Reductions chapter should include an overview of the environmental regulatory framework affecting aircraft emissions, changes in aircraft emissions, and the changes in air quality modeling.	The *2010 EDR* reports on modeled air quality using EDMS and MOBILE motor vehicle emissions models to model carbon monoxide (CO), nitrogen oxides (NOx), volatile organic compounds (VOCs), particulate mater (PM), nitrogen dioxide (NO_2). In addition, Massport modeled NOx emissions by airline. Finally, Massport reported in Air Quality Initiative Tracking, Massport's and Tenants' Alternative Fuel Vehicle Programs; and the status of other Logan Airport air quality studies undertaken by others. See Chapter 7*, Air Quality.*
A.37	Ian A. Bowles. Secretary	Air Quality	The chapter should also discuss analysis methodologies and assumptions and report on 2010 conditions using the most recent version of the Emissions Dispersion Modeling System (EDMS) and MOBILE motor vehicle emissions.	Chapter 7, *Air Quality/Emissions Reduction,* reports on the model updates to EDMS and MOBILE and uses the most recent versions of the models to assess air quality conditions.

Comment #	Author	Topic	Comment	Response
A.38	Ian A. Bowles. Secretary	Air Quality	The chapter should also include: emissions inventory for carbon monoxide (CO); emissions inventory for oxides of nitrogen (NOx); emissions inventory for volatile organic compounds (VOCs); emission inventory for particulate matter (PM); nitrogen dioxide (NO2) monitoring; and NOx emissions by airline. This chapter should also report on the following air quality initiatives (AQI) for 2009: Air Quality Initiative Tracking; Massport's and Tenant's Alternative Fuel Vehicle Programs; and the status of other Logan Airport air quality studies undertaken by Massport or others.	Chapter 7, *Air Quality/Emissions Reduction,* of this 2010 EDR includes emissions inventories for CO, NOx, VOC, PM; NO2 monitoring, and NOx emissions by airline. The chapter also reports on the status of the AQI for 2010.
A.39	Ian A. Bowles. Secretary	Air Quality	The air quality chapter should include an inventory of greenhouse gas (GHG) emissions from Logan Airport in 2010. GHG emissions should be quantified for aircraft, GSE, motor vehicles and stationary sources using emission factors and methodologies outlined in the Greenhouse Gas Emissions Policy and Protocol issued by EEA. The results of the 2010 GHG emissions inventory should be compared to the 2009 results.	Chapter 7, *Air Quality/Emissions Reduction,* of this *2010 EDR* includes a report on greenhouse gas (GHG) emissions at Logan Airport in 2010 and compares it to 2009.
A.40	Ian A. Bowles. Secretary	Water Quality	For 2010, the Water Quality/Environmental Compliance and Management chapter should report on the 2010 status of: the National Pollutant Discharge Elimination System (NPDES) Permit and monitoring results for Logan Airport's outfalls and the Fire Training Facility; jet fuel usage and spills; Massachusetts Contingency Plan (MCP) activities; tank management; update on Environmental Management Plan; fuel spill prevention; future stormwater management improvements (if any); future MCP and tank management activities. Massport should continue to report in the 2010 EDR how Massport will assess, remediate, and bring to regulatory closure areas of subsurface contamination.	These water quality/environmental compliance activities are reported in Chapter 8, *Water Quality/ Environmental Compliance and Management* .
A.41	Ian A. Bowles. Secretary	Sustainability	The information in [Chapter 1] is very informative and I encourage Massport to continue with its updates in the 2010 EDR.	These sustainability efforts are reported in Chapter 1, *Executive Summary/Introduction.*
A.42	Ian A. Bowles. Secretary	Mitigation	For 2010, this chapter should report on the status of mitigation commitments for specific Massport and tenant projects at Logan Airport that have commenced construction.	The status of these mitigation efforts is reported in Chapter 9, *Project Mitigation Tracking.*
A.43	Ian A. Bowles. Secretary	Mitigation	The mitigation commitments were made in the Section 61 findings for the following projects which should be reported: West Garage/Central Garage; International Gateway; Runway Ends 22R and 33L Safety Improvements; Replacement Terminal A; and Logan Airside Improvements Planning.	The status of these mitigation efforts is reported in Chapter 9, *Project Mitigation Tracking.*

Comment #	Author	Topic	Comment	Response
A.44	Ian A. Bowles. Secretary	Mitigation	This chapter should also update the status of Massport's mitigation commitments and identify projects for which mitigation is complete.	The status of these mitigation efforts is reported in Chapter 9, *Project Mitigation Tracking.*
A.45	Ian A. Bowles. Secretary	MEPA	The 2010 EDR must include Responses to Comments which addresses all of the substantive comments from the letters listed at the end of this Certificate. The Response to Comments included in this EDR is well-constructed and cross-referenced. Massport may follow the same format in addressing comments in the next EDR, although the Responses to Comments should pay particular attention to increased specificity, where necessary.	Individual responses to comments in the same format as used in the *2009 EDR* are provided in Appendices A and B of this *2010 EDR.*
A.46	Ian A. Bowles. Secretary	Noise	The majority of comments received on the 2009 EDR focused on noise related issues, including measurement of noise, modeling of noise contours, and noise abatement, and emission reduction issues. In addition to responding to these comments, the 2010 EDR should continue to report on the refinements to noise tracking and abatement efforts. Massport should consult directly with individual commentors where appropriate.	Individual responses to comments are provided in Appendices A and B of this *2010 EDR.*

Copies of Secretary of the Executive Office of Energy and Environmental Affairs Certificates issued for the Reporting Years 2004, 2005, 2006, 2007 and 2008

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August 16, 2006

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS ON THE ENVIRONMENTAL STATUS AND PLANNING REPORT

PROJECT NAME	: 2004 Logan Environmental Status and Planning Report
PROJECT MUNICIPALITY	: Boston / Winthrop
PROJECT WATERSHED	: Boston Harbor
EOEA NUMBER	: 3247
PROJECT PROPONENT	: Massachusetts Port Authority
DATE NOTICED IN MONITOR	: June 7, 2006

As Secretary of Environmental Affairs, I hereby determine that the Environmental Status and Planning Report submitted on this project **adequately and properly complies** with the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62H) and with its implementing regulations (301 CMR 11.00).

The environmental review process at Logan Airport has been structured to occur on two levels: airport-wide and project-specific. The Environmental Status and Planning Report (ESPR) has evolved from a largely retrospective status report on airport operations to a broader analysis that also provides a prospective assessment of long-range plans. It has thus become (consistent with the objectives of the MEPA regulations) part of Massachusetts Port Authority's (Massport) long range planning. The ESPR provides a "big picture" analysis of environmental impacts associated with current and anticipated levels of activities, and presents an overall mitigation strategy aimed at avoiding increases in such impacts. The ESPR analysis is supplemented by (and ultimately incorporates) the detailed analyses and mitigation commitments of project-specific EIRs. The ESPR is currently updated on a five-year basis, with much less detailed Environmental Data Reports filed in the years between submission of the ESPRs. The 2004 ESPR is the subject of this Certificate.

Background

In 1979, the Secretary of the Executive Office of Environmental Affairs (EOEA) 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 the submission of interim Annual Updates to provide data on conditions for the years between the GEIRs. The GEIR provided projections of environmental conditions

where the cumulative effects of individual projects could be understood. The Secretary's Certificate on the *1997 Annual Update* proposed a revised environmental review process for Logan Airport. As a result, Massport evaluates the cumulative impacts associated with airport activities through preparation of an ESPR every five years and provides data updates annually through the EDRs.

This 2004 ESPR was originally scheduled to be completed in 2005, but was postponed until 2006. The 2004 ESPR was delayed because of delays associated with the completion of the New England Regional Aviation System Plan (NERASP). Massport adopted the NERASP forecasts for its 2020 Logan Airport forecast of aviation activity in this ESPR, and upon which the analysis of 2020 environmental conditions is based. Postponing completion of the 2004 ESPR ensured that the forecasts used in the ESPR are the most current and accurate forecasts available.

Review of the 2004 ESPR

In general, the ESPR has responded to the scope. In particular, the ESPR contains a wealth of useful data on activity levels and impacts, and lays out a forecast for trends in the future years. The technical studies in the 2004 ESPR included reporting on and analysis of key indicators of airport activity levels, the regional transportation system, ground access, noise, air quality, environmental management, and project mitigation tracking.

As always, EOEA remains committed to evaluating and addressing the cumulative impacts of airport operations on the nearby communities. In June 2001, Massport agreed to work with EOEA on structuring a proposed Air Quality Initiative (AQI). The Certificate indicated that Massport was "to solicit project submissions from local governments and community groups, which will be reviewed in an objective, science-based process by a neutral organization such as NESCAUM." This Certificate on the ESPR reiterates that Massport has committed to the Air Quality Initiative, a key program designed to mitigate the cumulative air quality impacts of airport operations. The 2005 EDR should detail how Massport is meeting this commitment. The 2005 EDR must also address all of the air quality issues raised by the commenters.

Although Massport has presented a detailed ESPR, I remain concerned with a number of environmental issues, specifically air quality and noise related issues, as outlined below.

Follow-up

Massport should submit the next EDR (analyzing conditions for the 2005 calendar year no later than December 15, 2006. I recognize that this Certificate requires the inclusion of considerable follow-up in that document. However, ESPRs invariably raise important issues which require follow-up sooner rather than later, and this ESPR is no exception. I anticipate that the EDR in a year following the publication of an ESPR will always have to include such analytical follow-up to the ESPR and respond to comments on the ESPR. Other EDRs should provide more of a "snapshot" of the previous year's operations and impacts, with more substantial analysis awaiting the next GEIR. EDRs in years other than the year immediately following publication of an ESPR should therefore be considerably less voluminous and Massport should strive to submit these documents by July 31 of the year following the subject year.

Responses to Comments

The next EDR must include Responses to Comments which addresses all of the substantive comments from the letters listed at the end of this Certificate. The Response to Comments included in this ESPR is well-constructed and cross-referenced (although several comments have complained of general responses or document references in response to specific questions). Massport may follow the same format in addressing comments in the next EDR, although the Responses to Comments should pay particular attention to increased specificity, where necessary.

The majority of comments received on the EDR focused on air quality and noise related issues, including measurement of noise, modeling of noise contours, and noise abatement. In addition to responding to these comments, the 2005 EDR and future EDRs should also continue to report on the refinements to noise tracking and abatement efforts.

Airport Activity Levels

The ESPR included a chapter on airport activity levels, including information on aircraft operations, fleet mix, passenger activity levels, and cargo and mail operations. This chapter also reported on Massport's forecasts that will become the basis for Massport's strategic planning initiatives over the next few years. Past forecasts were based on low, medium, and high passenger activity levels. New forecasts are now based on the forecasts for 2020 developed for the New England Regional Airport System Plan (NERASP) study. This chapter included aircraft operations and passenger activity forecasts, and provided a discussion of methodologies and assumptions, including anticipated fleet mix changes and other trends in the aviation industry.

Air passenger traffic at Logan Airport continued to rebound in 2004, but remained below the peak year level reached in 2000. The total number of passengers using Logan Airport in 2004 increased by 14.7 percent over 2003 levels to 26.1 million passengers. Although the recovery in passenger demand was underway in 2004 at Logan Airport and throughout the industry, legacy commercial airlines continued to struggle financially as competition from low cost carrier (LCC) rivals increased and fuel prices remained high.

For the first time since 1998, total annual aircraft operations (arrivals and departures) at Logan Airport increased compared to the previous year and were at their highest level since 2001. Daily operations in 2004 averaged approximately 1,107 compared to approximately 1,027 in 2003, an increase of about 80 operations per day or about 8.6 percent. 2004 levels remain below historic peaks. The growth in aircraft activity was driven primarily by the entry and expansion of LCCs at Logan Airport in 2004. This increase in LCC services in 2004 stimulated growth in airport

passenger demand.

In 2004, Logan Airport ranked 19th among US airports in total cargo volume. All-cargo operations at Logan Airport declined by less than 1 percent in 2004. However, total cargo volume, including cargo carried in the belly compartments of passenger aircraft, rose by 0.6 percent.

Airport Planning

This section described the status of planning initiatives and projects through the planning horizon year (2020) for the Terminal Area; Airside Area; Service and Cargo Areas; and Edge Buffers and Landscaping. The Airport Planning Chapter also reported on the status of public works projects implemented by other agencies within the boundaries of Logan Airport.

Several projects were completed in 2004:

- The majority of construction of the main terminal and satellite concourse of Delta Air Lines' Replacement Terminal A Project was completed in 2004.
- A dedicated hourly parking area opened on the lower level of the Terminal B Garage in July 2004.
- Massport also launched Exit Express, Massport's convenient way to pay for parking.
- The Massachusetts Bay Transportation Authority's (MBTA's) $23 million new Blue Line Airport Station opened in June 2004.
- Demolition of the old MBTA Airport Station was completed in 2004.
- By the end of 2004, completion of the Central Artery/Tunnel (CA/T) Project and improvements to the roadway system were complete, allowing for a more efficient roadway network with shorter and more direct routes between destinations in the airport and the regional highway system.
- The Silver Line, the most recent addition to the transit system and Boston's first Bus Rapid Transit line, began limited service to Logan Airport in December 2004.

Both Massport and Logan Airport's tenants are proposing projects or exploring planning options to modernize and carry out future improvements at Logan Airport. Massport's planning criteria for Logan Modernization are based on accommodating 45 million annual passengers in airport terminals, facilities, and on airport roadways. Future projects and planning concepts include:

- Both Massport and Logan Airport's tenants are proposing projects or exploring planning options to modernize and carry out future improvements to the existing terminal facilities. Some projects and planning concepts include ongoing expansion and upgrade of Terminal E and constructing a new satellite Federal Inspectional Services (FIS) Facility at the southeast end of Terminal B.
- Some projects and planning concepts that are underway or under consideration include, consolidating flight kitchen facilities in the north service area, constructing new multi tenant maintenance facilities for ground service equipment (GSE), and constructing new

hangar facilities in the north cargo area.

- Airside improvements include upgrades and improvements to the airfield to enhance the operations efficiency and safety of Logan Airport. Some projects and planning concepts that are underway or under consideration include, installing a security wall along the perimeter of the air operations area, providing additional aircraft parking for certain types of aircraft, and an airside improvements planning project to reduce current and projected levels of aircraft delay.
- Buffer areas are being designed in consultation with Logan Airport's neighbors and other interested parties in an open community planning process. Some future airport buffer projects and planning concepts include, landscaping the former Navy Fuel Pier at Jefferies Point, installing a landscaped border in conjunction with the north service area Economy Parking Lot construction, and constructing a half-acre linear area with landscaping and lighting improvements along Maverick Street.
- Massport is considering a parking strategy to address future on-airport parking demands. Some ongoing and future parking projects and planning concepts include redeveloping three parcels into a combined economy parking facility with the capacity for up to 1,750 vehicles, proposed parking facility in the Southwest Service Area, and a new consolidated facility for all car rental operations

<u>Regional Transportation Context</u>

Overall, aviation activity levels at New England's regional airports increased in 2004, as passenger demand continued to rebound both within the region and nationally after the 2001 downturn. Just as the passenger decline seen at the regional airports in the wake of September 11, 2001 was less severe than the declines experienced at Logan Airport, the traffic recovery seen at the regional airports in 2004 was not as strong as the rebound experienced at Logan Airport. Growth at Logan Airport was largely fueled by a growing presence of LCC services. At the same time, regional airports continued to experience growth in 2004 and served a significant (42.5 percent) share of the region's air passenger traffic. Several factors have contributed to the success of the regional airports in recent years:

- Many of the regional airports benefited from the introduction and growth of LCC services over the past several years. This trend began when Southwest Airlines entered the New England market in 1996 by serving T.F. Green Airport in Warwick, Rhode Island and later expanding into the Manchester and Hartford/Bradley International Airports. The trend continued in 2004 when Spirit Airlines began service from T.F. Green Airport, Independence Air5 initiated low-fare service at several of the regional airports, and Southwest Airlines continued to increase service from its New England airports.
- Several of the smaller airports, particularly Burlington, Bangor, and Tweed-New Haven continued to benefit from the introduction of regional jets and gained new non-stop services to airline connecting hubs, which increase service options for regional airport passengers.

<u>Ground Transportation</u>

The chapter reported on 2004 conditions and provided a comparison of 2004 findings to previous years for variety of ground transportation indicators. The chapter also presented a discussion of analysis methodologies and assumptions for future year conditions for the planning horizon year 2020 for Traffic volumes, On-airport Vehicle miles traveled (VMT) and Parking demand.

- Completion of the CA/T and Logan Airport Modernization projects created a more efficient roadway network with shorter and more direct routes to destinations within Logan Airport.
- With the exception of water transportation, all scheduled and unscheduled high occupancy vehicle (HOV) transportation to Logan Airport saw increased ridership in 2004.
- Overall HOV mode share for air passengers increased from 25.8 percent in 1990 to 32 percent in 2003. Although the data shows a slight decrease to 30.3 percent in HOV modes in 2004, the 2003 HOV mode share was an all-time high, reflecting Massport's success in generally maintaining or increasing the percentage of passengers using HOV modes in all market segments.
- The most recent employee survey showed an employee HOV mode share of 26.8 percent.
- Airport-related average annual daily traffic (ADDT) volumes increased by 12.6 percent in 2004 over 2003 volumes. Despite this increase in ADDT volumes, the vehicle miles traveled (VMT) on Logan Airport's roadway system only increased by 3.5 percent in 2004 compared with the 2003 VMT. This reflects the effects of the changes in the airport roadway system resulting from the CA/T and Logan Airport Modernization projects, which result in a shorter average trip length, creating a much smaller increase in total VMT than in average weekday daily traffic volumes.
- Massport executed a Memorandum of Understanding with the MBTA to commence Silver Line bus rapid transit service in late 2004. Massport's support of the Silver Line Airport service will total more than $30 million over ten years.

Between 2003 and 2004, membership in the Transportation Management Association (TMA) declined by 800 employees, a 13.3% reduction. Massport stated in the ESPR that significant TMA funds had been expended for administrative functions resulting in underfunded programming. The Executive Office of Transportation's MassRIDES program will now provide a TMA coordinator at state expense. The EOT identified its expectation that Massport will "maintain its current level of effort, including both cash contributions and in-kind services.

The Secretary's June 15, 2001 Certificate on the AIPP directs Massport to require that all Logan employers join the TMA at the earliest possible opportunity. This mitigation measure is not listed in Table 10-7 and no plan is presented for meeting this requirement. A plan should be detailed in the 2005 EDR.

The ESPR indicated that two FAA programs had relocated to New Hampshire in 2004 and that Beacon-Skanska, having completed the construction of Terminal A, was no longer at Logan. Four additional corporate members left the TMA in 2004. The 2005 EDR should provide explanation for this.

The 2003 EDR stated that TMA shuttle ridership declined by 32.4 percent due to the elimination of services at mid-year due to lack of funding., but that the decrease in shuttle ridership had been more than off-set by increased Logan Express use. Massport should identify any efforts such as more active marketing of car/ridesharing options targeted to those who previously used the cancelled shuttles. This information should be provided in the 2005 EDR.

Noise

This chapter began with an overview of the environmental regulatory framework affecting aircraft noise, the changes in aircraft noise, the methodologies used to track noise, and what if any changes there was in noise modeling. The information in this chapter built upon the findings of the Boston Logan Overflight Noise Study. This chapter also updates the status Massport's efforts to reduce noise levels and provides noise contours population counts for 2020.

- Massport has continued to make improvements in the noise modeling process as the sophistication of noise models and data acquisition systems has advanced. Recent developments in noise modeling technologies and techniques employed in this 2004 ESPR and to be used in future years include: use of a new radar data acquisition system, known as a long-range PASSUR, for the source of all radar-based operations data; a new upgrade to Massport's radar data processing software; use of the latest update to the FAA's Integrated Noise Model, while retaining the unique capability to account for over-water sound propagation and hill effects unique to Logan Airport; incorporation of more than 1,800 modeled flight tracks, checked and updated where necessary to reflect 2004 radar data; use of radar data to determine the "best-fit" match among each of the nearly 402,000 radar traces captured by Logan Airport's noise monitoring system and the available climb profile contained within the INM database; procurement of an improved noise and operations monitoring system; procurement of automated altitude profile and noise contour generation software.
- From May to August 2004, Runway 4L-22R was closed either completely or partially to accommodate repaving. Due to this closure, jet aircraft departures on Runway 22R decreased by approximately 23 percent compared to 20036 while departures on other runways increased.
- As a result of changes in airport operations in 2004, the number of people exposed to Day-Night Sound Level (DNL) values greater than 65 dB increased compared to the number in 2003. An estimated 10,720 people were exposed to DNL levels greater than 65 dB in 2004, compared to 7,183 in 2003, and 8,309 in 2002. The majority of the increase occurred in East Boston off the northwest end of Runway 33L. The increases within the

65dB are in areas that were previously sound insulated. Despite these increases, the total count of people exposed to 65 dB DNL and above was 23 percent lower than in 2001.

- The 2004 Cumulative Noise Index (CNI) of 153.4 Effective Perceived Noise Level (EPNdB) remained well below the cap of 156.5 EPNdB. Although CNI also increased compared to 2003 and 2002 as a result of the increased number of operations, the 2004 level remained below the 2001 CNI value.

- The number of residential dwelling units for which Massport provided sound insulation in 2004 was 791. Since the program's inception, the total number of dwelling units receiving sound insulation is now 8,615. In addition, Massport completed sound insulation of a 36th school – the new Center School located in Winthrop.

The Logan Airport Noise Study is now expected to be conducted in at least three phases. I strongly encourage Massport to include a phase for the monitoring and assessment of altered flight paths so that any necessary modifications can be identified and implemented.

In addition, the ESPR indicated that there will be an increase from 2004 to 2020 in the number of Boston residents who will experience noise in the 70-75 DNL and the 75-80 DNL due to the use of parallel runways. Massport strive to identify ways to ensure that these increases do not occur. The 2005 EDR should include a preliminary discussion about how Massport will address projected exceedances.

Air Quality

This chapter presented an overview of the environmental regulatory framework affecting aircraft emissions, changes in aircraft emissions, and the changes in air quality modeling. It also predicts emission levels for 2020.

- To ensure consistency and comparability between 1999 and 2004 air quality emissions, the 1999 air emissions inventory was updated with information that was not available when first reported and 1999 emissions were recalculated using the new version of the FAA's Emissions and Dispersion Modeling System (EDMS) v4.21. Additional data were also added to the 2004 inventory in order to increase the accuracy of the results, for example curbside queue times were updated and new parking areas were added to the inventory.

- In 2004, the emission inventory results were driven by an 8 percent increase in aircraft operations compared to 2003 activity levels. Increases in stationary source (fuel storage facilities, heating plant, etc.) emissions further contributed to the increase in levels of volatile organic compounds (VOCs) and oxides of nitrogen (NOx).
- In 2004, total VOC emissions at Logan Airport were estimated to be approximately 1,360

kilograms (kg)/day, which is an increase of 17 percent from 2003 levels. However, total VOC emissions at Logan Airport were 41 percent lower in 2004 than in 1999. The increase of VOC emissions between 2003 and 2004 was due to the increase in aircraft operations in 2004.

- In 2004, total NOx emissions from all airport-related sources were estimated to be 4,290 kg/day, which is an increase of 16 percent from 2003 levels, but is a 26 percent decrease as compared to 1999 levels. Once again, the increase in aircraft operations contributed the most to this increase in airport-related NOx in 2004.

- Total carbon monoxide (CO) emissions at Logan Airport in 2004 were estimated to be 9,852 kg/day, or 3 percent below 2003 levels. In 2004, total CO emissions at Logan Airport were 32 percent lower than 1999 levels. While CO emissions from aircraft increased due to increased aircraft operations, the use of alternative fuel vehicles (AFVs) and the lower emission rates of the motor vehicle fleet helped to reduce the overall CO emissions in 2004. Massport added three new AFVs to its fleet in 2004.

- Massport developed an Air Quality Initiative (AQI) in 2001 as a long-range program with the overall goal to maintain NOx emissions associated with Logan Airport at or below the 1999 level of 2,347 tpy. In 2004, NOx emissions from all airport-related sources were estimated to be 1,726 tpy, well below the 1999 level.

Through the June 15, 2001 Certificate of the Secretary of EOEA on the FEIR for the AIPP, Massport was directed to develop a program to maximize the use of single-engine taxiing procedures by all of its tenant airlines. Massport must describe in the 2005 EDR how it presently encourages reduced-engine (single-engine) taxiing. The cited issues of safety and practicality should be discussed and the program that will be implemented as noted in Table 10-7of the 2005 ESPR should be outlined.

Massport was also directed in the same Certificate to conduct follow-up air quality monitoring in neighborhoods surrounding the airport and surrounding flight paths. This mitigation measure does not appear in Table 10-7, "Logan Airside Improvements Planning Project, Details of Ongoing Section 61 Mitigation Measures." The 2005 EDR should address this measure in detail.

Table 7-13 of the 2004 ESPR , "Inventory of Tracking of NOx Emissions in tons per year for Logan Airport," contains numbers that have been "adjusted to reflect know reductions achieved by Massport and its tenants at Logan Airport." The 2005 EDR should include unadjusted numbers and detailed information about the means for achieving reductions and the emissions value of each reduction method.

Massport had agreed to work with EOEA on structuring a proposed Air Quality Initiative (AQI) in the June 2001 Certificate for the AIPP. The Certificate indicated that Massport was "to solicit

project submissions from local governments and community groups, which will be reviewed in an objective, science-based process by a neutral organization such as NESCAUM." There is no information in the ESPR about the substance and status of any process with EOEA or about the solicitation of information and objective, neutral, scientific review. The 2005 EDR should address this matter in detail.

Environmental Management/Water Quality/Environmental Compliance

This chapter reported on the activities of Massport's Environmental Management Unit in meeting the state's environmental regulatory requirements.

- In 2004, of the 126 spills reported to the Logan Airport Fire-Rescue Department, 18 spills (14 percent) were ten gallons or greater in quantity. Jet fuel spills accounted for 82 (65 percent) of the total spills, with 12 spills (15 percent) being ten gallons or greater in quantity. The remaining 44 spills involved gasoline, hydraulic oil, diesel fuel, ethylene glycol, propylene glycol, paint, and AVGAS. Of these spills, 6 (14 percent) were ten gallons or greater. Since 2002 there has been a reduction in the total volume of all spills.

- In accordance with the Massachusetts Contingency Plan (MCP), Massport continues to assess, remediate, and bring to regulatory closure areas of subsurface contamination.

Massport indicates that it has had limited success in identifying the causes of exceedances due to "first flush" pollutants in stormwater, the number of potential sources at Logan, and the size of drainage areas serving outfalls. Massport needs to develop a plan for maximizing its ability to identify causes. This plan should be identified in the 2005 EDR. Massport should also include in the 2005 EDR copies of any new NPDES stormwater and fire training permits.

Sustainability Initiatives

This Chapter presented Massport's on-going and upcoming sustainability initiatives at Logan Airport. Massport continues to demonstrate forward thinking in sustainability policies and practices for transportation agencies. I encourage Massport to require tenant participation and compliance with all elements of the plan as leases are renewed.

As I stated at the beginning of this Certificate, the 2005 EDR must provide responses to the issues raised in comments received. The 2005 EDR must include a copy of this Certificate and a copy of each comment letter received on the 2004 ESPR. In particular, Massport should provide a thorough examination of issues raised regarding individual noise monitoring locations, noise measurement and modeling, and noise abatement. Massport should consult directly with individual commentors where necessary.

A distribution list for the 2005 EDR (indicating those receiving documents, CDs, or Notices of

Availability) should be provided in the document. This section must also include copies of all GEIR/Annual Update Certificates issued since 1995 to provide context for reviewers. Supporting technical appendices should be provided as necessary.

August 16, 2006
Date

Robert W. Golledge, Jr.

Comments received:

07/25/06	Stephen Kaiser
08/08/06	Nancy Timmerman
08/09/06	MA Executive Office of Health and Human Services
08/09/06	John Vitagliano
08/09/06	Bruce Egan, Egan Environmental
08/10/06	City of Boston Environment Department
08/14/06	Boston Transportation Department

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February 15, 2007

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS
ON THE
2005 LOGAN AIRPORT ENVIRONMENTAL DATA REPORT

PROJECT NAME	: 2005 Environmental Data Report
PROJECT MUNICIPALITY	: Boston / Winthrop
PROJECT WATERSHED	: Boston Harbor
EOEA NUMBER	: 3247
PROJECT PROPONENT	: Massachusetts Port Authority
DATE NOTICED IN MONITOR	: December 23, 2006

As Secretary of Environmental Affairs, I hereby determine that the Environmental Data Report submitted on this project **adequately and properly complies** with the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62H) and with its implementing regulations (301 CMR 11.00).

The environmental review process at Logan Airport has been structured to occur on two levels: airport-wide and project-specific. The Environmental Status and Planning Report (ESPR) has evolved from a largely retrospective status report on airport operations to a broader analysis that also provides a prospective assessment of long-range plans. It has thus become (consistent with the objectives of the MEPA regulations) part of Massachusetts Port Authority's (Massport) long range planning. The ESPR provides a "big picture" analysis of environmental impacts associated with current and anticipated levels of activities, and presents an overall mitigation strategy aimed at avoiding increases in such impacts. The ESPR analysis is supplemented by (and ultimately incorporates) the detailed analyses and mitigation commitments of project-specific EIRs. The ESPR is currently updated on a five-year basis, with much less detailed Environmental Data Reports (EDR) filed in the years between submission of the ESPRs. The 2005 EDR is the subject of this Certificate.

Background

In 1979, the Secretary of the Executive Office of Environmental Affairs (EOEA) 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 the submission of interim Annual Updates to provide data on conditions for the years between the GEIRs. The GEIR provided projections of environmental conditions where the cumulative effects of individual projects could be understood. The Secretary's Certificate on the *1997 Annual Update* proposed a revised environmental review process for Logan Airport. As a result, Massport evaluates the cumulative impacts associated with airport activities through preparation of an ESPR every five years and provides data updates annually through the EDRs.

Review of the 2005 EDR

In general, the EDR has fulfilled its purpose of providing a "snapshot" of year 2005 passenger and impact levels at Logan Airport. Most environmental parameters showed significant improvement in calendar year 2005. In particular, the technical studies in the 2005 EDR included reporting on and analysis of key indicators of airport activity levels, airport planning, the regional transportation system, ground access, noise, air quality, environmental management, and project mitigation tracking.

As always, EOEA remains committed to evaluating and addressing the cumulative impacts of airport operations on the nearby communities. In June 2001, Massport agreed to work with EOEA on structuring a proposed Air Quality Initiative (AQI). The Certificate indicated that Massport was "to solicit project submissions from local governments and community groups, which will be reviewed in an objective, science-based process by a neutral organization such as NESCAUM." The 2005 EDR reiterates that Massport has committed to the Air Quality Initiative, a key program designed to mitigate the cumulative air quality impacts of airport operations. The 2005 EDR details how Massport is meeting this commitment. The 2006 EDR should continue to report on the details of Massport's committment. In addition to the environmental issues listed below, the 2006 EDR should address all of the air quality and noise related issues raised by the commenters during the review of the 2005 EDR.

Follow-up

Massport should file the next EDR (covering operations for the 2006 calendar year) in calendar year 2007. The EDR should provide more of a "snapshot" of the 2006 operations and impacts, with more substantial analysis awaiting the next GEIR. Massport should also address the comments received on the current EDR when developing its 2006 EDR.

Responses to Comments

The next EDR must include Responses to Comments which addresses all of the substantive comments from the letters listed at the end of this Certificate. The Response to Comments included in this EDR is well-constructed and cross-referenced. Massport may follow the same format in addressing comments in the next EDR, although the Responses to Comments should pay particular attention to increased specificity, where necessary.

The majority of comments received on the 2005 EDR focused on air quality and noise related issues, including measurement of noise, modeling of noise contours, and noise abatement. In addition to responding to these comments, the 2006 EDR and future EDRs should also continue to report on the refinements to noise tracking and abatement efforts.

Activity Levels

The Activity Levels chapter presents aviation activity statistics for Logan Airport in 2005 and compares activity levels to the prior year including air passengers, aircraft operations, fleet mix, and cargo/mail volumes. Air passenger traffic at Logan Airport continued to rebound in 2005, but remained below the peak year level reached in 2000. Specifically, the total number of passengers using Logan Airport in 2005 increased by 3.6 percent over the prior year to 27.1 million passengers. In 2005, total aircraft operations (409,066 operations) at Logan Airport increased by 0.9 percent over 2004 levels. While 2005 passenger traffic at Logan Airport was approximately equal to 1999 levels, in 2005 these passengers were being carried on approximately 86,000 fewer flights (495,000 flights in 1999 versus 409,066 flights in 2005). Several commenters raised concerns with the increase in passenger levels requesting long-term solutions to meeting demand which do not include expansion of Logan Airport's capacity or footprint. I advise Massport to consider and attempt to address these comments in the next 20006 EDR.

Planning

The Airport Planning chapter provides an overview of planning, construction, and permitting activities that occurred at Logan Airport in 2005. It also describes known future planning, construction, and permitting activities. Specifically, several projects were completed in 2005 including the majority of construction of the main terminal and satellite concourse of Delta Air Lines' Replacement. Terminal A Project was completed in 2004, with final fit up and commissioning in 2005. Massport also launched Exit Express as part of an on-going program to improve parking facilities and improve air quality through enhanced circulation and reduced idling at the toll booths. In addition, as part of a cooperative venture between the Massachusetts Bay Transportation Authority (MBTA) and Massport, initial Silver Line service to the airport began in December 2004. Full Silver Line service to Logan Airport began on June 1, 2005.

The chapter also includes future planning including: ongoing expansion and upgrade of Terminal E and completion of West Garage Phase II(Central Garage Expansion); more efficient ways of using the limited land resources in the service areas; airside improvements include upgrades and improvements to the airfield to enhance the operations, efficiency and safety of Logan Airport; In addition, buffer areas are being designed in consultation with Logan Airport's neighbors and other interested parties in a community planning process. Massport is also considering a parking strategy to address future on-airport parking demands. Some ongoing and future parking projects and planning concepts include redeveloping three parcels into a combined economy parking

facility with the capacity for up to 1,750 vehicles and a new consolidated facility for all car rental operations.

Regional Transportation

This chapter describes activity levels at New England's regional airports in 2005 and updates recent planning activities. Overall, the number of air passengers utilizing New England's primary commercial service airports in 2005 rose by 5.3 percent over 2004. When measured by aircraft operations, however, activity levels fell by 0.6 percent. This reflects sweeping changes in both the commercial aviation and general aviation (GA) sectors of the industry. Passenger numbers rose despite capacity reductions as airlines operated at higher load factors. Carriers flew fewer flights to the regional airports than in 2004, but used larger aircraft on average in 2005, and carried more passengers. GA operations at New England airports declined by 3.8 percent from the 2004 levels. The Boston Transportation Department has raised a number of suggestions related to the Regional Transportation that Massport should consider in the 2006 EDR.

Ground Transportation

This chapter reports on transit ridership, roadways, traffic volumes, and parking for 2005. Specifically, ground transportation activity levels increased from 2004 to 2005 as a result of a 3.6 percent increase in the number of air passengers. In addition, traffic volumes on airport roadways increased by 5.8 percent, while the vehicle miles traveled (VMT) on the airport increased by 4.2 percent. The lower VMT growth when compared to overall traffic volume growth suggests that more direct connections over shorter roadway distances are provided. The facilities at the MBTA Blue Line Airport Station were also substantially improved in 2005, including the conversion from a manual to an automated fare collection system. In addition, full MBTA Silver Line service to Logan Airport began on June 1, 2005. In 2005, Terminal A and its associated access roadways were fully opened for operation. There were no other roadway modifications completed in 2005. In addition, contract negotiations began between Massport and the C & J Bus Company in New Hampshire to expand early morning transportation between New Hampshire and Logan Airport. This service began in 2006. Massport also re-bid its Logan Airport Transportation Management Association (Logan TMA) contract with the Executive Office of Transportation (EOT) through the MassRIDES program.

Noise

The Noise Abatement chapter updates the status of the noise environment at Logan Airport in 2005, and describes Massport's efforts to reduce noise levels. In 2005, the number of people exposed to Day-Night Sound Level (DNL) values greater than 65 decibels (dB) decreased compared to 2004. An estimated 6,477 people were exposed to DNL levels greater than 65 dB in 2005, compared to 9,438 in 2004, and 7,183 in 2003. The total count of people exposed to 65 dB Day-Night Sound Level (DNL) and above was 55 percent lower than in 2001. Winthrop, which has always experienced the highest levels of noise exposure of any community around Logan Airport, continued its decline in the number of people exposed to levels greater than 65 DNL. This number has dropped 81 percent since reaching its peak in 1998. The number of residents exposed to noise over 75 DNL increased from 2004 but still remained below 2001 levels.

The 2005 Cumulative Noise Index (CNI) of 153.2 Effective Perceived Noise Level (EPNdB) remained well below the cap of 156.5 EPNdB. The CNI decreased slightly compared to 2004 even with a slight increase in the number of operations in 2005. This decrease is primarily due to decreased use of recertified aircraft by cargo operators. Massport provided sound insulation for 471 residential dwelling units in 2005. Since the program's inception, Massport has sound insulated a total of 9,086 dwelling units. The majority of the units insulated in 2005 were in Winthrop.

The information in this chapter is very informative and I encourage Massport to continue with its updates in the 2006 EDR. I also strongly advise Massport to consider and address the numerous comments received that have raised noise related concerns in comments.

Air Quality

The Air Quality/Emissions Reduction chapter provides an overview of airport-related air quality issues in 2005 and efforts to reduce emissions. The 2005 emissions inventory results are driven by the small increase in aircraft operations at Logan Airport compared to 2004 levels. Compared to 2004 levels, total emissions of volatile organic compounds (VOCs) are estimated to have decreased by approximately 6 percent to 1,285 kilograms per day (kg/day). In 2005, total emissions of oxides of nitrogen (NOx) were estimated to be 4,187 kg/day, which is a 2 percent decrease from 2004 levels. Total emissions of carbon monoxide (CO) in 2005 were 9,556 kg/day, or 3 percent lower than 2004 levels.

For the first time, estimates of particulate matter emissions associated with Logan Airport are reported in this 2005 EDR in response to the recent availability of an FAA-approved method for computing particulate matter emission factors for aircraft. Total emissions of particulate matter (PM2.5) at Logan Airport in 2005 were approximately 83 kg/day [33 tons/year (tpy)]. NOx emissions at Logan Airport in 2005 were approximately 662 tpy lower than 1999 levels—a 28 percent decrease. It appears that there is an ongoing trend of decreasing nitrogen dioxide (NO2) concentrations at both the Massport and Massachusetts Department of Environmental Protection (MassDEP) monitoring sites located in the general vicinity of Logan Airport. In addition, annual NO2 concentrations at all monitoring locations were well below the NO2 air quality standards in 2005. The 2006 EDR should continue updates on the information presented in the 2005 EDR.

Water Quality/Environmental Compliance

This chapter describes Massport's ongoing environmental management activities including NPDES compliance, stormwater, fuel spills, activities under the Massachusetts Contingency Plan, and tank management. Specifically, of the 97 spills reported in 2005, 15 (15 percent) were ten gallons or greater in quantity. Jet fuel spills accounted for 66 (68 percent) of the total spills, 12 of the jet fuel spills (18 percent) were ten gallons or greater in quantity. The remaining 31 spills involved gasoline, hydraulic oil, diesel fuel, and other substances. Of these spills, only

three (10 percent) were ten gallons or greater. In 2005, only eight samples exceeded the regulatory limits. The North Outfall had two samples which exceeded the 15 milligrams per liter (mg/L) National Pollutant Discharge Elimination System (NPDES) limit for oil and grease, and the Porter Street Outfall had one sample exceed this limit. The North Outfall had two samples which exceeded the 0.3 milliliters per liter (ml/L) daily maximum limit for settable solids, and the West Outfall had three samples exceed this limit. No other exceedances occurred. In accordance with the Massachusetts Contingency Plan (MCP), Massport should continue to report in the 2006 EDR how Massport will assess, remediate, and bring to regulatory closure areas of subsurface contamination.

Sustainability at Logan Airport

This chapter describes Massport's airport wide sustainability goals. 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. In October 2004, the Massport Sustainability Team produced the *Massachusetts Port Authority Sustainability Plan* (Sustainability Plan). The Environmental Management Policy is incorporated in the Sustainability Plan as Massport's long-term sustainability goal or vision. This chapter describes Massport's continued efforts.

As I stated at the beginning of this Certificate, the 2006 EDR must provide responses to the issues raised in comments received. The 2006 EDR must include a copy of this Certificate and a copy of each comment letter received on the 2005 EDR. In particular, Massport should provide a thorough examination of issues raised regarding individual noise monitoring locations, noise measurement and modeling, and noise abatement. Massport should consult directly with individual commentors where necessary.

A distribution list for the 2006 EDR (indicating those receiving documents, CDs, or Notices of Availability) should be provided in the document. This section must also include copies of all GEIR/Annual Update Certificates issued since 1995 to provide context for reviewers. Supporting technical appendices should be provided as necessary.

February 15, 2007
Date

Ian A. Bowles

Comments Received:

01/30/07	State Representative Robert A. DeLeo
01/31/07	Joseph Felzani
02/05/07	Boston Transportation Department
02/06/07	Nancy Timmerman
02/07/07	Stephen Kaiser
02/13/07	City of Boston Environment Department

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November 1, 2007

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
2006 LOGAN AIRPORT ENVIRONMENTAL DATA REPORT

PROJECT NAME	: 2006 Environmental Data Report
PROJECT MUNICIPALITY	: Boston / Winthrop
PROJECT WATERSHED	: Boston Harbor
EOEA NUMBER	: 3247
PROJECT PROPONENT	: Massachusetts Port Authority
DATE NOTICED IN MONITOR	: September 25, 2007

As Secretary of Executive Office of Energy and Environmental Affairs (EEA), I hereby determine that the Environmental Data Report submitted on this project **adequately and properly complies** with the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62H) and with its implementing regulations (301 CMR 11.00).

The environmental review process at Logan Airport has been structured to occur on two levels: airport-wide and project-specific. The Environmental Status and Planning Report (ESPR) has evolved from a largely retrospective status report on airport operations to a broader analysis that also provides a prospective assessment of long range plans. It has thus become (consistent with the objectives of the MEPA regulations) part of Massport's long range planning. In recognition of the increased role of planning in the GEIR process, the name of the document was changed to ESPR. The ESPR provides a "big picture" analysis of environmental impacts associated with current and anticipated levels of activities, and presents an overall mitigation strategy aimed at avoiding increases in such impacts. The ESPR analysis is supplemented by (and ultimately incorporates) the detailed analyses and mitigation commitments of project-specific EIRs. The ESPR is currently updated on a 5-year basis, with much less detailed Environmental Data

Reports (formerly Annual Updates) filed in the years between ESPRs. The 2006 EDR is the subject of this Certificate.

In general, the EDR has fulfilled its purpose of providing a "snapshot" of year 2006 passenger and impact levels at Logan Airport. Most environmental parameters showed improvement in calendar year 2006. In particular, the technical studies in the 2006 EDR included reporting on and analysis of key indicators of airport activity levels, airport planning, the regional transportation system, ground access, noise, air quality, environmental management, and project mitigation tracking. Mitigation of noise impacts and air quality remain key concerns both of this office and the commenters. These commitments take the form of project-specific Section 61 Findings, as well as more general mitigation that has emerged from the ESPR process.

Background

In 1979, the Secretary of the Executive Office of Environmental Affairs 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 the submission of interim Annual Updates to provide data on conditions for the years between the GEIRs. The GEIR provided projections of environmental conditions where the cumulative effects of individual projects could be understood. The Secretary's Certificate on the *1997 Annual Update* proposed a revised environmental review process for Logan Airport. As a result, Massport evaluates the cumulative impacts associated with airport activities through preparation of an ESPR every five years and provides data updates annually through the EDRs.

Review of the 2006 EDR

As always, EEA remains committed to evaluating and addressing the cumulative impacts of airport operations on the nearby communities. In June 2001, Massport agreed to work with EEA on structuring a proposed Air Quality Initiative (AQI). The Certificate indicated that Massport was "to solicit project submissions from local governments and community groups, which will be reviewed in an objective, science-based process by a neutral organization such as NESCAUM." The 2006 EDR reiterates that Massport has committed to the Air Quality Initiative, a key program designed to mitigate the cumulative air quality impacts of airport operations. The 2006 EDR details how Massport is meeting this commitment. The 2007 EDR should continue to report on the details of Massport's commitment and address the concerns raised by the City of Boston's Environment Department on this issue. In addition to the environmental issues listed below, the 2007 EDR should address all of the air quality and noise related issues raised by the commenters during the review of the 2006 EDR.

Procedural

Given the overall strength of the analysis in the 2006 EDR, the 2007 EDR can restrict itself to providing an update on 2007 conditions, and respond to those issues explicitly noted in this

Certificate and the comments received as requiring response in the next EDR. The EDR should provide a "snapshot" of the 2007 operations and impacts, with more substantial analysis awaiting the next ESPR. Massport should file the 2007 EDR no later than October 15, 2008 (although I encourage Massport to file sooner, given the relatively few requirements for the next EDR).

A distribution list for the 2007 EDR (indicating those receiving documents, CDs, or Notices of Availability) should be provided in the document. This section must also include copies of all ESPR and EDR Certificates issued since the 2004 Logan Environmental Status and Planning Report (issued on August 16, 2006) to provide context for reviewers. Supporting technical appendices should be provided as necessary.

Responses to Comments

The comments received on the 2006 EDR are thoughtful and detailed although I note that some of the comments were received only one day before this Certificate was to be issued. I request that during the review of the 2007 EDR that commenters make every attempt to submit comments by the close of the comment period to allow time for review. The 2007 EDR must include Responses to Comments which addresses all of the substantive comments from the letters listed at the end of this Certificate. The Response to Comments included in this EDR is well-constructed and cross-referenced. Massport may follow the same format in addressing comments in the next EDR, although the Responses to Comments should pay particular attention to increased specificity, where necessary.

The majority of comments received on the 2006 EDR focused on air quality and noise related issues, including measurement of noise, modeling of noise contours, and noise abatement. In addition to responding to these comments, the 2007 EDR and future EDRs should also continue to report on the refinements to noise tracking and abatement efforts. Massport should consult directly with individual commentors where necessary.

Organization of the Certificate

I have organized the remainder of this Certificate to respond to issues raised roughly in the order in which they were presented in the 2006 EDR, although I have for the most part incorporated discussion of issues raised in the technical appendix into the discussion of the environmental impact analyses.

Activity Levels

The Activity Levels chapter provides a solid analysis of major activity issues and the technical appendix contains useful and detailed information. This chapter presents aviation activity statistics for Logan Airport in 2006 and compares activity levels to the prior year including air passengers, aircraft operations, fleet mix, and cargo/mail volumes. Air passenger traffic at Logan Airport reached 27.7 million, up from 27.1 million in 2005. The total number of aircraft

operations decreased in 2006 even though the total number of air passengers increased because airlines increased the number of passengers per aircraft operation. Specifically, the total number of aircraft operations declined from 409,066 in 2005 to 406,119 in 2006 which is a decrease of 0.7 percent. Air cargo volumes continued to decline from 728 million pounds in 2005 to 679 million pounds in 2006 with the largest volume decrease in the express/small packages. I advise Massport to consider and attempt to address all comments related to activity levels in the next 2007 EDR.

Planning

The Airport Planning chapter provides an overview of planning, construction, and permitting activities that occurred at Logan Airport in 2006. It also describes known future planning, construction, and permitting activities. Specifically, several projects were completed in 2006. The new Terminal A, which opened on March 16, 2005, achieved Leadership in Energy and Environmental Design (LEED) certification in June 2006. It is the first airport terminal in the U.S. to earn this ranking. In addition, in November, 2006 the MBTA Silver Line service was enhanced with the addition of the Massachusetts Bay Transportation Authority's (MBTA) Charlie Card automatic fare collection kiosks in all Logan Airport terminals. Several construction projects were also completed, including the construction of the North Service Road (SR-2) Roadway Buffer, which consists of a sidewalk linking the Blue Line Airport Station to Logan Airport Terminals, and a landscaped area adjacent to the sidewalk. Construction of Phase 1 of the Southwest Service Area (SWSA) buffer, which began in 2005, was completed in the fall of 2006, and the Navy Fuel Pier Edge Buffer was completed in December 2006.

Regional Transportation

This chapter describes activity levels at New England's regional airports in 2006 and updates recent planning activities. Massport has demonstrated that it is coordinating its planning with other transportation agencies, and that this planning effort is aimed at minimizing cumulative impacts from Logan Airport operations. The 2006 EDR includes estimates of potential passenger diversions from Logan, and outlines how Massport planning encourages those diversions.

In general, the 2006 EDR has met the requirements laid out in the ESPR Certificate. The directives in the ESPR Certificate were laid out to have Massport look at potential diversions, and explain how its planning and coordination with other agencies could impact potential diversions. The 2006 EDR has performed this task.

Overall, the number of air passengers utilizing New England's primary commercial service airports in 2006 declined marginally, from 48.0 million to 47.9 million. When measured by the number of aircraft operations, however, activity levels fell by 4.4 percent, from 1.4 million operations to 1.3 million operations. This reflects substantial changes in the commercial aviation sector and the continued decline of general aviation (GA) noted in the 2005 EDR. Major airlines reduced capacity at the regional airports in 2006 as they reconfigured their operations in an effort to consolidate gains made in bankruptcy and near-bankruptcy restructuring. Passenger declines were generally consistent with capacity reductions. In addition, the average aircraft size of scheduled flights to the regional airports declined in 2006 as airlines substituted regional jet service for mainline jets on certain routes. Declines in GA activity in New England (declined by 4.2 percent from 2005 levels) continue to outpace declines in the rest of the country. According to the FAA as reported in the 2006 EDR, GA activity declined by 1.3 percent nationally in 2006, largely due to rising fuel costs.

Ground Transportation

The 2006 EDR serves its purpose of updating 2006 ground access conditions on the airport, and has also adequately addressed the larger ground access issues identified in previous Certificates, as discussed below.

This chapter reports on transit ridership, roadways, traffic volumes, and parking for 2006. Specifically, ground transportation activity levels increased across the board from 2005 to 2006 as a result of a 2.4 percent increase in the number of air passengers. Also, a portion of I-90 connecting the City of Boston and areas to the south and west of Boston to Logan Airport was closed from July 2006 until early 2007, which is believed to have reduced traffic flows to and from the Airport. The 2006 EDR reports that ridership on the MBTA, Logan Express, water transportation, scheduled and unscheduled HOV Services, and taxis increased in 2006. This is due in part to the completion of roadway and other construction projects at the Airport, and to the closure of the I-90 connector to the Airport for much of 2006. Massport-subsidized service provided by the C & J Bus Company began in 2006 providing early morning transportation between New Hampshire and Logan Airport. The 2006 EDR also reports that the number of on-Airport parkers decreased by 8.4 percent in 2006.

Noise

The Noise Abatement chapter updates the status of the noise environment at Logan Airport in 2006, and describes Massport's efforts to reduce noise levels. The technical appendix contains useful and detailed information, while the main text provides a solid analysis of major noise issues. Many of the issues raised in the noise analysis are ongoing and require continuous monitoring a point raised by several commenters. The EDR represents an appropriate forum to serve this updating function.

In 2006, the overall number of people exposed to Day-Night Sound Level (DNL) values greater than 65 decibels (dB) decreased in 2006 compared to 2005. An estimated 5,583 people were exposed to DNL levels greater than 65 dB in 2006, compared to 6,477 in 2005, and 9,438 in 2004. For the second year in a row, fewer than 7,000 people experienced levels of 65 dB DNL and above. The 2006 Cumulative Noise Index (CNI) of 152.6 Effective Perceived Noise Level (EPNdB) remained well below the cap of 156.5 EPNdB. The CNI decreased compared to 2005

primarily because of decreased use of recertificated aircraft by cargo operators.

Massport provided sound insulation for 857 residential dwelling units in 2006. This is the largest number of units to receive sound insulation in the vicinity of the Airport in any one year since the beginning of the program. Since the program's inception, Massport has sound insulated a total of 9,943 dwelling units. The majority of the units insulated in 2006 were in Chelsea.

The information in this chapter is very informative and I encourage Massport to continue with its updates in the 2007 EDR. I also strongly advise Massport to consider and address the comments received that have raised noise related concerns.

Air Quality

The Air Quality/Emissions Reduction chapter provides an overview of airport-related air quality issues in 2006 and efforts to reduce emissions.

The emissions inventory results are driven largely by improvements to the FAA Emissions and Dispersion Modeling System (EDMS), v5.0.1. These include the addition of aircraft main engine startup VOC emissions; adjustments to how aircraft performance profiles are modeled, which changed aircraft times-in-mode and thus emissions of all pollutants; an advanced method to calculate aircraft PM10/PM2.5 emissions; and updated ground support equipment (GSE) emission factors using NONROAD2005. The in-place air quality initiatives at Logan Airport and other ongoing efforts by Massport to minimize emissions also played a role, as did changes to aircraft taxi time, fleet mix, and number of operations.

The 2006 EDR reports that emissions inventory changes show an increase in VOC over 2005 levels attributed to the changes to EDMS. The 2006 EDR reported that total VOC emission number is up 34 percent (1,724 kg/day). The total NO_x emissions were one percent lower than reported in the 2005 EDR. In 2006, NOx emissions at Logan Airport were approximately 677 tons per year (tpy) lower than the 1999 threshold level established by Massport's Air Quality Initiative. This represents a 28 percent decrease since1999. There was a continuing trend of decreasing NO2 concentrations at both the Massport and Massachusetts Department of Environmental Protection (MDEP) monitoring sites located in the general vicinity of Logan Airport. In addition, in 2006 the annual NO2 concentrations at all monitoring locations were well below the NO2 air quality standards.

For the second year (2005 EDR was the first year), estimates of particulate matter emissions associated with Logan Airport are reported in this 2006 EDR in response to the recent availability of an FAA-approved method for computing particulate matter emission factors for aircraft. The total CO decreased 15 percent and the total PM_{10} /$PM_{2.5}$ decreased seven percent below the 2005 EDR reported numbers.

The 2006 EDR emissions inventory analysis used the actual aircraft fleet mix, except in the few instances where aircraft/engine types or combinations were not available in the EDMS database. Data included aircraft type, engine, landing and takeoff operations (LTOs) and aircraft taxi times. Aircraft types are divided into four categories: commercial air carriers, commuter aircraft, general aviation and cargo.

The 2007 EDR should continue updates on the information presented in the 2006 EDR and address comments received related to air quality. In particular the City of Boston has raised several concerns the Massachusetts Department of Public Health's (DPH) Logan Airport Health Study and the air quality monitoring study. The 2007 EDR should update the status of discussions with the City of Boston related to this concern.

Last, I ask that Massport consult with the MEPA office regarding the recently promulgated Greenhouse Gas Emissions Policy and Protocol prior to subsequent filings.

Water Quality/Environmental Compliance

This chapter describes Massport's ongoing environmental management activities including NPDES compliance, stormwater, fuel spills, activities under the Massachusetts Contingency Plan, and tank management. Specifically, Logan Airport experienced 92 hazardous material spills in 2006, 11 (12 percent) were considered reportable (i.e., over 10 gallons) under the applicable environmental regulations. Jet fuel spills accounted for 65 (71 percent) of the total spills, with nine of the jet fuel spills exceeding 10 gallons. The remaining 27 spills (29 percent) involved gasoline, hydraulic oil, diesel fuel, and other substances, including two reportable spills.

In 2006, only four of 332 outfall samples exceeded the regulatory limits. The West Outfall and the Maverick Street Outfall each had one sample which exceeded the 15 milligrams per liter (mg/L) National Pollutant Discharge Elimination System (NPDES) limit for oil and grease. The North Outfall had two samples which exceeded the 0.3 milliliters per liter (ml/L) daily maximum limit for settable solids. This is an improvement compared to 2005, when eight samples exceeded the regulatory limits. In accordance with the Massachusetts Contingency Plan (MCP), Massport continues to assess, remediate, and bring to regulatory closure areas of subsurface contamination. In 2006, two of its five MCP sites were closed out, and Massport was working towards achieving regulatory closure of the three remaining MCP sites. In accordance with the Massachusetts Contingency Plan (MCP), Massport should continue to report in the 2007 EDR how Massport will assess, remediate, and bring to regulatory closure areas of subsurface contamination.

Sustainability at Logan Airport

This chapter describes Massport's airport wide sustainability goals. 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. In October 2004, the Massport Sustainability Team produced the *Massachusetts Port Authority Sustainability Plan* (Sustainability Plan). The Environmental Management Policy is incorporated in the Sustainability Plan as Massport's long-term sustainability goal or vision.

This chapter describes Massport's continued efforts including Massport-wide sustainability and details how sustainability is incorporated into many aspects of Massport's activities: Planning and Design; Construction; Operations, Maintenance and Management; and Monitoring of Environmental Performance.

Massport has been a leader in sustainable development. Terminal A, which opened in 2005, received LEED certification in 2006. It is the first airport terminal in the country to receive such certification, and is a model for other airports in the country. In addition, in an effort to reduce air pollutants, Massport is phasing in alternative fuel vehicles in place of conventionally-fuel vehicles. At the airport, Massport maintains electric vehicles infrastructure, as well as a privately operated CNG station to power newer vehicles. The information in this chapter is very informative and I encourage Massport to continue with its updates in the 2007 EDR.

November 1, 2007
Date

Ian A. Bowles

Comments Received:

10/24/07	Nancy Timmerman
10/25/07	Stephen Kaiser
10/26/07	**Town of Lincoln,** Lincoln Board of Selectmen
10/31/07	City of Boston's Environment Department
10/31/07	The Boston Harbor Association

IAB/ACC/acc

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October 31, 2008

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS
ON THE
2007 LOGAN AIRPORT ENVIRONMENTAL DATA REPORT

PROJECT NAME	: 2007 Environmental Data Report
PROJECT MUNICIPALITY	: Boston / Winthrop
PROJECT WATERSHED	: Boston Harbor
EOEA NUMBER	: 3247
PROJECT PROPONENT	: Massachusetts Port Authority
DATE NOTICED IN MONITOR	: September 24, 2008

As Secretary of Executive Office of Energy and Environmental Affairs (EEA), I hereby determine that the Environmental Data Report submitted on this project **adequately and properly complies** with the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62I) and with its implementing regulations (301 CMR 11.00).

The environmental review process at Logan Airport has been structured to occur on two levels: airport-wide and project-specific. The Environmental Status and Planning Report (ESPR) has evolved from a largely retrospective status report on airport operations to a broader analysis that also provides a prospective assessment of long range plans. It has thus become (consistent with the objectives of the MEPA regulations) part of Massport's long range planning. In recognition of the increased role of planning in the Generic Environmental Impact Report (GEIR) process, the name of the document was changed to ESPR. The ESPR provides a "big picture" analysis of environmental impacts associated with current and anticipated levels of activities, and presents an overall mitigation strategy aimed at avoiding increases in such impacts. The ESPR analysis is supplemented by (and ultimately incorporates) the detailed analyses and mitigation commitments of project-specific EIRs. The ESPR is currently updated on a 5-year basis, with much less detailed Environmental Data Reports (EDR) (formerly Annual Updates) filed in the years between ESPRs. The 2007 EDR is the subject of this Certificate.

In general, the EDR has fulfilled its purpose of providing a "snapshot" of year 2007 passenger and impact levels at Logan Airport. Most environmental parameters showed improvement in calendar year 2007. In particular, the technical studies in the 2007 EDR included reporting on and analysis of key indicators of airport activity levels, airport planning, the regional transportation system, ground access, noise, air quality, environmental management, and project mitigation tracking. Mitigation of noise impacts and air quality remain key concerns both of this office and the commenters. These commitments take the form of project-specific Section 61 Findings, as well as more general mitigation that has emerged from the ESPR process.

Background

In 1979, the Secretary of the Executive Office of Environmental Affairs 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 the submission of interim Annual Updates to provide data on conditions for the years between the GEIRs. The GEIR provided projections of environmental conditions where the cumulative effects of individual projects could be understood. The Secretary's Certificate on the *1997 Annual Update* proposed a revised environmental review process for Logan Airport. As a result, Massport evaluates the cumulative impacts associated with airport activities through preparation of an ESPR every five years and provides data updates annually through the EDRs.

Review of the 2007 EDR

As always, EEA remains committed to evaluating and addressing the cumulative impacts of airport operations on the nearby communities. In June 2001, Massport agreed to work with EEA on structuring a proposed Air Quality Initiative (AQI). The Certificate indicated that Massport was "to solicit project submissions from local governments and community groups, which will be reviewed in an objective, science-based process by a neutral organization such as NESCAUM." The 2007 EDR reiterates that Massport has committed to the Air Quality Initiative, a key program designed to mitigate the cumulative air quality impacts of airport operations. The 2007 EDR details how Massport is meeting this commitment. The 2008 EDR should continue to report on the details of Massport's commitment and address the concerns raised by the commenters on this issue. In addition to the environmental issues listed below, the 2008 EDR should address all of the air quality and noise related issues raised by the commenters during the review of the 2007 EDR.

Procedural for 2008 EDR

Given the overall strength of the analysis in the 2007 EDR, the 2008 EDR can restrict itself to providing an update on 2008 conditions, and respond to those issues explicitly noted in this Certificate and the comments received as requiring response in the next EDR. The EDR should provide a "snapshot" of the 2008 operations and impacts, with more substantial analysis awaiting the next ESPR. Massport should file the 2008 EDR no later than October 15, 2009 (although I encourage Massport to file sooner).

A distribution list for the 2008 EDR (indicating those receiving documents, CDs, or Notices of Availability) should be provided in the document. This section must also include copies of all ESPR and EDR Certificates issued since the 2004 Logan Environmental Status and Planning Report (issued on August 16, 2006) to provide context for reviewers. Supporting technical appendices should be provided as necessary.

Responses to Comments

The comments received on the 2007 EDR are thoughtful and detailed. The 2008 EDR must include Responses to Comments which addresses all of the substantive comments from the letters listed at the end of this Certificate. The Response to Comments included in this EDR is well-constructed and cross-referenced. Massport may follow the same format in addressing comments in the next EDR, although the Responses to Comments should pay particular attention to increased specificity, where necessary.

The majority of comments received on the 2007 EDR focused on air quality and noise related issues, including measurement of noise, modeling of noise contours, and noise abatement. In addition to responding to these comments, the 2008 EDR and future EDRs should also continue to report on the refinements to noise tracking and abatement efforts. Massport should consult directly with individual commentors where appropriate.

Organization of the Certificate

I have organized the remainder of this Certificate to respond to issues raised roughly in the order in which they were presented in the 2007 EDR, although I have for the most part incorporated discussion of issues raised in the technical appendix into the discussion of the environmental impact analyses.

Activity Levels

The Activity Levels chapter provides a solid analysis of major activity issues and the technical appendix contains useful and detailed information. This chapter presents aviation activity statistics for Logan Airport in 2007 and compares activity levels to the prior year including air passengers, aircraft operations, fleet mix, and cargo/mail volumes. In 2007, the total number of air passengers reached 28.1 million, up from 27.7 million in 2006. The increase in the total number of air passengers at Logan Airport was 1.4 percent compared to 2.4 percent in the previous year. Specifically, the total number of aircraft operations declined from 406,119 in 2006 to 399,537 in 2007, a decrease of 1.6 percent. Operations by general aviation (GA) aircraft

decreased most significantly (8.9 percent) in 2007 as compared to passenger and cargo operations. As a result of continued passenger growth and a reduction in operations, the number of air passengers per aircraft operation continued to increase in 2007. Air cargo volumes, continued to decline from 679 million pounds in 2006 to 632 million pounds in 2007. In addition to reporting the analysis of major activity issues, I advise Massport to consider and attempt to address all comments related to activity levels in the 2008 EDR.

Planning

The Airport Planning chapter provides an overview of planning, construction, and permitting activities that occurred at Logan Airport in 2007. It also describes known future planning, construction, and permitting activities. Several projects were completed in 2007 including the International Gateway Project (Terminal E) Phase 2. The Federal Inspection Services (FIS) facility was enlarged and the new arrivals level was constructed with the other Phase 2 improvements. The replacement GA Facility in the North Cargo Area was completed and opened in June, 2007 and the southwest corner of Taxiway D was realigned. In addition, the Terminal Area Roadway Landscaping was completed in 2007 and significant portions of Bremen Street Park were completed in early 2007. Also Phase II of the West Garage Project was completed which added three levels of parking to the Central Garage.

Regional Transportation

In general, the 2007 EDR has met the requirements laid out in the ESPR Certificate with respect to regional transportation issues. This chapter describes activity levels at New England's regional airports in 2007 and updates recent planning activities. Massport has demonstrated that it is coordinating its planning with other transportation agencies, and that this planning effort is aimed at minimizing cumulative impacts from Logan Airport operations. The 2007 EDR includes estimates of potential passenger diversions from Logan, and outlines how Massport planning encourages those diversions. The total number of air passengers using New England's primary commercial service airports in 2007 increased marginally, from 47.13 million in 2006 to 47.2 million. Of the 47.2 million air passengers using New England's primary commercial service airports in 2007, 60 percent utilized Logan Airport as compared to 88 percent in 1995. When measured by the number of aircraft operations, activity levels fell by 2.1 percent, from 1.33 million operations in 2006 to 1.31 million operations in 2007.

The directives in the ESPR Certificate were laid out to have Massport look at potential diversions, and explain how its planning and coordination with other agencies could impact potential diversions. The 2007 EDR has performed this task. I direct Massport to continue the directive from the ESPR Certificate for the 2008 EDR.

This chapter also reflects that passenger traffic at the regional airports fell by 1.6 percent. Major airlines reduced capacity at the regional airports in 2007 because they eliminated unprofitable routes and reduced their domestic flying to deal with the high and rising cost of fuel. Passenger declines were generally consistent with capacity reductions. Declines in GA activity in New England (declined by 3.5 percent compared with 2.6 percent nationally in 2007) continue to outpace declines in the rest of the country, which is largely attributed to the impact of rising fuel costs on recreational flying.

Ground Transportation

The 2007 EDR serves its purpose of updating 2007 ground access conditions on the airport, and has also adequately addresses the updating of the three new programs to support employees' use of alternative transportation options.

This chapter reports on transit ridership, roadways, traffic volumes, and parking for 2007. Specifically, ground transportation activity levels increased across the board from 2006 to 2007 as a result of a 1.4 percent increase in the number of air passengers. The re-opening of Interstate 90 (I-90) connecting the City of Boston and areas to the south and west of Boston to Logan Airport resulted in increased traffic flows to and from the Airport when compared to previous years. The 2007 EDR reports that ridership on water transportation, scheduled and unscheduled high occupancy vehicle (HOV) services, and employee ridership on Logan Express increased over 2005 levels. The 2007 EDR also reports that the number of on-Airport parkers decreased by 16.9 percent in 2007 compared to 2005. A portion of this decrease is likely due to the increase of pick-up and drop-off at the Airport.

I also note that this chapter discusses that the Logan Employee Transportation Management Association (Logan TMA) introduced and implemented three new programs to support employees' use of alternative transportation options: the Sunrise Shuttle, which provides shuttle services between 3:00 AM and 5:30 AM for Airport employees who reside in East Boston; the Logan TMA Preferential Carpooling, which provides free terminal garage parking to employees in Logan TMA member companies who carpool in groups of three or more; and the Commuter Cash program, which financially rewards employees ($3/day) who switch from driving alone to either carpooling, bicycling, walking, or using public transportation. The 2008 EDR should continue to update 2008 ground access conditions on the airport and report on the use of the three new programs to support employees' use of alternative transportation options.

Noise

The Noise Abatement chapter updates the status of the noise environment at Logan Airport in 2007, and describes Massport's efforts to reduce noise levels. The technical appendix contains useful and detailed information, while the main text provides a solid analysis of major noise issues. Many of the issues raised in the noise analysis are ongoing and require continuous monitoring, a point raised by several commenters. The future 2008 EDR represents an appropriate forum to serve this updating function.

2007 was the first full year of operation for Runway 14-32. Consistent with the 2002 Record of Decision (ROD) on the Airside Improvements Planning Project and based on FAA data, the runway was used primarily for arrivals over Boston Harbor during 2007. Consistent with historical patterns, despite the introduction of Runway 14-23, the FAA continued to rely on Logan Airport's north-south traffic flow in 2007. However, within the north-west flow, the FAA increased reliance on Runway 33L for departures with an associated reduction in Runway 27 departures. The changes in runway utilization in 2007 have led to changes in the noise environment. Since 2006, the noise contours over East Boston increased in extent and, over the same period, decreased over South Boston, Revere, and Winthrop.

The population within the 75-80 decibel (dB) DNL contours decreased in 2007 compared to 2006. In 2006, the population in the 75-80 dB DNL contour was 104 but in 2007 zero population was located in this coutour. In 2006, the population in the 70-75 dB DNL contour was 597 compared to 416 in 2007. The overall number of people exposed to Day-Night Sound Level (DNL) values greater than 65 decibels (dB) increased 36 percent compared to 2006. An estimated 7,591 people were exposed to DNL levels greater than 65 dB in 2007, compared to 5,583 in 2006. This is still well below the pre-September 11, 2001, level of 17,745. The residences exposed to DNL levels greater than 65 dB in 2007 are located within the 65 dB sound insulation contour, and thus are within areas that have been sound insulated by Massport. The comments from the Boston Transportation Department, the City of Cambridge as well as from individuals such as Mr. Peter Koff and Ms. Nancy Timmerman have raised a number of concerns and suggestions related to noise that Massport should consider incorporating into the 2008 EDR.

In 2007, Massport provided sound insulation to 548 homes, the majority of which were in Chelsea. Since the inception of Massport's Sound Insulation program, 10,461 homes in East Boston, South Boston, Winthop and Chelsea have received sound insulation.

The information in this chapter is very informative and I encourage Massport to continue with its updates in the 2008 EDR. I also strongly advise Massport to consider and address the comments received that have raised noise related concerns.

Air Quality

The Air Quality/Emissions Reduction chapter provides an overview of airport-related air quality issues in 2007 and efforts to reduce emissions. The emissions inventory results were driven largely by three factors: changes in the aircraft fleet mix at the Airport (the airlines' substitution of select narrow-body aircraft with wide-body and commuter aircraft); the reported change in the aircraft average taxi/delay times at Logan Airport; and continual improvements to the FAA Emissions and Dispersion Modeling System (EDMS), v5.0.2, particularly in regard to the advanced method for calculating particulate matter (PM) emissions from aircraft engines. Because of the changes to the EDMS model, total modeled emissions of PM10/PM2.5 associated with Logan Airport in 2007 appeared to have increased by approximately 64 percent to 128 kilograms per day (kg/day) compared to 2006 levels. By comparison, using the EDMS version available in 2006 (v5.0.1) total emissions of PM10/PM2.5 would have increased by approximately 5 percent to 82 kg/day due to a combination of changes in aircraft fleet mix and aircraft taxi/delay time. This data shows that the estimated increase in PM10/PM2.5 was due mostly to the updated EDMS model and not the result of significant changes in Airport operations. Nonetheless, the increases in modeled emissions are notable and I encourage Massport to revisit all feasible efforts to mitigate PM10/PM2.5 emmissions.

The 2007 EDR reports that the total emissions of volatile organic compounds (VOC) were 1,673 kg/day, or 3 percent lower than 2006 levels. Total emissions of carbon monoxide (CO) were 9,233 kg/day, or 13 percent higher than 2006 levels. Total emissions of oxides of nitrogen (NOX) were 4,457 kg/day, or 7 percent higher than 2006 levels. In 2007, total NOx emissions at Logan Airport were approximately 541 tons per year lower than the 1999 Air Quality Initiative (AQI) benchmark which represents a 27 percent decrease in NOx emissions at Logan Airport since 1999. There was also a continuing trend of decreasing nitrogen dioxide (NO2) concentrations at both the Massport and Massachusetts Department of Environmental Protection (MA DEP) monitoring sites located in the general vicinity of Logan Airport. In addition, the annual NO2 concentrations at all monitoring locations in 2007 were within the NO2 Air Quality Standards.

In the 2007 EDR Massport for the first time has voluntarily submitted its first emission inventory of greenhouse gas (GHG) emissions directly and indirectly associated with Logan Airport. "Direct emissions" are those that occur in areas located within the Airport's geographic boundaries and "indirect emissions" are those that occur off the Airport site. "Direct" GHG emissions associated with Logan Airport in 2007 were 0.37 million metric tons (MMT), and the sum of "direct" and "indirect" emissions was 0.69 MMT (less than 0.1 percent of state-wide totals). Massport has control of only 18 percent of these combined totals and will implement plans by 2009 to reduce further GHGs associated with its operations at Logan Airport helping minimize the Airport's carbon footprint.

The 2008 EDR should continue updates on the information presented in the 2007 EDR and address comments received related to air quality. In particular the Mr. Peter Koff has raised several concerns related to air quality monitoring and the Massachusetts Department of Public Health's (DPH) Logan Airport Health Study. The 2008 EDR should clarify this issue and update the status of any air quality monitoring related to this concern.

Water Quality/Environmental Compliance

This chapter describes Massport's ongoing environmental management activities including NPDES compliance, stormwater, fuel spills, activities under the Massachusetts Contingency Plan, and tank management.

I note on July 31, 2007, the Environmental Protection Agency (EPA) and MA DEP issued a new National Pollutant Discharge Elimination System (NPDES) Program permit for Logan Airport's stormwater outfalls. The new NPDES permit regulates stormwater discharges from the North, West, Northwest, Porter Street, and Maverick Street Outfalls, and all of the airfield outfalls. The previous NPDES permit regulated stormwater discharges only from the North, West, Porter Street, and Maverick Street Outfalls. The new NPDES permit also has additional sampling requirements, including the requirement to sample for deicing compounds. In 2007, three of 404 outfall samples exceeded the regulatory limits contained in the NPDES permit. The Maverick Street Outfall had two samples exceed the 100 milligrams per liter (mg/L) daily maximum limit for Total Suspended Solids (TSS) and the West Outfall had one sample exceed this limit. This is an improvement compared to 2004 and 2006 when four samples exceeded the regulatory limits, and 2005 when eight samples exceeded the regulatory limits.

In 2007, Massport completed an update to the Airport's Stormwater Pollution Prevention Plan (SWPPP). The SWPPP addresses stormwater pollutants in general, and also addresses deicing and anti-icing chemical, potential bacteria, fuel and oil, and other sources of stormwater pollutants. Best management practices (BMPs) are included in the SWPPP. Also in accordance with the Massachusetts Contingency Plan (MCP), Massport continued to assess, remediate, and bring to regulatory closure areas of subsurface contamination. In 2007, Massport worked towards achieving regulatory closure of six remaining MCP sites. Massport should continue to report in the 2008 EDR how Massport will assess, remediate, and bring to regulatory closure areas of subsurface contamination.

Sustainability at Logan Airport

This chapter describes Massport's airport wide sustainability goals. 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. In October 2004, the Massport Sustainability Team produced the *Massachusetts Port Authority Sustainability Plan* (Sustainability Plan). The Environmental Management Policy is incorporated in the Sustainability Plan as Massport's long-term sustainability goal or vision.

This chapter describes Massport's continued efforts including Massport-wide sustainability and details how sustainability is incorporated into many aspects of Massport's activities: Planning and Design; Construction; Operations, Maintenance and Management; and Monitoring of Environmental Performance which are detailed in this chapter. The replacement GA Facility in the North Cargo Area, which was constructed in early 2007 and opened in June 2007, is an example of planning and design sustainability initiatives being undertaken at Logan Airport. The new GA Facility incorporates sustainable design, construction, and operational elements. On the operations and maintenance in 2007, Massport created preferred parking areas in garages and parking areas throughout Logan Aiport to promote use of lower emitting vehicles. In cooperation with the City of Boston, in the spring of 2007, Massport began a limited head-of-line privilege program for taxis using AFVs, helping to increase the use of alternatively-powered taxis. Additionally, in 2007, Massport created a Cell Phone Waiting Lot, a new parking area where drivers picking up arriving passengers can park for a maximum of 30 minutes. The information in this chapter is very informative and I encourage Massport to continue with its updates in the 2008 EDR.

Conclusion

As I stated at the beginning of this Certificate, the 2008 EDR must provide responses to the issues raised in comments received. The 2008 EDR must include a copy of this Certificate and a copy of each comment letter received on the 2007 EDR. In particular, Massport should provide a thorough examination of issues raised regarding individual noise monitoring locations, noise measurement and modeling, noise abatement, and air quality issues. Massport should consult directly with individual commentors where appropriate.

October 31, 2008
Date

Ian A. Bowles

Comments Received:

10/20/2008	Boston Transportation Department
10/20/2008	Peter L. Koff, Engel & Schultz, LLP
10/24/2008	Stephen H. Kaiser, PhD
10/27/2008	City of Cambridge, Robert Healy, City manager
10/28/2008	Nancy Timmerman

IAB/ACC/acc

The Commonwealth of Massachusetts

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November 13, 2009

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS
ON THE
2008 LOGAN AIRPORT ENVIRONMENTAL DATA REPORT

PROJECT NAME	: 2008 Environmental Data Report
PROJECT MUNICIPALITY	: Boston / Winthrop
PROJECT WATERSHED	: Boston Harbor
EOEA NUMBER	: 3247
PROJECT PROPONENT	: Massachusetts Port Authority
DATE NOTICED IN MONITOR	: October 7, 2009

As Secretary of Executive Office of Energy and Environmental Affairs (EEA), I hereby determine that the Environmental Data Report submitted on this project **adequately and properly complies** with the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62I) and with its implementing regulations (301 CMR 11.00).

The environmental review process at Logan Airport has been structured to occur on two levels: airport-wide and project-specific. The Environmental Status and Planning Report (ESPR) has evolved from a largely retrospective status report on airport operations to a broader analysis that also provides a prospective assessment of long range plans. It has thus become (consistent with the objectives of the MEPA regulations) part of Massport's long range planning. The ESPR provides a "big picture" analysis of environmental impacts associated with current and anticipated levels of activities, and presents an overall mitigation strategy aimed at avoiding increases in such impacts. The ESPR analysis is supplemented by (and ultimately incorporates) the detailed analyses and mitigation commitments of project-specific EIRs. The ESPR is currently updated on a 5-year basis, with less detailed Environmental Data Reports (EDR) (formerly Annual Updates) filed in the years between ESPRs. The EDR addressing airport operations during 2008 is the subject of this Certificate.

In general, the EDR has fulfilled its purpose of providing a "snapshot" of year 2008 passenger and impact levels at Logan Airport. Most environmental parameters showed improvement in calendar year 2008. In particular, the technical studies in the 2008 EDR included reporting on and analysis of key indicators of airport activity levels, airport planning, the regional transportation system, ground access, noise, air quality, environmental management, and project mitigation tracking. Mitigation of noise impacts and air quality remain key concerns both of this office and the commenters. These commitments take the form of project-specific Section 61 Findings, as well as more general mitigation that has emerged from the ESPR process.

Background

In 1979, the Secretary of the Executive Office of Environmental Affairs 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 the submission of interim Annual Updates to provide data on conditions for the years between the GEIRs. The GEIR provided projections of environmental conditions where the cumulative effects of individual projects could be understood. The Secretary's Certificate on the *1997 Annual Update* proposed a revised environmental review process for Logan Airport. As a result, Massport evaluates the cumulative impacts associated with airport activities through preparation of an ESPR every five years and provides data updates annually through the EDRs.

The last Logan ESPR was filed for calendar year 2004. Following the recent sequence of annual environmental filings, the environmental filing scheduled for next year was previously anticipated to be in the form of an ESPR rather than an EDR. However, due to the current economic downturn, as described in this 2008 EDR, activity levels at Logan Airport and associated environmental impacts continue to remain well below historic levels and recent peaks. In 2009, near-term activity levels and associated environmental effects are also expected to remain 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. Therefore, I will allow Massport to prepare a 2009 EDR in lieu of the scheduled ESPR. The 2009 EDR should address the activity levels observed in 2009 in comparison with those predicted in the 2004 ESPR. The 2009 EDR should explain Massport's proposed schedule for filing the next ESPR in light of observed and expected activity levels and any other changes in airport operations that have occurred since the 2004 ESPR was filed. Where appropriate, Massport must continue to identify and address any longer term aviation and environmental trends in each annual filing whether that will be in the form of an EDR or ESPR.

Review of the 2008 EDR and Scope for the 2009 EDR

Procedural for 2009 EDR

The 2009 EDR must provide an annual update on conditions at Logan Airport for calendar year 2009. The 2009 EDR should continue to serve as a background/context against which projects at Logan Airport can be evaluated. It should also report on the cumulative effects of Logan Airport operations and activities, compared to 2008.

The 2009 EDR must respond to those issues explicitly noted in this Certificate and the comments received in the next EDR. The EDR should provide a "snapshot" of the 2009 operations and impacts, with more substantial analysis awaiting the next ESPR. Massport should file the 2009 EDR no later than October 15, 2010.

A distribution list for the 2009 EDR (indicating those receiving documents, CDs, or Notices of Availability) should be provided in the document. This section must also include copies of all ESPR and EDR Certificates issued since the 2004 Logan Environmental Status and Planning Report (issued on August 16, 2006) to provide context for reviewers. Supporting technical appendices should be provided as necessary.

Responses to Comments

The comments received on the 2008 EDR are thoughtful and detailed. The 2009 EDR must include Responses to Comments which addresses all of the substantive comments from the letters listed at the end of this Certificate. The Response to Comments included in this EDR is well-constructed and cross-referenced. Massport may follow the same format in addressing comments in the next EDR, although the Responses to Comments should pay particular attention to increased specificity, where necessary.

The majority of comments received on the 2008 EDR focused on air quality and noise related issues, including measurement of noise, modeling of noise contours, and noise abatement. In addition to responding to these comments, the 2009 EDR and future EDRs should also continue to report on the refinements to noise tracking and abatement efforts. Massport should consult directly with individual commentors where appropriate.

Organization of the Certificate

I have organized the remainder of this Certificate to respond to issues raised roughly in the order in which they were presented in the 2008 EDR, although I have for the most part incorporated discussion of issues raised in the technical appendix into the discussion of the environmental impact analyses.

Activity Levels

The Activity Levels chapter provides a solid analysis of major activity issues and the technical appendix contains useful and detailed information. This chapter presents aviation activity statistics for Logan Airport in 2008 and compares activity levels to the prior year including air passengers, aircraft operations, fleet mix, and cargo/mail volumes. The total number of air passengers at Logan Airport dropped to 26.1 million from 28.1 million in 2007. The decrease in the total number of air passengers was 7.1 percent. In addition, the total number of aircraft operations declined from 399,537 in 2007 to 371,604 in 2008, a decrease of 7 percent. The 2008 EDR also reports that the passenger aircraft operations decreased by 6.4 percent and operations by general aviation (GA) aircraft also declined by 16.8 percent from 2007. The average domestic load factor (average number of passengers per available seat) for flights also dropped to 72.8 percent, from 74.9 percent in 2007. However, the number of air passengers per aircraft operation was similar to the previous year with an average of 70.2 passengers per aircraft operation in 2008. In response to high and rising fuel prices and declining passenger demand, both low-cost carriers (LCCs) and legacy airlines reduced the number of aircraft operations at Logan Airport. Air cargo volumes, excluding mail, continued to decline from 632 million pounds in 2007 to 588 million pounds in 2008.

For the 2009 EDR, the Activity Levels chapter should include:

- Aircraft operations, including fleet mix and scheduled airline services at Logan Airport;
- Passenger activity levels;
- Cargo and mail activities;
- A comparison of the 2009 aircraft operations, cargo/mail operations, and passenger activity levels to 2008 activity levels; and
- A report on national aviation trends in 2009 and a comparison to trends at Logan Airport.

In addition to reporting the analysis of major activity issues, I advise Massport to consider and attempt to address all comments related to activity levels in the 2009 EDR.

Planning

The Airport Planning chapter provides an overview of planning, construction, and permitting activities that occurred at Logan Airport in 2008. It also describes known future planning, construction, and permitting activities. In 2008 the replacement Signature Flight Support GA Facility in the North Cargo Area (NCA) was certified under the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Green Building Rating System. In addition, several other projects were also completed in 2008. The southwest corner taxiway system was realigned and the northern portion of the centerfield taxiway was constructed and was operational in 2008. Also Phase 1 of the Consolidated Maintenance Facility was constructed in the NCA and Phase 2, involving rehabilitation of the existing Facilities Building Number 2, began. Massport also completed renovations of the existing gas station in the NCA, which included installing Logan Airport's first E85 fuel dispensing tank. (E85 is an alcohol fuel mixture that typically contains a mixture of up to 85 percent denatured ethanol and gasoline or other hydrocarbon.) In 2008 Massport also completed the final construction of the Bremen Street Park. In addition, a security wall was installed along the perimeter of the air operations area in the North Service Area.

For the 2009 EDR, the Airport Planning chapter should describe the status of planning initiatives for the:

- Terminal Area;
- Airside Area;
- Service and Cargo Areas; and
- Airport Buffers and Landscaping.

The chapter should also report on the status of public works projects implemented by other agencies within the boundaries of Logan Airport. Massport should continue to assess planning strategies for improving Logan Airport's operations and services in a, safe, secure, efficient, and environmentally sensitive manner.

Regional Transportation

In general, the 2008 EDR has met the requirements with respect to regional transportation issues. This chapter describes activity levels at New England's regional airports in 2008 and updates recent planning activities. Massport has demonstrated that it is coordinating its planning with other transportation agencies, and that this planning effort is aimed at minimizing cumulative impacts from Logan Airport operations. The 2008 EDR includes estimates of potential passenger diversions from Logan, and outlines how Massport planning encourages those diversions. The total number of air passengers utilizing New England's primary commercial service airports decreased from 47.2 million in 2007 to 44.4 million in 2008. This represents a passenger traffic decline of 5.9 percent. Activity levels as measured by the number of aircraft operations fell by 7.7 percent, from 1.31 million operations in 2007 to 1.21 million operations in 2008.

The decreases in passenger traffic and aircraft operations at New England airports reflect national trends in the face of volatile fuel prices and a worsening global economy. Specifically, of the 44.4 million air passengers using New England's primary commercial service airports, 59 percent of air passengers used Logan Airport in 2008 and 60 percent in 2007, as compared to 88 percent in 1995. In addition, air passenger traffic in the region fell more quickly than in the overall U.S. domestic market. As reported in the 2008 EDR, airlines introduced major reductions in operations through the year, eliminating less profitable routes and cutting frequencies in smaller markets. Fuel prices also forced airlines to ground less fuel efficient aircraft, as well as aircraft with high per seat operating costs, such as the small regional jets (with 50 seats or fewer) prevalent at the regional airports. As a result, the average number of seats per scheduled flight at the regional airports increased from 84 in 2007 to 88 in 2008. In comparison to 2007 levels, the operations by GA aircraft at New England regional airports declined by 7.6

percent. Declines in GA activity in New England also outpaced declines in the rest of the country. According to the FAA, GA activity fell by 5.6 percent nationally in 2008, due to high fuel costs resulting in a sharp decrease in recreational flying.

The directives in the ESPR Certificate were laid out to have Massport look at potential diversions, and explain how its planning and coordination with other agencies could impact potential diversions. The 2008 EDR has performed this task.

I direct Massport to continue the directive from the ESPR Certificate for the 2009 EDR. In addition, for 2009 EDR the chapter on Regional Transportation should describe Logan Airport's role in the region's intercity transportation system by reporting on the following related to Regional Airports and Regional Transportation System:

Regional Airports

- 2009 regional airport operations, passenger activity levels, and schedule data within an historical context;
- Status of plans and new improvements as provided by the regional airport authorities;
- Ground Access improvements to the regional airports; and
- The role that Worcester Regional Airport and Hanscom Field play in the regional aviation system and Massport's efforts to promote these airports.

Regional Transportation System

- Massport's efforts in strengthening the regional transportation system;
- Massport's cooperation with other transportation agencies to promote efficient regional highway and transit operations; and
- Report on metropolitan and regional rail initiatives and ridership.

Ground Transportation

The 2008 EDR serves its purpose of updating 2008 ground access conditions on the airport, and has also adequately addresses the updating of the three new programs to support employees' use of alternative transportation options.

This chapter reports on transit ridership, roadways, traffic volumes, and parking for 2008. Specifically, ground transportation activity levels associated with Logan Airport generally decreased for all surface transportation modes from 2007 to 2008 as a result of a 7 percent decline in the annual number of air passengers. In addition, the average daily traffic on Airport roadways decreased by 13 percent from 2007 to 2008, while vehicle miles traveled (VMT) decreased by 11 percent. This can be attributed directly to a decrease in annual passengers at the Airport. Air passenger ridership on Logan Express bus service also decreased by 14 percent in 2008 compared to 2007. However, Silver Line boardings at the Airport increased 5 percent. The increase in Silver Line ridership is likely due to new ridership as well as diversion from other services, such as from water transportation, limousines, and taxis. Ridership on water transportation decreased by 12 percent, limousine ridership decreased by 19 percent, and taxi dispatches decreased 9 percent.

The 2008 EDR also documented that over the past several years, transit services have seen substantial increases in employee use. In 2008, the number of employees using Logan Express increased by 7 percent. In 2008, the Logan Transportation Management Association (Logan TMA) continued the operation of three programs that were introduced in 2007: 1) Sunrise Shuttle, which provides shuttle services between 3:00 A.M. and 5:30 A.M. for Airport employees who reside in East Boston; 2) Logan TMA Preferential Carpooling, which provides free parking at the West Garage to employees of Logan TMA member companies who carpool in groups of three or more; and 3) the Commuter Cash program, which financially rewards employees ($3/day) who switch from driving alone to either carpooling, bicycling, walking, or using public transportation. The number of vehicles parked on-Airport decreased by 14 percent in 2008 compared to 2007. The most significant change to the parking supply was the 40 percent reduction of spaces in the Economy Lot due to construction activities during most of the year.

The 2009 EDR should continue to update 2009 ground access conditions on the airport and report on the use of the three new programs to support employees' use of alternative transportation options. The chapter should also report on 2009 conditions and provide a comparison of 2009 findings to those of 2008 for the following:

- High occupancy vehicle (HOV) ridership (including Blue Line, Silver Line, Scheduled, Unscheduled, Water Transportation, and Logan Express);
- Logan Airport Employee Transportation Management Association (Logan TMA) membership and services;
- Logan Airport gateway volumes;
- On-airport traffic volumes;
- On-airport vehicle miles traveled (VMT). VMT will be calculated using the updated model created in 2004 that is based on the full build roadway network;
- Parking demand and management (including rates and duration statistics); and
- Ground access management strategy.

Noise

The Noise Abatement chapter updates the status of the noise environment at Logan Airport in 2009, and describes Massport's efforts to reduce noise levels. The technical appendix contains useful and detailed information, while the main text provides a solid analysis of major noise issues. Many of the issues raised in the noise analysis are ongoing and require continuous monitoring, a point raised by several commenters. The future 2009 EDR represents an appropriate forum to serve this updating function.

The decrease in aircraft operations in 2008 led to changes in the noise environment. The 2008 Day-Night Sound Level (DNL) contours were smaller in almost all locations compared to 2007. The 65 decibel (dB) DNL contour decreased in size in East Boston pulling back from

across the Chelsea River to the East Boston waterfront. Over Winthrop and Revere, the DNL 65 dB contour decreased slightly with additional reductions out over Boston Harbor. The population exposed to noise levels greater than DNL 70 dB decreased in 2008 compared to 2007. In 2007, the population exposed to noise levels greater than DNL 70 dB was 416 but in 2008 the number dropped to 249. The overall number of people exposed to DNL values greater than 65 dB decreased 26 percent in 2008 compared to 2007. An estimated 5,968 people were exposed to DNL levels greater than 65 dB as depicted in the 2008 contour, compared to 8,099 in 2007. The residences exposed to DNL levels greater than 65 dB in 2008 are located within the 65 dB sound insulation contour, and thus are within areas that already have been sound insulated by Massport.

In 2008, Massport provided sound insulation to 388 homes, the majority of which were in Chelsea. The focus of this program in Chelsea is to fulfill federal and state mitigation commitments related to the opening of Runway 14-32. Since the inception of Massport's Sound Insulation program, 10,849 homes have received sound insulation in East Boston, South Boston, Winthrop, and Chelsea.

In 2008, Massport continued installing an improved Noise Monitoring System (NOMS). The flight tracking system and all new noise monitors were operational in 2008. Combined with new noise monitor software, the system has an improved capability of correlating measured noise events with individual flight tracks. This has greatly reduced differences between measured and modeled DNL values.

The information in this chapter is very informative and I encourage Massport to continue with its updates in the 2009 EDR. I also strongly advise Massport to consider and address the comments received that have raised noise related concerns. Several commenters have requested further explanation of the reasons for the increased use of Runway 33L for jet aircraft departures and corresponding decrease in use of Runway 27. The comments from the Boston Transportation Department, the Town of Winthrop, the City of Cambridge, as well as from individuals such as Mr. Peter Koff and Ms. Nancy Timmerman have raised a number of concerns and suggestions related to noise that Massport should incorporate into the 2009 EDR.

For 2009 the Noise Abatement chapter should provide an overview of the environmental regulatory framework affecting aircraft noise, the changes in aircraft noise, and the updates in noise modeling. The chapter should report on 2009 conditions and compare 2009 conditions to those of 2008 for the following:

- Fleet Mix, including Stage II, Recertified (Hushkitted) Stage III, newly manufactured Stage III, and any qualifying Stage IV aircraft;
- Nighttime operations;
- Runway utilization (report on aircraft and airline adherence with runway utilization goals);
- Preferential runway advisory system (PRAS) compliance; and
- Flight tracks, including a discussion of the update on the Standard Terminal Automation

Replacement System (STARS) radar and consolidation of the Boston Terminal Radar Approach Control (TRACON) at Merrimac, plus Massport's installation and use of PASSUR data.

The chapter should also report on 2009 conditions and compare those to 2008 conditions for the following noise indicators:

- Using the Federal Aviation Administration's (FAA) most current version of the Integrated Noise Model (INM), and RealContours and RealProfiles, produce an accurate set of Day-Night Sound Level (DNL) noise contours. Adjustments made to account for over-water sound propagation and the propagation of sound to areas of higher terrain will be reported;
- Noise-impacted population;
- Measured versus modeled noise values, including reasons for differences and any improvements attributable to the use of RealContours and RealProfiles;
- Cumulative Noise Index (CNI);
- Times-Above for 65, 75, and 85 dBA threshold values;
- Installation and benefits of the new noise monitoring system; and
- Flight track monitoring noise quarterly reports.

The chapter should also report on noise abatement efforts and provide a status update on the new noise and operations monitoring system.

Air Quality

The Air Quality/Emissions Reduction chapter provides an overview of airport-related air quality issues in 2008 and efforts to reduce emissions. The modeled emissions inventory results were driven principally by three factors: the lower number of aircraft operations at Logan Airport compared to 2007; the reported change in the aircraft average taxi/delay times at the Airport; and continual improvements to the FAA Emissions and Dispersion Modeling System (EDMS), v5.1, which has revised methods for calculating particulate matter (PM) and hydrocarbon (HC) emissions from aircraft engines, and has new functionality of calculating PM emissions from auxiliary power units (APUs). Because of the changes to the EDMS model and decreased air traffic, total emissions of PM10/PM2.5 associated with Logan Airport have decreased by approximately 37 percent to 81 kilograms per day (kg/day) compared to 2007 levels. By comparison, using the earlier version of EDMS total emissions of PM10/PM2.5 would have decreased by approximately 20 percent to 102 kg/day. This difference is attributed to modifications in the EDMS versions.

The 2008 EDR reports that the total emissions of volatile organic compounds (VOC) were 1,208 kg/day, or 28 percent lower than 2007 levels. The total emissions of carbon monoxide (CO) were 8,361 kg/day, or 9 percent lower than 2007 levels and the total emissions of

oxides of nitrogen (NOX) were 4,204 kg/day, or 6 percent lower than 2007 levels. In 2008, total NOx emissions at Logan Airport (net total with reductions) were approximately 656 tons per year (tpy) lower than Massport's 1999 Air Quality Index (AQI) benchmark. This represents a 28 percent decrease in NOx emissions since 1999. The 2008 EDR notes that other contributing factors to the results of the emissions inventory include the change in stationary source fuel usage, and the change in VMT and parking volumes. Air quality initiatives in place at the Airport and other ongoing efforts by Massport to minimize emissions also played a role. For example, there is a continuing trend of decreasing nitrogen dioxide (NO2) concentrations at both the Massport and Massachusetts Department of Environmental Protection (MassDEP) monitoring sites located in the general vicinity of Logan Airport since 1999. In addition, the annual NO2 concentrations at all monitoring locations in 2008 were well within the National Ambient Air Quality Standards (NAAQS) for NO2.

For the second year, Massport prepared an emission inventory of greenhouse gas (GHG) emissions directly and indirectly associated with Logan Airport. "Direct" GHG emissions are those that occur in areas located within the Airport's geographic boundaries and "indirect emissions" are those that occur off the Airport site. "Direct" GHG emissions associated with Logan Airport were 0.35 million metric tons (MMT), and the sum of "direct" and "indirect" emissions was 0.65 MMT, or less than 1 percent of statewide totals. Massport operations at Logan Airport contribute only 18 percent of these combined totals. GHG emissions in 2008 were 6 percent lower than 2007 levels.

As part of the Section 61 findings for the centerfield taxiway component, the first phase of a two-phase Massport Air Quality Monitoring Study was initiated in September 2007 at ten locations on- and off-airport using both real time and time-integrated methods to measure fine particulates, volatile organic compounds (VOC), carbonyls, black carbon, and polynuclear aromatic hydrocarbons (PAHs). The 2008 EDR states that this first phase commenced in September 2007 and was completed September 2008, with a report summarizing the findings expected to be completed before the end of 2009. Massport has committed to post this report on Massport's website when completed. The study collected ambient data on a variety of air pollutants over a two year period and assessed air quality changes due to the operation of the new centerfield taxiway. Massport should consult with the Massachusetts Department of Public Health (DPH), the Massachusetts Department of Environmental Protection (MassDEP), the City of Boston Environment Department and Boston Public Health Commission (BPHC) to discuss the second phase of the protocol.

The 2009 EDR should continue updates on the information presented in the 2008 EDR and address comments received related to air quality. For 2009 the Air Quality/Emissions Reductions chapter should include an overview of the environmental regulatory framework affecting aircraft emissions, changes in aircraft emissions, and the changes in air quality modeling. The chapter should also discuss analysis methodologies and assumptions and report on 2009 conditions using the most recent versions of the Emissions Dispersion Modeling System

(EDMS) and MOBILE motor vehicle emissions. The chapter should also include:

- Emissions inventory for carbon monoxide (CO);
- Emissions inventory for oxides of nitrogen (NOx);
- Emissions inventory for volatile organic compounds (VOCs);
- Emissions inventory for particulate matter (PM);
- Nitrogen dioxide (NO2) monitoring; and
- NOx emissions by airline.

This chapter should also report on the following air quality initiatives (AQI) for 2009:

- Air Quality Initiative Tracking;
- Massport's and Tenant's Alternative Fuel Vehicle Programs; and
- The status of other Logan Airport air quality studies undertaken by Massport or others.

The Air Quality Chapter should also include an inventory of GHG emissions from Logan Airport in 2009. GHG emissions should be quantified for aircraft, GSE, motor vehicles and stationary sources using emission factors and methodologies outlined in the Greenhouse Gas Emissions Policy and Protocol issued by EEA. The results of the 2009 GHG emissions inventory should be compared to the 2008 results. The 2008 EDR indicates that Massport commissioned a study to evaluate operational, economic and environmental benefits of cogeneration as a way reduce air emissions associated with the Central Utility Plant. If cogeneration is found feasible, energy consumption could be reduced Airport-wide as could the emissions of criteria pollutants (i.e., CO, NOx, etc.) and GHGs. The status of this study is not described. Therefore, an update should be provided in the 2009 EDR.

Water Quality/Environmental Compliance

This chapter describes Massport's ongoing environmental management activities including NPDES compliance, stormwater, fuel spills, activities under the Massachusetts Contingency Plan, and tank management. In accordance with the requirements of the current NPDES permit for Logan Airport that was issued on July 31, 2007, Massport and all 27 co-permittees and tenants began preparation of updated Stormwater Pollution Prevention Plan (SWPPP). Massport completed its SWPPP in December of 2007 and tenant SWPPPs were completed in March 2008. Massport's SWPPP addresses stormwater pollutants in general, and also addresses deicing and anti-icing chemical, potential bacteria, fuel and oil, and other sources of stormwater pollutants.

The 2008 Annual Certificates of Compliance were submitted to U.S. Environmental Protection Agency and MA DEP in December 2008 for Massport and each co-permittee. Three out of a total of 73 outfall samples exceeded the regulatory limits of the National Pollutant Discharge Elimination System (NPDES) Program permit for the Airport's permitted outfalls. Two out of 23 samples exceeded the limits at the Maverick Street Outfall and one out of 24 samples exceeded a limit at the West Outfall. Over the past five years, the number of samples that exceeded the regulatory limits has ranged from three (2007) to eight (2005). Due to the large

size of the drainage areas and relatively low concentration of pollutants, it is typically not possible to trace exceedances to specific events. Where a known event, such as a spill, is reported, Massport routinely checks the drainage system for possible impacts from the event and takes corrective actions if necessary.

In accordance with the Massachusetts Contingency Plan (MCP), the 2008 EDR reports that Massport continues to assess, remediate, and bring to regulatory closure areas of subsurface contamination. The 2008 EDR states that Massport is working towards achieving regulatory closure of the remaining MCP sites. In addition, preparation of the Environmental Management System (EMS) for facilities, where fleet and field maintenance activities are conducted, was on-going in 2008.

For 2009 the Water Quality/Environmental Compliance and Management chapter should report on the 2009 status of:

- National Pollutant Discharge Elimination System (NPDES) Permit and monitoring results for Logan Airport's outfalls and the Fire Training Facility
- Jet fuel usage and spills
- Massachusetts Contingency Plan (MCP) Activities
- Tank Management
- Update on the environmental management plan
- Fuel spill prevention
- Future stormwater management improvements (if any)
- Future MCP and tank management activities

Massport should continue to report in the 2009 EDR how Massport will assess, remediate, and bring to regulatory closure areas of subsurface contamination.

Sustainability at Logan Airport

This chapter describes Massport's airport wide sustainability goals. 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. In October 2004, the Massport Sustainability Team produced the *Massachusetts Port Authority Sustainability Plan* (Sustainability Plan). The Environmental Management Policy is incorporated in the Sustainability Plan as Massport's long-term sustainability goal or vision.

This chapter describes Massport's continued efforts including Massport-wide sustainability and details how sustainability is incorporated into many aspects of Massport's activities: Planning and Design; Construction; Operations, Maintenance and Management; and Monitoring of Environmental Performance which are detailed in this chapter. The information in this chapter is very informative and I encourage Massport to continue with its updates in the 2009 EDR.

The 2008 EDR outlines how Massport is committed to sustainable practices to help reduce impacts associated with construction. For example, Massport requires contractors to comply with construction guidelines regarding demolition waste recycling, soil reuse, and air emissions from construction equipment. In addition, in 2008, Logan Airport became the first airport in the U.S. to use warm mix asphalt for its airfield pavement (Runway 4R). Warm-mix as opposed to hot-mix asphalt is heated to a lower temperature, which saves energy resulting in 20 percent lower GHG emissions than hot-mix asphalt. It also contains 18 percent recycled material. Another environmental benefit of warm mix asphalt is that it can be applied in a thicker layer, requiring fewer passes with construction vehicles and fewer emissions of associated pollutants.

Massport has several programs in place that contribute to the environmentally sustainable operation and maintenance of Logan Airport and its facilities. Massport also encourages its tenants to do the same. These programs and other sustainability initiatives include developing 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. Massport is also establishing and implementing 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. In March 2008, Massport installed twenty 10-foot-tall wind turbines on the roof of Logan Office Center. The wind turbines are expected to generate approximately 100,000 kWh annually, or about 2 percent of the building's monthly energy use.

In 2008 Massport completed renovations to the existing gas station in the NCA to include installing an E85 fuel dispensing tank. As discussed earlier in this Certificate, E85 is a first-generation biofuel. Massport also established a bicycle security program with State Police Troopers providing additional patrols on bicycle, which helps to reduce vehicle-related emissions and fossil fuel use. Finally, Massport created preferred parking areas in garages and parking areas throughout Logan Aiport to promote use of lower emitting vehicles. I commend Massport for the existing and planned sustainability measures.

For 2009, this chapter should report on the status of mitigation commitments for specific Massport and tenant projects at Logan Airport that have commenced construction. The mitigation commitments were made in the Section 61 Findings for the following projects which should be reported:

- West Garage/Central Garage;
- International Gateway;
- Runway Ends 22R and 33L Safety Improvements;
- Replacement Terminal A; and
- Logan Airside Improvements Planning.

This chapter should also update the status of Massport's mitigation commitments and identify

projects for which mitigation is complete.

Conclusion

I have determined that the 2008 EDR for Logan Airport has adequately compiled with MEPA and that Massport may prepare a 2009 EDR in lieu of a multi-year ESPR for submission in 2010. As I stated at the beginning of this Certificate, the 2009 EDR must provide responses to the issues raised in comments received. The 2009 EDR must include a copy of this Certificate and a copy of each comment letter received on the 2008 EDR. In particular, Massport should provide a thorough examination of issues raised regarding individual noise monitoring locations, noise measurement and modeling, noise abatement, and air quality issues. Massport should consult directly with individual commentors where appropriate.

November 13, 2009
Date

Ian A. Bowles

Comments Received:

10/26/2009	Peter L. Koff, Engel & Schultz, LLP
10/28/2009	Town of Winthrop, Noise Air Pollution & Airport Hazards Committee
11/05/2009	Nancy Timmerman
11/06/2009	City of Cambridge, Robert Healy, City Manager
11/09/2009	Boston Transportation Department
11/10/2009	City of Boston Environment Department

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Copies of Secretary of the Executive Office of Energy and Environmental Affairs Certificates issued for other Logan Airport Projects during 2010

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The Commonwealth of Massachusetts

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May 28, 2010

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
FINAL ENVIRONMENTAL IMPACT REPORT

PROJECT NAME	: Southwest Service Area Redevelopment Program at Boston-Logan International Airport
PROJECT MUNICIPALITY	: Boston
PROJECT WATERSHED	: Boston Harbor
EEA NUMBER	: 14137
PROJECT PROPONENT	: Massachusetts Port Authority
DATE NOTICED IN MONITOR	: April 21, 2010

As the Secretary of Energy and Environmental Affairs, I hereby determine that the Final Environmental Impact Report (FEIR) submitted on this project **adequately and properly complies** with the Massachusetts Environmental Policy Act (G. L., c. 30, ss.61-62I) and with its implementing regulations (301 CMR 11.00).

As described in prior MEPA filings, the proponent, the Massachusetts Port Authority (Massport), has proposed to redevelop the Southwest Service Area (SWSA) at Logan International Airport and construct a new consolidated rental car facility and associated uses. According to Massport, the SWSA is currently underutilized and inefficient, and the currently dispersed rental car operations result in redundant efforts that increase environmental impacts. As documented in the FEIR, consolidation of rental car operations and their shuttle buses into one coordinated operation will result in reduced vehicle miles traveled and associated air emissions. The remediation of the site and upgraded stormwater infrastructure systems will likewise improve upon current environmental conditions. Finally, the project will be constructed to meet state of the art green building standards and will include the use of renewable energy.

However, despite these expected environmental benefits of the project, I recognize that

the project may also result in a localized increase in impacts to adjacent communities. I have received numerous comment letters expressing concern about the proposed siting of the consolidated rental car facility in proximity to neighborhoods and about the potential for increased traffic, noise and air pollution impacts to these areas. I recognize these issues are of serious concern to many residents of these areas and that the project should therefore receive careful scrutiny. However, at the same time, the MEPA process is not a siting or permitting approval process. My charge under the MEPA statute is to ensure that the environmental impacts of the proposed project are fully studied and considered by state agencies such as Massport prior to their construction. I do not have the ability to simply approve or deny projects or require that they be constructed in an alternate location.

I have closely reviewed the FEIR and the comments received. My review indicates that the FEIR has thoroughly analyzed environmental impacts associated with the project. The FEIR demonstrates that the project will meet all applicable environmental permitting and regulatory standards. I also note that the project has been significantly down-sized since MEPA review of the project commenced. The elimination of the previously-proposed public parking component of the project will result in reduced impacts to adjacent neighborhoods including reduced massing, noise, and air emissions, as well as an increased buffer area between the building and its neighbors. In this way the MEPA review process has already served to minimize the adverse environmental impacts of this project.

Although the MEPA review process has concluded for this project, I expect the proponent will continue to work closely with the State and City agencies and authorities, as well as neighbors and neighborhood organizations that have provided detailed comments on the FEIR. It is critical that Massport work hard to address remaining questions and concerns about the project. With this expectation in mind, I find that the FEIR has adequately disclosed the potential environmental impacts of the project in accordance with MEPA. The project may proceed to state permitting.

Project History and Description

The SWSA is presently occupied by the taxi pool, a bus/limousine pool, a flight kitchen and six rental car businesses. At the time of the Draft EIR (DEIR), Massport indicated that a seventh car rental agency would soon relocate to the airport with an eighth moving to the SWSA once the project is operational.

The originally proposed project included 2.7 million gross feet (gsf) structure that would be constructed as a five-level, 50-foot +/- high garage to house car rental facilities and up to 3,000 commercial parking spaces. The project was designed to include 270,000 square feet (sf) of space for a car rental customer service center (CSC) and maintenance and storage areas for rental car operations (referred to as quick turnaround areas (QTAs)) which provide fueling, car washing and cleaning facilities, and vehicle storage. The project also included a shared shuttle bus system, rather than the existing eight individual shuttles, a reconfigured taxi pool, roadway and intersection improvements, site access improvements, landscaped buffers, and new pedestrian and bicycle facilities. To accommodate the project, the taxi pool and limousine pool were proposed to be relocated from the current location (and the taxi pool would be increased) to the north of Porter Street within the SWSA. The flight kitchen and bus pool would be moved to another area on the airport. Bicycle access and parking would be provided.

In December 2009 a Notice of Project Change (NPC) presented several changes to the project as previously described, including primarily the removal of the commercial parking component from the garage structure. The project as described in the 2009 NPC continued to include the consolidation of the existing rental car facilities and operations into a single facility (Levels 1 through 4 (rooftop) of the Garage Structure and CSC, as well as the QTAs) and eliminated the consolidated commercial parking previously proposed at Levels 4 and 5 of the Garage Structure. Although temporarily relocated, the Bus and Limousine Pool would be retained within the SWSA east of Jeffries Street (but would be moved to the North Service Area temporarily during construction).

The removal of the commercial parking component from the garage structure served to: reduce the size of overall garage structure by approximately half; reduce the height of the garage structure by one level, or 18 feet; reduce the total number of structured parking spaces by 59 percent; provide additional set-back of the garage structure from the airport property edge and the neighboring residential community; retain the Bus and Limousine Pools within the SWSA; retain the long term commercial overflow parking within the SWSA; eliminate the second phase of construction (now a single-phase project); and combine the individual rental car shuttle buses and Massport Airport Station buses (routes 22/33/55) through a Unified Bus System thereby reducing the rental car shuttle bus fleet size by 70 percent compared to the Future No-Build/No-Action Conditions (from 94 vehicles to 28 vehicles). These changes are expected to result in reduced project impacts, including: further reduction in vehicle-miles-traveled (VMT) and associated air emissions as compared to the DEIR; an increase in additional pervious/landscaped areas site-wide; and allowing even greater operational efficiency of the facility through the reduction in floor area and volume of the garage structure.

As presented in the FEIR, the project would improve environmental conditions over the future No-Build/No-Action Conditions under a number of environmental impact categories (specifically, surface transportation/traffic, air quality, and drainage). The proposed project includes a number of measures that are expected to benefit the environment, such as:

- Surface traffic access/egress/circulation and other transportation-related initiatives, such as roadway and signalization improvements and the Unified Bus System would improve traffic flow and reduce vehicle-miles-traveled (VMT) and, therefore, would have substantial air quality benefits;
- Site design, including an improved stormwater management system, noise reduction measures, and removal and upgrade of underground storage tanks and remediation (as

required);
- Sustainable building design elements, including specific performance criteria and/or targets for energy demand (20 percent efficiency), including an on-site renewable energy (e.g., solar or wind), reduced water consumption (30 percent efficiency), wastewater reduction (including car wash water reuse), improved indoor environmental quality, and environmentally-friendly building materials;
- Construction management, including recycling and diverting construction waste from landfills; and
- Sustainable operational elements, including recycling (a goal of minimum 50 percent of waste stream).

In addition, the project supports Executive Order 484, which establishes the Leading by Example Program as a way to oversee and coordinate sustainable efforts by state agencies. The project will implement many of the key initiatives of Executive Order 484, including:

- Reducing Greenhouse Gas (GHG) emissions through compliance with the MEPA Greenhouse Gas Emissions Policy and Protocol.
- Incorporating energy and water conservation measures into the SWSA Redevelopment Program, including evaluation of on-site renewable energy opportunities.
- Recycling of construction waste material.
- Using the Leadership in Energy and Environmental Design (LEED) Green Building Rating System, to guide the design, construction and operation of the proposed program. Massport will meet the requirements of the MA LEED Plus program (established by the Commonwealth's Executive Office for Administration and Finance) and strive to achieve a LEED Silver rating.

MEPA Jurisdiction and Permitting Requirements

The project is undergoing review and subject to the preparation of a mandatory EIR pursuant to sections 11.03(6)(a)(6) and 11.03(6)(a)(7) of the MEPA regulations because the project will be undertaken by a State Agency and involves the generation of 3,000 or more new additional trips on roadways providing access to a single location and the construction of more than 1,000 new parking spaces at a single location. Because the proponent is an Authority of the Commonwealth, MEPA jurisdiction is broad and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in the MEPA regulations.

The project will require an Order of Conditions from the Boston Conservation Commission for work within the buffer zone to wetlands resources (and if the local Order were appealed, the project would require a Superseding Order from the Department of Environmental Protection (MassDEP). MassDEP has indicated during the review of the FEIR that the project will also likely require a sewer connection permit; if an individual sewer connection permit is not ultimately required then a self-certification under the sewer regulations will be required. The

Massachusetts Water Resources Authority (MWRA) previously indicated during the review of the DEIR that a MWRA Sewer Use Discharge Permit will be required for wastewater discharges to the sanitary sewer system. The project must also comply with a USEPA-NPDES General Permit for construction activities at Logan International Airport and with Logan International Airport's USEPA-NPDES General Permit for Stormwater Discharges from its construction activities. The project is also subject to the MEPA Greenhouse Gas Emissions Policy and Protocol.

In addition to the EIR requirement, the project is undergoing review pursuant to the Federal Aviation Administration (FAA) and the National Environmental Policy Act (NEPA) in an Environmental Assessment (EA).

MEPA Background

In its annual (EEA #3247) Environmental Status and Planning Reports (ESPRs) and Environmental Data Reports (EDRs) for the airport dating back to 1993, Massport has contemplated making the SWSA more efficient through the development of enhanced transportation facilities, including a consolidated rental car facility (the "ConRAC") and commercial parking.

This project (EEA #14137) originally underwent MEPA review in January, 2008 when Massport filed the Environmental Notification Form (ENF). In July, 2008 Massport submitted a combined state and federal Draft EIR/EA. After careful review of the Draft EIR and extensive comments from agencies, interested parties, and the public that cumulatively addressed every facet of the project, I issued a Certificate on the Draft EIR on October 10, 2008 to guide development of the FEIR. The Draft EIR Certificate was comprehensive in subject matter and required the proponent to develop a substantial amount of additional information to characterize and assess potential impacts to the environment of the full project. As noted above, an NPC was filed in 2009 describing certain changes to the proposed project and on December 23, 2009 a Certificate was issued on the NPC that updated the previous scope for the FEIR to reflect the changes to the project described in the NPC.

Review of the FEIR

General

The FEIR includes a thorough description of the entire project and all project elements. The FEIR also provides an update on project activities and permitting requirements. It provides a Response to Comments section, a revised mitigation section that includes expanded commitments and revised Section 61 findings for each state permit.

The Preferred Alternative presented in the NPC was the basis for the analysis of impacts and comparisons of alternatives in the FEIR. As noted above, a key programmatic change to the SWSA Redevelopment Program was the removal of the commercial parking component from the Garage Structure (the approximately 3,000 existing on-airport spaces previously proposed for consolidation to Levels 4 and 5). The proposed Garage Structure in the NPC consisted of two main components: 2,500 rental car "ready/return" parking spaces for customer pick-up (Levels 1-3); and 620 rental car storage parking spaces with no public access (rooftop Level 4). Entry to and primary exit from the garage structure would be along the south side. Separate and dedicated rental car employee access and rental car customer vertical circulation ramps are stacked along the west side of the Garage Structure.

The removal of the commercial parking spaces within the garage structure combined with a re-organization of and improvement to the garage design (which resulted in a reduction in rental car spaces) allows for: an increase in set back from the airport edge and neighboring Gove Street residential community (an additional 60 feet from the western edge and an additional 18 feet from the southern edge for a total ranging from 470 to 620 feet away from the airport edge/community); and a shift (to the east) so that majority of the structure is shielded by the existing 18-foot noise barrier reducing visual impacts to homes on Maverick Street. This is expected to result in further reductions in noise, visual and light impacts. The bulk of the Garage Structure is now hidden from Maverick Street, behind Massport's existing sound wall. The southwest corner of the Garage Structure will continue to be screened from the community. The west and north facades will be similarly treated, with screening of the facades visible to the community.

The CSC, which continues to be adjacent to the garage structure, has been reshaped and reduced in size slightly (by 1,000 gross square feet) to better accommodate the revised Garage Structure program. Rental car customers will enter and exit on the east side of the building facing the airport, closest to the terminal area and access roadway by way of the Unified Bus System (described below). Customer access to the Garage Structure (Levels 1-3) from the CSC will occur via enclosed pedestrian passages along the west side of the CSC. The CSC will also include a Ground Transportation Unit operating center to support management of the Unified Bus System.

The four rental car service and storage areas commonly referred to as "Quick Turnaround Areas" (QTAs) have been relocated west of Jeffries (Figure 1.6). The previously proposed improvements to the QTA buildings (e.g., enclosure of noise-generating equipment) and solid fences/walls designed to reduce noise from activities at the QTA facilities (including car washing and vehicle movements) continue to be proposed, providing a noise and visual buffer as well as a buffer from the intrusion from headlights into the adjacent community.

The Bus and Limousine Pools will be temporarily relocated to the North Service Area (NSA) during construction and returned back to the SWSA (just west of its existing location east of Jeffries) upon completion of the ConRAC. The Bus and Limousine Pools will include a total of approximately 370 parking spaces and a 2,500 square foot administration building. Buses and limousine vehicles will access the SWSA off of Harborside Drive through a shared access with the retained long-term commercial overflow parking lot off of Tomahawk Drive. The existing long term commercial overflow parking lot located in the southwest corner of the SWSA (the former post office site) will be retained and relocated within the SWSA as surface parking (with a similar number of spaces) east of the proposed Bus and Limousine Pool (east of Jeffries) and will be further away from residences than where the spaces are currently situated.

The Common Shuttle Bus will serve both ConRAC facility customers (replacing the eight on- and off-airport rental car companies' individual diesel shuttle bus services) and MBTA Airport Station riders (Massport airport bus routes 22/33/55). All other Massport airport buses (long-term economy parking; employee lot; water taxi; Logan Office Center) will continue as currently operated.

The FEIR provided updated information on transportation and buffer streetscape design to the surrounding neighborhood in relation to the Preferred Alternative. The FEIR also examined the Robie Parcel, the North Service Area, the North Cargo Area, and the Bird Island Flats/South Cargo area and presented a discussion that these alternative locations continued to not be feasible, as described previously in the DEIR.

Traffic/ Vehicular Transportation

The DEIR previously presented a Traffic Impact Assessment in conformance with the EOEA/EOTC Guidelines for EIR/EIS Traffic Impact Assessment. It analyzed traffic impacts by determining the Level-of-Service (LOS) at the intersections required in the ENF Certificate and the Boston Transportation Department (BTD) comment letter. The DEIR identified the potential Transportation Demand Management (TDM) measures that the proponent will commit to implementing. Analysis in the DEIR also showed that without the SWSA Redevelopment Program and associated ground access improvements, the projected growth for most of the major current uses in the SWSA (rental cars, taxis, limousines) would lead to an overload of the surrounding airport roadway and traffic congestion during 2012 and 2017 No-Build/No-Action Conditions.

In the FEIR, the project proponent revised the Traffic Impact Assessment to reflect the changes to the project since the DEIR. The analysis took into account the shift in trips from the SWSA to the NSA during the temporary relocation of the Bus and Limousine Pools. The FEIR also indicated how Logan Airport air passenger and ground service peak activity periods, such as Sunday afternoon and evening arrival periods are accounted for in the traffic analysis. I note that Massport has committed to comply with the Massachusetts Idling regulation (310 CMR 7.11). Massport should post idling restriction signs in all loading and drop-off areas within the site to remind all drivers, patrons, and delivery personnel of the state's idling regulation.

As a result of the proposed reduction in the overall size of the project (e.g., the removal of 3,000 commercial parking spaces from the Program), the new Unified Bus System concept, and lowering of future traffic projections, the total trip generation is expected to result in 4 to 7 percent less traffic adjacent to and within the SWSA than the previously proposed program. With the proposed roadway and intersection improvements, all study area roadway and intersections are expected to continue to operate at or above acceptable levels. Similarly, the proposed fuel-efficient/clean-fueled Unified Bus System provides for a reduction in the rental car shuttle bus fleet by 70 percent (from 94 vehicles to 28 vehicles) and a reduction in the rental car shuttle bus system vehicle-miles-traveled compared to No-Build/No-Action Conditions by approximately 65 percent through implementation of the Unified Bus System. This equates to a reduction of approximately 4,865 vehicle miles daily and a savings of around 400,000 gallons per year of fuel (depending on the Unified Bus System fuel option) and a reduction of around 5,000 tons per year of CO_2e emissions.

The resulting air quality benefits from the Unified Bus System would be enhanced by proponent's commitment to use a clean-fuel low-emissions shuttle bus fleet. With shuttle bus consolidation into the Unified Bus System, the projected Build traffic volumes entering and leaving the SWSA would be approximately two percent less than the traffic volumes associated with No-Build/No-Action Conditions. In addition, the proposed ramp, roadway and intersection improvements would result in peak hour traffic and daily VMT totals that are lower than the 2013 and 2018 No-Build/No-Action Conditions.

The FEIR included clear commitments to implement the mitigation, and described the timing and any phasing of the mitigation. However, comments I have received from the BTD indicated ongoing concerns with the project's expected impacts on local traffic, specifically related to service vehicles, potential future changes to the Maverick Street Gate and traffic assignment measures. Massport should continue to coordinate closely with BTD to address all outstanding concerns.

Pedestrian/Bicycle

The DEIR described design standards for plantings, street furniture, signage, and sidewalk and crosswalk widths and paving to ensure that the pedestrian environment generally is appealing and efficient. The FEIR discussed methods of improving pedestrian safety and facilities in connection with the revised project plan, and limiting pedestrian-vehicular conflicts.

As part of this project, the proponent proposes to implement the Phase 2 Airport Edge Buffer, one of four buffer areas designed to beautify airport property which abuts residential neighborhoods. Phase 1 of the Southwest Service Area Redevelopment Program's Airport Edge Buffer was completed in 2006 with the construction of approximately 0.5 acre of landscaping and lighting along Maverick Street.

Phase 2 will complete an open space corridor with access from Maverick Street, Geneva Street, and Porter Street to accommodate pedestrian and bicycle circulation and improve connections to existing open spaces and public transportation in East Boston. Three to four foot high landscaped berms and a six foot high solid fence or wall may be erected at the edge of Massport's property to provide both a visual and noise buffer. The Boston Harbor Association's (BHA) comments have requested the use of vegetation rather than a solid wall to provide a buffer and to maintain views for both pedestrians and bicyclists.

I encourage the proponent to consider BHA's comments during the design process. Specifically, attention needs to be given to the pedestrian and bicycle connections from Maverick Street to Memorial Stadium, and also to Bremen Street Park and the East Boston Greenway. As noted by the Boston Natural Areas Network and others, crossing the path at Porter Street into Memorial Stadium creates conflicts between pedestrians, bicyclists, and vehicles, particularly since more taxis will be using Porter Street as a result of the proposed new taxi pool location. More information is needed as to how pedestrians and bicyclists can safely cross this newly created intersection with its anticipated higher volume of taxis and vehicles.

Parking

The FEIR addressed MassDEP's comments from the DEIR that while rental car storage spaces are not regulated under the Parking Freeze, the provisions of the Parking Freeze allow Massport to manage its parking space inventory on Logan Airport property as operational needs require so long as Massport does not exceed the inventory limiting number of 17,319 commercial and 3,373 employee parking spaces. The FEIR also described how each phase of the project will comply with the mandates of the Parking Freeze.

The FEIR provided additional information relative to the fuel use and emissions reductions expected from the common shuttle bus operation. Consistent with the requirements of the Parking Freeze, the FEIR provided information on Massport's plans to relocate any remaining East Boston based rental car facilities that serve Logan Airport and are not part of the proposed consolidation onto Logan Airport.

The FEIR included an updated operations discussion, including: description of rental car parking access and egress routes with plans in sufficient detail to show access/egress controls; Unified Bus System drop-off, pick-up and circulation. As part of this project, the existing taxi pool located adjacent to the rental car facilities on Harborside Drive will be relocated to Lot B parking.

The taxi pool relocation involves the reconfiguration and repaving of the existing Lot B parking area, installation of site utilities, landscaping, and the construction of a 3,500 square foot, single story building with rest room facilities for cab drivers. At the end of the four year

construction period for the consolidated rental car facility of the Southwest Service Area Program, the taxi pool will then move back. Massport has not decided what, if any, use there will be for the building. BHA has stated in its comments that the Boston Conservation Commission's Order of Conditions requested that the proponent consider using the building for a public use. Given the proximity of the building to Boston Harbor and to the HarborWalk near the Hyatt Harborside Hotel, when the taxi pool is relocated the proponent should consider implementing a future public use of the building, as indicated in BHA's comments.

Air Quality

The proponent conducted an air quality assessment with a microscale analysis of localized carbon monoxide (CO) and particulate matter (PM2.5 and PM10) conditions, a mesoscale analysis of volatile organic compounds (VOCs) and nitrogen oxides (NOx) emissions in the project study area, and a greenhouse gas analysis to quantify carbon dioxide (CO2) emissions. As stated in its comment letter received during the review on the DEIR, MassDEP approved the modeling parameters used in the microscale and mesoscale analyses. However, comments received on the DEIR and NPC continued to raise questions concerning the methodology.

The microscale analysis within the DEIR applied atmospheric dispersion modeling for CO and PM2.5 and PM10 and "hotspot" modeling for roadway/intersections. The atmospheric dispersion modeling was conducted using the US Environmental Protection Agency's (EPA) AERMOD, Massachusetts-specific MOBILE 6.2 motor vehicle emission factors and meteorological data collected at Logan Airport. The CO "hot-spot" modeling was conducted using the EPA CAL3QHC model combined with Massachusetts-specific MOBILE 6.2 motor vehicle emission factors.

The DEIR's mesoscale analysis predicted VOC and NOx emissions using the current US EPA emission model (MOBILE 6.2), and traffic flow conditions for the respective 2007 existing condition, and respective Build and No Build conditions for 2012 and 2017. The mesoscale analysis also was used to estimate the indirect emissions from transportation CO2 emissions associated with the additional project related vehicle trips. The calculation compared CO2 emissions for the respective 2007 existing condition, and respective Build and No Build conditions for 2012 and 2017.

The results of the atmospheric dispersion modeling and hot-spot modeling indicate that the proposed project concentrations are well below NAAQS for CO and PM10/2.5. The mesoscale analysis indicates the proposed project is expected to reduce NOx emissions by 23.1 and 6.33 tons/year in 2012 and 2017, respectively, when compared to Future No-Build Conditions. The proposed project also is expected to result in reductions of up to three percent in VOC emissions when compared to the 2012 and 2017 No-Build Conditions.

The FEIR states that the Mesoscale Emissions Inventory demonstrates an overall decrease in emissions (NOx, VOCs and CO) when comparing the 2013 Interim Build and 2018 Full Build Conditions to the 2007 Existing Condition and future No-Build/No-Action of the same years. The results are presented for two possible Unified Bus System alternative fueling options: (1) Clean Diesel Hybrid and (2) Compressed Natural Gas (CNG). Under both fuel type options, these reductions in NOx, VOC, and CO emissions are attributable to: (1) a reduction in overall VMTs (associated with the rental cars and Unified Bus System); (2) the upgrading of the shuttle bus fleet with new, lower NOx-emitting vehicles; and (3) the U.S. Environmental Protection Agency's (EPA) Federal Motor Vehicle Emissions Standards (FMVES) program (reflected in the MOBILE6.2 model).

The FEIR describes how the SWSA Redevelopment Program will comply with the applicable State and Federal air quality standards and regulations as well as Massport's Air Quality Initiative. Specifically, the future-year, project-related NOx and VOCs emissions (the two primary precursors to ozone (O3) formation – a pollutant for which the Boston area is declared "non-attainment") and CO (a pollutant for which the Boston area was formerly designated "non-attainment") are well within the federal CAA General Conformity Rule de minimis levels. In addition, based upon Microscale Atmospheric Dispersion/Carbon Monoxide (CO) hot-spot Modeling results, CO and Particulate Matter (PM10/2.5) concentrations in the vicinity of the SWSA are expected to remain below the National Ambient Air Quality Standards (NAAQS) for these pollutants. Also based upon the CO hot-spot dispersion modeling, the highest predicted levels of this pollutant in the vicinity of nearby roadway intersections are also expected to remain below the NAAQS for this pollutant.[1]

In response to previous public comments related to enclosing the Garage Structure, Massport evaluated a range of options for providing some level of enclosure to the Garage Structure. Rather than full enclosure (which would require significant mechanical system additions and changes, including much higher stationary source GHG emissions) and to avoid impacts related to mechanical systems for the Garage Structure, the proponent proposes in the FEIR architectural facade treatments that have been designed to screen the adjacent community from air emissions, noise, and light spill. The proposed facade treatments minimize openings on the southern and western facades (to be approximately 80 and 50 percent enclosed, respectively) while providing the required natural ventilation for an 'open parking garage', as defined by the state building energy code.

The transportation related air quality benefits associated with the proposed project are largely derived from the reduction of vehicle trips, roadway improvements, and the proposed TDM measures. However, the FEIR contained additional discussion of the mitigation measures

[1] I previously received comments from EPA on the DEIR seeking clarification with respect to the analysis of CO emissions. Subsequent to the close of the public comment period on the DEIR, the proponent supplied additional information with respect to CO emissions. This additional information was also included in the FEIR.

the project will employ to reduce air emissions and noise impacts on nearby residences, some of which have already been mentioned. These measures include barriers to neighboring areas such as solid fences/walls, gateway signs/walls, and landscaped berms; improvements to 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. These measures are included in the mitigation commitments outlined below.

Air Quality and Public Health

As was true during the review of the DEIR and the NPC, I have received many comment letters on the FEIR expressing concern about the proposed project's air quality and human health impacts. In particular, commenters express concern about the health impacts of particulate matter (PM) emissions associated with vehicle emissions that will occur at the site. The FEIR has performed the required air quality modeling analysis, which shows that the project will meet all applicable air emissions standards under the Clean Air Act, and I find the air quality analysis for this particular project to be adequate. However, I agree with many of the commenters that the study planned to be undertaken by the Massachusetts Department of Public Health concerning air pollution, and particularly PM pollution, at neighborhoods surrounding Logan Airport would provide additional useful information on the impact of projects such as this. I note that the Senate final budget for FY 11 included a provision that would require Massport to fund this study, and I agree that a contribution from Massport to this study would be appropriate. I ask that Massport consider providing this funding voluntarily if not required to do so by the budget as it is ultimately enacted.

Greenhouse Gases

As outlined in the Certificate on the ENF, in accordance with the EEA Greenhouse Gas Emissions (GHG) Policy and Protocol, the DEIR was required to quantify GHG emissions generated by the proposed project and describe all GHG mitigation measures associated with the project. The FEIR included a modeling analysis of the energy use and CO_2 emissions from the project's direct and indirect stationary sources. This modeling analysis supports the conclusion that Massport will be able to achieve its commitment to a reduction of at least 20% of the projected annual energy used by the sum of all stationary sources as compared to a standard code-compliant project and I commend Massport for undertaking measures to achieve this high standard. This commitment is also consistent with the requirements for meeting the Mass LEED Plus standard established by the Sustainable Design Roundtable, which calls for energy performance in buildings greater than 20,000 square feet to exceed MA Energy Code requirements by at least 20 percent.

The effective building energy code used in the FEIR is ASHRAE 90.1 2007. The energy modeling for stationary sources in the FEIR reflected all of the specific mitigation measures selected for the building design including:

- Interior natural daylighting through clearstory windows and/or skylights;
- High-efficiency lighting and lighting system controls, including potentially the use of light-emitting diode bulbs ("LEDs") and/or motion sensors;
- Efficient, directed exterior lighting (including potentially the use of LEDs);
- High-albedo roofing materials;
- Energy-efficient mechanical systems and high-efficiency HVAC systems;
- Architectural elements on the façade that accommodate natural ventilation;
- Window glazing and windows (included the intended U-values);
- Roof and wall insulation (with associated R-values); and
- Independent building control systems.

The FEIR also included the following additional mitigation measures:

1) Maximizing the thermal mass of conditioned buildings; and
2) Providing automated energy management control system with the capacity to:

- Adjust and maintain set points and schedules;
- Indicate alarms and problems; and
- Provide information on trends and operating history.

Finally, the project will involve utilization of on-site renewable energy source (e.g., solar or wind) that will supplement a minimum 2.5 percent of the overall electricity demand.

In its comment letter, the Department of Energy Resources (DOER) suggests that the proponent consider further measures that will help to transform the proposed project into one that will serve as an impressive model for other similar projects. Some of the measures suggested for consideration are:

Electric Resistance Heating

The FEIR states that "Electric Space Heating" represents 27.2% of the total projected energy costs. The proponent should examined carefully to see if most, if not all of this heating load can be reduced and served by natural gas fired systems.

Building Automated Controls /Energy Management System (BAC/EMS)

The proponent should consider using a BAC/EMS system because it is a standard and effective measure for the mitigation of building energy use and related GHG emissions.

Use of Energy Star Rated Office Machines and Appliances

The proponent should consider to only permit the use of Energy Star rated equipment in the areas under the direct control of the proponent, which should be a requirement explicitly stated in the tenant leases and manuals.

Ventilation Exhaust Air Heat Recovery with Desiccant Assisted Dehumidification

Based on the dramatic reductions in gas usage for space heating as shown in the simulation modeling results for other MEPA submittals and the opportunity for significant reduction or the cooling load, the proponent should consider the addition of these measures to all of the conditioned building spaces.

Interior Lighting

The proponent should consider the addition of dimmable fixtures and lighting controls which will automatically adjust the level of the electric lights such that draw only the energy needed to supplement the daylight to meet the desired overall level of illumination.

HVAC

The base heating and cooling systems are water based (both chilled and hot water). The proponent should consider the incorporation of water source heat pumps in spaces where the capacities of the commercially available units are compatible with the arrangement and loads. Depending on the size and profile of the cooling load, reducing the "lift " duty of the chiller compressor by over-sizing the cooling tower heat transfer capacity can result in significant energy and cost savings, with as paybacks of a year or less.

Combined Heat and Power (CHP)

The electrical and thermal loads and load profiles associated with the building HVAC, vacuuming and washing of the cars may be compatible with the application of a CHP system. CHP offers both operational savings and the support of federal and state incentives which can make the return on investment very attractive, while producing very significant reductions in GHG emissions.

Solar Thermal Energy

Heating or pre-heating of wash water with solar panels should be considered.

Wash Water Heat Recovery

The proponent should consider provisions in the design (such as a plate and frame low approach temperature heat exchanger) for a car washing systems which transfers heat from warm effluent streams for preheating of the make-up water.

As the project design advances, I ask that the proponent to consider the feasibility of incorporating these additional measures to reduce GHG emissions and to make this project a model of green building and sustainable design techniques. I encourage the proponent to continue working with the Executive Office of Energy & Environmental Affairs and DOER as the design progresses.

Drainage/Stormwater

The existing stormwater system for the project consists of catch basins and underground piping that flow to Maverick Street and Porter Street Outfalls. The project is expected to improve the quality of runoff by upgrading stormwater management facilities site-wide, replacing uncovered vehicle surface parking with buildings and decreasing paved area.

The FEIR reiterates that the 2009 NPC incorporated a number of changes that resulted in benefits relating to drainage. The NPC stated that work within the 100-foot Coastal Bank buffer would be reduced to include constructing portions of the extension of Tomahawk Drive and landscaping only (the portions of one of the two proposed QTA service areas east of Jeffries Street are being located west of Jeffries). The stormwater management plan will create additional pervious surface area (for an overall total of approximately 7.7 acres) through the implementation of the proposed landscape/open space and pedestrian plan.

As noted above, under Existing Conditions, portions of the SWSA discharge stormwater to the BWSC Porter Street Outfall. The proposed new stormwater system will reduce combined sewer overflow (CSO) discharge volumes and all stormwater will be conveyed to the existing Maverick Street Outfall, which has sufficient capacity for anticipated flow. In order to properly evaluate the likelihood of unanticipated CSO occurrences, the FEIR evaluated the runoff rate using TR20/TR55 method described in MassDEP's comment letter on the DEIR as well as the flow model required to be developed by the NPDES permit for Outfalls 001, 002, and 004. I note that the NPDES permit (No. 0000787) was issued jointly by USEPA and MassDEP. Therefore, MassDEP's review of the proposed stormwater drainage system for compliance with the stormwater management standards extends to the entire site of the Southwest Service Area.

MassDEP has stated in it comments that the proponent has addressed MassDEP's concerns that the project site runoff would not increase overflows at the Maverick Street CSO outfall. I ask that Massport continue to coordinate closely with MassDEP and the Boston Water and Sewer Commission (BWSC) to ensure that there is close coordination between Massport's project and the planned BWSC conversion of the Maverick Street combined sewer to a storm drain from Lamson Street to the outfall as requested by BWSC.

MassDEP has stated in it comments total suspended solids (TSS) calculations have not been presented for required pretreatment prior to the infiltration best management practices and that low impact development (LID) measures have not been included in the stormwater management system design for the site. I remind the proponent that stormwater regulations require that consideration be given to LID and also the use of integrated management practices (IMP) for control of stormwater, either alone or in combination with conventional drainage control measures, which were not included in the FEIR.

The proponent submitted a response to MassDEP's comments, dated May 27, 2010. In

the response, the proponent states that at the time of the filing of the FEIR, the design of the stormwater management system had not progressed enough to confirm and quantify the effectiveness of LID measures and are still under evaluation. Estimated TSS removal for some of the proposed LID measures range from approximately 50% (grass swales) to 85% (Filterra Bioretention system, or tree box filters). The proponent states that the effectiveness of the final LID measures will be presented and quantified as part of the Notice of Intent (NOI) submittal to the Boston Conservation Commission and MassDEP.

Wastewater

The FEIR presented a revised calculation of projected wastewater flows using the specific guidance provided in MassDEP's comment letter, and included wastewater flow and metering data from similar facilities. According to the FEIR, the SWSA Redevelopment Program would generate approximately 95,465 gallons per day of wastewater (based on MassDEP Title 5 guidelines), which represents a decrease of 41,054 gallons per day from the 2007 Existing Condition (136,519 gallons per day). Compared to the estimated wastewater generation for the 2018 No-Build/No-Action Condition, which includes the removal of the Flight Kitchen, the Program would generate an additional 10,774 gallons per day of wastewater (based on MassDEP Title 5 guidelines) due to the consolidation and increased capacity of rental car operations at the ConRAC facility.

In MassDEP's comment letter on the FEIR, MassDEP determined that the project is expected to result in a net increase of 30,946 gpd in wastewater flows than what was indicated n the FEIR. Specifically, the FEIR concluded that implementation of the project will result in a net decrease in wastewater flow, primary due to the demolition of the existing In-Flight Kitchen, and the 70,000 gallons per day (gpd) of wastewater flow associated with the kitchen uses. However, the FEIR indicates that the In-Flight Kitchen facilities will be relocated to the North Service Area. Thus, the relocation of the In-Flight Kitchen on the Logan Airport site will not actually result in elimination of these flows, and as such, the flows from the existing In-Flight Kitchen should not be included in the calculation of net wastewater flow for the project. Without inclusion of the In-Flight Kitchen flows, the project will result in a net increase in wastewater flows of 30,946 gpd. In the proponent submitted response to MassDEP's comments, the letter states that the 2018 No-Build/No-Action Condition presented in the FEIR did not include the 72,000 gallons per day of wastewater associated with the In-Flight Kitchen because the proponent anticipated it to be relocated to the NSA or off-site in 2011 since this is the end date of the current lease agreement. I strongly encourage the proponent to work with MassDEP to address these wastewater flow discrepancies prior to permitting.

The Masssachusetts Water Resouces Authority (MWRA) handles the wastewater generated from the SWSA, which is ultimately treated at the Deer Island Sewage Treatment Plant in Boston Harbor. I note that the MWRA is now implementing the federally court ordered East Boston Branch Sewer Relief project intended to bring CSO discharges along the East Boston shoreline into compliance with the federal Clean Water Act and state water quality standards. Any increase in flow to the East Boston system may contribute to greater surcharging and overflows during wet weather. Therefore MassDEP's policy on infiltration and inflow (I/I) mitigation removal in the MWRA service area establishes that a commitment to I/I mitigation is a required element of the project. As explained in MassDEP's Policy, Managing Infiltration and Inflow in MWRA Community Sewer Systems, removal of four gallons of I/I is required for every gallon added to the sewer system.

MassDEP's comments indicate that because the proponent was unable to identify a plan for I/I removal work in the FEIR within the sewer system for the project, and in light of the net increases in flow identified by MassDEP and the need for I/I removal in the MWRA service area described above, MassDEP is requiring an individual sewer connection permit for this project. A 4:1 I/I mitigation will be required element of the required permit. I remind the proponent that proponent must meet BWSC and MassDEP's requirements related to I/I removal mitigation.

Water

The SWSA currently receives potable water from the City of Boston Water and Sewer Commission (BWSC) which obtains water from the MWRA system. The SWSA Redevelopment Program would require 105,012 gallons per day of potable water (including approximately 8,300 gallons per day for irrigation uses) which represents a reduction when compared to the 2007 Existing Condition water usage of approximately 150,171 gallons per day (of which the Flight Kitchen utilizes approximately 72,000 gallons per day).

In accordance with the goals of the MA LEED Plus program, the FEIR states that the SWSA Redevelopment Program aims to reduce water use demand by a minimum of 20 percent (to aim for a 30 percent reduction) through the utilization of high-efficient, low flow plumbing fixtures, car wash water reclamation systems, and reduce irrigation water by a minimum of 50 percent through the use of efficient landscaping (e.g., use of low-water demand vegetation and native plantings; stormwater runoff collection with rain barrels and/or cisterns). Although the main sources of GHG emission from this project are associated with building heating and cooling, lighting, and vehicle travel, the energy required to provide potable water and treat wastewater also will be a source of GHG emissions, and in particular CO_2. I continue to emphasize to the proponent as the design is finalized that in order to achieve water and energy savings goals, consideration also should be given to using HVAC equipment with advanced evaporator coils, which have been reported to reduce water loss by about 50 percent and energy demand by up to 25 percent.

Pursuant to 360 C.M.R. 10.023(1), the MWRA prohibits the discharge of groundwater to the sanitary sewer system, except in a combined sewer area when permitted by the Authority and the municipality. The proposed construction site of the SWSA Redevelopment Project at Logan International Airport has access to storm drains and it is not located in a combined sewer area;

therefore, the discharge of groundwater to the sanitary sewer system associated with this project is prohibited. Currently, Logan International Airport holds a USEPA-NPDES General Permit for its construction activities. For the SWSA Redevelopment Project, I reiterate as stated in the ENF certificate that Massport must comply with Logan International Airport's USEPA-NPDES General Permit for Storm Water Discharges from its construction activities.

Wetlands

The majority of the 49-acre site is not within a wetlands resource area or buffer zone. Wetlands jurisdiction extends to a small section of Harborside Drive within a buffer zone to wetlands, for which a Notice of Intent (NOI) is required to be filed. It also appears that the replacement of tidegates and stone dissipators at the outfall would entail work within coastal bank and land under water.

Noise

By consolidating and improving the efficiency of existing rental car operations, the project will help to reduce overall future noise levels in adjacent neighborhoods. The project would result in the relocation of several existing noise sources away from the adjoining neighborhoods. The FEIR contained an updated assessment of project-related noise impacts on appropriately sited nearby residential receptors. Specifically, day-night average noise levels (DNL) from SWSA on-site sources under the 2018 Build Condition would be lower throughout the surrounding community than under the 2018 No-Build/No-Action Condition. In addition, overall combined DNL noise levels from both on-site and off-site sources for the 2018 Build Condition would be equal to or lower than the noise levels under the 2018 No-Build Condition throughout the community.

The FEIR analyzed both construction-period and operational noise, including noise from loading docks and service areas. The FEIR also contained a revised assessment of noise impacts related to the ongoing construction of the proposed project, discussing the quantity and type of heavy construction equipment used.

Based on the modification to the Garage Structure (location, reduced height and design), sound paths from the facade to homes are more distant compared to the location of the Garage Structure under the 2008 DEIR. Traffic noise associated with the rental car shuttle bus fleets would also be reduced with the Unified Bus System (because individual buses for each rental car company would be consolidated into a common shuttle system) and because the Unified Bus System would operate farther away from the airport edge and community on the opposite side (airside) of the Garage Structure compared to the 2007 Existing and future No-Build/No-Action Conditions. Noise abatement elements have been incorporated into design and site landscaping and improvements were presented in the FEIR to ensure that potential increases in noise levels are mitigated.

Wind Impacts

The DEIR contained an analysis of pedestrian level wind impacts as it relates to air quality impacts associated with the project. The DEIR concludes that the results of a wind analysis demonstrate that the proposed SWSA Redevelopment Program (including the ConRAC facility and associated parking structure) is not expected to have any significant effect on pedestrian-level winds near the project or in the adjoining neighborhoods. The only predicted exception to this is near the corners of the garage structure and only under high wind conditions where planned landscaping in these areas will help minimize these potential effects. The FEIR provided more details to the planned landscaping that will minimize wind conditions.

Massachusetts Contingency Plan (MCP)/M.G.L. Chapter 21E

I note that this project site is being regulated under MGL c. 21E (3-1611). The FEIR contained an update on the status of the clean-up efforts on the Release Tracking Numbers (RTN) areas for the site and the additional investigations in accordance with the Massachusetts Contingency Plan (MCP). Activities within the SWSA, particularly storage and transfer of petroleum products, have resulted in releases to the subsurface. Releases of Oil and Hazardous Material (OHM) by tenants were reported to MassDEP. All but one of the RTNs have been closed out, with three resulting in the filing of an Activity and Use Limitation (AUL). The other RTN was assigned in August 2007 and the area is still under investigation. The three AUL areas will require that a soil management plan be developed by a Licensed Site Professional (LSP) and submitted to MassDEP prior to construction within those areas. The decommissioning of the existing rental car facilities will include the removal of older fueling systems and associated tanks (in accordance with applicable public safety regulations), which will be replaced with new state-of-the-art systems. The project will also include the remediation of subsurface contamination encountered during tank removals or other excavation activities. It is anticipated that replacing open surface parking areas with a parking structure will reduce the runoff from parking lots and its incidental hydrocarbon loading.

Construction Period

The FEIR commits to a construction plan that proposes to minimize disruptions in the project area and for the entire airport. Specifically, foundation work, such as pile driving, will be arranged for minimal impact and only occur for a relatively short period of time. Piles will be pre-augured through the upper 60 feet or more of soils, reducing the number of hammer blows required to seat the piles, therefore reducing the noise impact on the community. In order to reduce potential impacts from construction activities, Massport will implement a Construction Management Plan that will include:

- An Erosion and Sedimentation Control Program to minimize construction phase impacts to the nearby water resources.

- A requirement that construction contractors install emission control devices on certain equipment types in order to reduce impacts to air quality.
- Noise attenuation measures such as temporary noise barriers, re-routing traffic and/or equipment mufflers that may reduce temporary construction noise impacts within the surrounding community. Pile driving will be required to comply with a project-specific noise specification that will reflect the requirements of City of Boston noise ordinances, and will restrict the types of equipment that can be used and may limit the hours when certain activities can take place.
- Recycling of the materials resulting from removal of the existing above ground building structures, along with the below-ground foundation slabs and footings, plus all other surface asphalt and concrete that is removed during demolition will divert construction waste from landfills.

I commend Massport for committing to require all project contractors to install after-engine emission controls such as diesel oxidation catalysts (DOCs) or diesel particulate filters (DPFs) to reduce engine emissions. The proponent should also work with the nine abutting homeowners to closely inspect the conditions of these homes prior to the commencement of construction to ensure no changes to the condition of the homes occurs as a result of any pile driving or any other heavy construction procedures required to complete the project.

Mitigation/Section 61 Findings

The FEIR contained a separate chapter updating commitments to project-related mitigation. This section included a summary of mitigation commitments as well as draft Section 61 finding language for use by State agencies during each individual permitting process. The Section 61 findings identified and clarified parties responsible for funding and implementation, and the anticipated implementation schedule that will ensure mitigation is implemented in relation to environmental impacts.

The FEIR describes the specific mitigation measures that the proponent has made a commitment to implement. These measures include:

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 LID elements, and replacing uncovered parking areas with buildings.

— 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.

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.
— Develop a Soil Management Plan and submit to the MassDEP prior to construction for the AUL areas.
— 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).

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.
— Incorporate noise reduction strategies into site design, such as solid fences/walls, gateway signs/walls, and landscaped berms.

Phase 2 SWSA Airport Edge Buffer and Other Site Landscaping
— Complete the SWSA Airport Edge Buffer (Phase 2).
— 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.

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.
— 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.
— 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).
— Conduct a third-party commissioning process to ensure the effectiveness of building systems (as required by MA LEED Plus).

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.

— Reduce water use demand and wastewater generation by reclaiming and reusing car washing water.
— Potential collection of and reuse of stormwater runoff for irrigation of landscaped areas.

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.

Transportation and Parking
Roadway Improvements
— Reconstruct Porter Street, including turnaround for exiting taxis.
— Reconfigure SR-14 and new alignment of Ramp 1A-S.
— Construct new dedicated Unified Bus System access and ramp off of SR-14.
— Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Porter Street intersection.
— Reconstruct, widen and convert Jeffries Street to one-way northbound, between Harborside Drive and Tomahawk Drive.
— Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Jeffries Street intersection.
— Construct the extension of Tomahawk Drive –a one-way westbound roadway connecting Harborside Drive with the Maverick Street Gate and Garage Structure.
— Reconstruct traffic signals and pedestrian accommodations at the Harborside Drive/Hotel Drive intersection.
— Reconfigure inbound lane of the Maverick Street Gate to provide additional queue storage.

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.
— Reduce VMT associated with rental car shuttling and, therefore, a reduction in air emissions when compared to the 2007 Existing Condition and future No-Build/No-Action Conditions.
— Reduce rental car shuttle bus terminal curbside congestion through the creation of the Unified Bus System resulting in reduced emissions.
— Utilize clean- and low-emission fuel for the Unified Bus System to further reduce emissions.
— Install Intelligent Transportation System features, as part of the Unified Bus System to further reduce emissions and improve operational efficiency.
— Implement new signage to increase the efficiency of the circulating vehicles within and around the SWSA.

Pedestrian and Bicycle Facilities
— Provide new pedestrian and bicycle facilities, including secure and covered bicycle storage at CSC and QTA buildings for employees, customers and the general public, as well as shower/changing facilities within the QTA buildings for employees.
— 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.
— Provide street and pedestrian-level lighting and advanced warning signals and/or systems at crosswalks.

Transportation Demand Management (TDM) Plan
— Provide limited SWSA employee parking on-site.
— 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.
— Require rental car companies to participate in the Logan Transportation Management Association (TMA).

Alternative-Fuel Vehicles
— As presented under 'Rental Car Company-Related Environmental Commitments' below, the rental car companies would provide fuel-efficient and/or alternative-fueled rental vehicles (quantity to be determined by the rental car companies).
— The current design guidelines for the Garage Structure include infrastructure necessary to accommodate future demands for electric plug-in stations, such as conduit and electrical capacity, and other alternative fuel sources such as E-85.

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 NSA during construction).
— 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.

Construction Management
— Aim to divert/reduce construction waste to landfills.
— Implement Erosion and Sedimentation Control Program.
— Retrofit certain diesel construction equipment types with diesel oxidation catalyst and/or particulate filters (in accordance with the MassDEP Clean Air Construction Initiative).
— Require the use of ultra-low sulfur diesel fuel for off-road construction vehicles and/or equipment.

— 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.
— To ensure no changes in the conditions of abutting homes due to pile driving, proponent will require the Contractor to inspect the conditions of the abutting homes prior to and following pile driving activities.

<u>Conclusion</u>

Based upon my review of the FEIR and after consultation with the state permitting agencies and carefully reviewing all of the comment letters received, I am satisfied that the FEIR has met the requirements of MEPA by provideding sufficient information to allow the state agencies to understand the environmental consequences of the project. Any remaining issues concerning the proposed mitigation measures can be resolved during the permitting processes. The final Section 61 Findings by each of the agencies should be forwarded to the MEPA Office for publication in the Environmental Monitor, in accordance with 301 CMR 11.12.

May 28, 2010
Date

Ian A. Bowles

Comments received:

05/12/2010	Mimi Goss
05/17/2010	Boston Transportation Department
05/17/2010	Jefferies Point Neighborhood Association, Catherine Brayden-Stelitz, Co-Chair, 1st Comment letter
05/21/2010	Local 103 of Greater Boston, International Brotherhood of Electrical Workers
05/21/2010	Jefferies Point Neighborhood Association, Karen Maddalena, Co-Chair, 2nd Comment letter
05/21/2010	Suffolk Construction Company, Inc.
05/21/2010	Mimi Goss
05/21/2010	Melissa Tyler
05/24/2010	Avis Budget Group, Dollar Rent A Car, Vanguard Car Rental USA, Dollar Thrifty Automotive Group, The Hertz Corporation, Enterprise Rent A Car
05/24/2010	Karen M. Maddalena
05/24/2010	New England Regional Council of Carpenters, United Brotherhood of Carpenters and Joiners of America
05/24/2010	New England Regional Office, Laborers International Union of North America
05/24/2010	Pj Schott

Comments received (continued):

05/24/2010 Mary Ellen Welsh
05/24/2010 Massachusetts Department of Public Health
05/24/2010 Department of Environmental Protection, NERO
05/24/2010 Massachusetts Department of Energy Resources (DOER)
05/24/2010 Wig Zamore
05/25/2010 AIR, Inc.
05/26/2010 Boston Water and Sewer Commission
05/26/2010 The Boston Harbor Association
05/27/2010 Proponent's Response to MassDEP's Comments

IAB/ACC/acc

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September 17, 2010

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Logan Airport Green Bus Depot
PROJECT MUNICIPALITY	: Boston
PROJECT WATERSHED	: Boston Harbor
EEA NUMBER	: 14629
PROJECT PROPONENT	: Massachusetts Port Authority
DATE NOTICED IN MONITOR	: July 21, 2010

Pursuant to the Massachusetts Environmental Policy Act (M.G. L. c. 30, ss. 61-621) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **does not require** the preparation of an Environmental Impact Report (EIR).

Project Description

As described in the Environmental Notification Form (ENF), the project consists of construction of a bus maintenance and storage facility within the North Service Area (NSA) of Logan Airport. The purpose of the project is to relocate and consolidate shuttle bus services into a state-of-the-art facility located within the airport. The facility will provide storage and maintenance of Massport's bus fleet and the Unified Bus System that will serve the new Consolidated Rental Car Facility (ConRAC) (EEA# 14137). The bus fleet will include 32 articulated diesel-electric hybrid buses and 18 compressed natural gas (CNG) buses. Vehicular access to the site will be provided via an extension of the existing airport roadway system.

The project includes construction of 72,810 square feet (sf) of enclosed structures, a fueling station, 13–15 parking spaces and vehicular and pedestrian circulation. The facility will include an administrative office, maintenance facilities, bus washing and cleaning, bus parking and storage. Buses will be stored in an enclosed heated structure which will be used for starting and warming buses. In addition, the project includes a covered canopy for the remainder of the bus fleet. The entire site will be fenced and access will be limited. The fueling station will only provide ultra low sulfur diesel (ULSD) fuel for the hybrid busses. The station will include two 10,000 gallon below-ground storage tanks. The site will include vegetated buffers to the north and between the site and the Wood Island marsh.

The project will include sustainable design and construction practices and Massport will seek certification of the facility by the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) and may seek certification at the Silver Level. In addition, Massport has made a commitment to install a 50 kilowatt (kw) rooftop solar array which is estimated to provide 8 -10% of building energy demand. I applaud Massport's strong commitment to reducing the environmental footprint of this project through a significant investment in renewable energy.

Project Site

The project site is a 7.7 acre triangular parcel of land in the NSA of Logan Airport. It is bordered by the Massachusetts Bay Transportation Authority (MBTA) Blue Line tracks and residences to the north, Boston Harbor/Wood Island Marsh to the east and south, and existing buildings housing Logan flight kitchens and parking to the west. In addition, the MBTA Wood Island Station is located to the west between Neptune Road and the flight kitchen building. The project site is relatively flat and almost entirely covered with gravel. It has been used for a range of aviation support activities including vehicle and equipment storage, overflow parking and construction staging. Site access is between the two existing flight kitchen buildings. Resource areas located on and adjacent to the site include coastal bank, salt marsh and filled and flowed Commonwealth tidelands. A rip-rap bulkhead running along the eastern edge of the parcel, which includes a 36-inch outfall structure, forms the coastal bank in this area. The 100-foot buffer zone is vegetated with grasses and small trees. The entire site is above the 100-year flood elevation (9.5 mean sea level).

The existing bus maintenance and storage facility is located off-airport along Eastern Avenue in Chelsea. Buses currently travel through Chelsea and East Boston to service the airport. These off-airport trips will be eliminated through this proposed project.

Permitting and Jurisdiction

The project is undergoing MEPA review and requires preparation of an Environmental Notification Form (ENF) pursuant to 301 CMR 11.03 (1)(b)(2) because it requires a state Permit and will create more than five acres of new impervious area. The project requires a Sewer Use Discharge Permit from the Massachusetts Water Resources Authority (MWRA). It will also require an Order of Conditions from the Boston Conservation Commission (which will serve as the 401 Water Quality Certificate) and, on appeal only, a Superseding Order of Conditions from the Massachusetts Department of Environmental Protection (MassDEP). The project requires a Section 404 General Permit from the Army Corps of Engineers (ACOE), a Notice of Construction to the Federal Aviation Administration (FAA) and a National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharge from Construction Activities from the U.S. Environmental Protection Agency (EPA). Although the parcel includes filled former tidelands, use of the tidelands within the airport boundary is exempt from Chapter 91 licensing pursuant to MassDEP's Chapter 91 regulations (310 CMR 9.03(3)(b)).

Because the Proponent is a State Agency and the project will be funded by the Commonwealth, MEPA jurisdiction is broad in scope and extends to all aspects of the project that may, directly or indirectly, cause Damage to the Environment as defined in the MEPA regulations. These include wetlands, water quality, tidelands, air quality, traffic/transportation and greenhouse gas (GHG) emissions.

Environmental Impacts

Potential environmental impacts associated with the project include: creation of 5.1 acres of new impervious surfaces; alteration of 10–12 feet of coastal bank; work within the buffer zone to wetland resource areas; generation of 340 average daily vehicle trips (adt); generation of 16,525 gallons per day (gpd) of wastewater; and construction period impacts. Measures to avoid, minimize and mitigate environmental impacts include re-development of an altered site in close proximity to transit, construction of a raised, vegetated buffer at the property line to screen the facility from adjacent neighborhoods, provision of pedestrian and bicycle access for employees, and construction of a stormwater management system that will improve the quality and reduce the quantity of runoff to Wood Island Marsh and includes a vegetated bioswale that will provide a buffer between the project and the marsh. Measures to minimize construction-period impacts will include limiting construction to daytime hours, noise control measures such as use of electric generators and mufflers for construction equipment and soil erosion and sediment control plans. In addition, the consolidation of bus and shuttle service and the re-location of the existing maintenance and storage facility from Chelsea will reduce the number of bus trips on airport and through East Boston and Chelsea neighborhoods. As noted in the project description, the project includes sustainable design and construction practices such as a 50 kw solar array, low-voltage light fixtures, limited on-site parking, daylighting in work areas, use of drought tolerant native plants and a high-albedo roof.

Review of the ENF

The Proponent submitted an Expanded ENF that provides detailed project information and analysis. Copies of the ENF were distributed consistent with MEPA regulations and copies were also provided to additional organizations and individuals. The ENF was subject to public review which was extended three weeks beyond the comment period required for filing of an Expanded ENF. A meeting and site visit was held on August 12, 2010. In addition, the ENF notes that Massport held an abutters meeting on April 27, 2010 to discuss development of the NSA, including the Green Bus Depot proposal. The ENF includes a project description, description of existing conditions, identification of required permits and approvals, discussion of

alternatives and potential environmental impacts and identifies measures to avoid, minimize and mitigate project impacts. In addition, it includes an air quality and noise analysis. Comments from State and City agencies are generally supportive of the project and its objectives. City Councilor Sal LaMattina submitted a comment letter expressing his support for the project and for reducing neighborhood impacts.

Alternatives Analysis/Land Alteration

The ENF analyzes a No Build and Build Alternative. The No Build consists of continued use of the Eastern Avenue maintenance facility. The ENF indicates that this Alternative was rejected because one of Massport's objectives is to shift the facility onto the airport to reduce airport-related traffic in the community. In addition, because Massport will be operating shuttle buses associated with the ConRAC facility, the number of buses at the maintance facility will increase and would result in an increase in traffic within these communities. Airport planning efforts and MEPA filings, including development of the ConRAC facility, the proposed Economy Parking Consolidation project (EEA #13456) and the 2008 Environmental Data Report (EDR) (EEA #3247) have evaluated the feasibility of airport parcels for various uses, including the Green Bus Depot. A number of on-airport sites were rejected because they were not large enough to support the programming needs of the facility.

The Build Alternative includes construction of a LEED certified state-of-the-art facility located within the airport boundary. The site was selected because it is large enough to support the programming needs of the facility and provides adequate vehicular access. The ENF indicates that a number of site layouts were considered for their ability to provide adequate vehicle circulation, adequate buffers between project activities, the community and sensitive resources and to minimize potential noise impacts. Site layouts included concentrating development at the northern edge of the site parallel to the MBTA tracks or along the harbor edge of the site and included consideration of a single large structure, as well as a series of smaller buildings arranged on the site.

The ENF indicates that the design of the Preferred Alternative was developed to reduce impacts on the neighboring community. The enclosed and covered buildings will be located in the northeast corner of the site, with the majority of bus operations shielded from the community by the building itself, the proposed landscaped berm along the MBTA tracks and the existing tree line to the north of the MBTA tracks. The bus shed closest to the community will include a solid noise attenuating wall and its height will shield rooftop equipment. In addition, the maintenance bays are located to the south to minimize noise impacts. Bus circulation is proposed in a counter-clockwise loop around the site, with drive-through bus maintenance bays, to minimize unnecessary movements and the use of back-up alarms. The use of low-height, low-cutoff light fixtures will limit light emittance from the building and site, and the landscaped edge area will further reduce site visibility from the Swift Terrace and Neptune Circle neighborhoods to the northwest of the project site.

Many comment letters indicate that the Proponent should explore other parcels within the airport boundary to avoid development of this parcel which is in close proximity to Wood Island Marsh and residential areas. The parcel is located within an existing service area and the parcel has been used to support airport-related activities on an as-needed basis. Analysis of environmental impacts indicates that the project will either improve existing conditions or that associated impacts, such as noise and wetland alteration, are minimal. The ENF identifies measures to avoid, minimize and mitigate environmental impacts. Comments from state and City agencies are supportive of the project and do not indicate that additional analysis of alternative on-airport sites is warranted.

Sustainable Design/Greenhouse Gas Emissions

As noted throughout this Certificate, the project is being designed to minimize environmental impacts including the generation of GHG emissions and wetlands impacts. The Proponent is seeking LEED Certification at the Silver Level. I strongly support Massport's efforts to green this facility and recognize the importance of this effort to air quality and the health of the salt marsh. The project will include many notable sustainable design features including a 50 kw solar array that will provide 8 – 10% of building energy needs, daylighting, reuse of wash water and a commitment to reduce energy use by 20% beyond building code requirements. I strongly encourage Massport to explore how the project design can be refined to further reduce its impacts with an objective of certifying the project at the Silver level.

Air Quality

The ENF indicates that no air quality permits are required for the project. Operation and design of the emergency generator must comply with the MassDEP Environmental Results Program (ERP). The ENF indicates that the project will be designed and constructed consistent with the Logan Air Quality Initiative, Logan Parking Freeze, Massport Construction Program, Massport Climate Change Program and the Commonwealth's efforts to address climate change. In addition, the ENF indicates that the project is being designed with operational flexibility to support incorporation of advanced alternative fuel vehicles.

The ENF includes an analysis of local and regional air quality impacts (Appendix D: Air Quality Technical Report) and identifies efforts to avoid, minimize and mitigate impacts. The analysis indicates that localized concentrations of carbon monoxide (CO) and particulate matter (PM2.5 and PM10) will not result in exceedances of the National Ambient Air Quality Standards (NAAQS) or MassDEP significant impact levels (SIL). Analysis of area-wide emissions includes comparison of baseline and project emissions of volatile organic compounds (VOC), nitrogen oxides (NOx) and CO. Results indicate that future emissions will not exceed *de minimis* thresholds for these pollutants.

The ENF indicates that moving the maintenance facility to the airport from Chelsea will reduce air emissions by significantly reducing trip lengths (from 2.4 miles to 1.3 miles) and avoiding travel through congested intersections in East Boston and Chelsea. Reductions in air emissions associated with the consolidation of the rental car fleet was identified during review of the ConRAC proposal and is not included in this air quality analysis.

Consistent with many other projects proposed at Logan Airport and reviewed by MEPA, some commentors have expressed concerns about the impact of the Airport on air quality and

human health, in particular, about the health impacts of vehicle-related PM emissions. The air quality analysis included in the ENF demonstrates that the project will meet all applicable air emissions standards under the CAA. Comments from Airport Impact Relief, Incorporated (AIR, Inc.)/Friends of Belle Isle Marsh request clarification regarding analysis of ultrafine particulates (UFP) in association with this project and Logan Airport operations as a whole. The ENF indicates that reductions in UFP were generally assessed in the context of the cleaner shuttle bus fleet. It indicates that the diesel-electric hybrid buses equipped with diesel particulate filters (DPF) can reduce particulates by over 90% and will lower emissions of UFP associated with the shuttle buses. In addition, the Massachusetts Department of Public Health (DPH) is conducting a study concerning air pollution, and particularly PM pollution, at neighborhoods surrounding Logan Airport which will provide additional useful information on the impact of projects such as this. On September 16, 2010, the Massport Board approved $195,000 in funding to DPH to complete this study. The study is anticipated to be completed in 2011. I am satisfied that the emissions control and mitigation measures being employed by Massport for this project, in conjunction with Massport's commitment to funding the DPH study, will result in adequate mitigation of the project's potential air quality impacts.

Traffic and Transportation

As noted previously, the project will relocate existing trips associated with the off-airport maintenance facility and support the consolidation of shuttle buses that serve rental car facilities. The site will be served through extension of the existing airport access road to the west of the site. In addition, the site will be designed to encourage employees to use bicycles and transit, including a safe pedestrian connection from the Wood Island MBTA station.

Comments from the City of Boston Transportation Department (BTD) indicate support for the project because it will enhance airport operations while producing important environmental, traffic and public safety benefits by reducing traffic trips and congestion. These comments indicate that traffic conditions will improve at the following critical neighborhood intersections in Chelsea and East Boston: Chelsea Street/Curtis Street, Chelsea Street/Neptune Road, Neptune Road/Bennington Street, Neptune Road/Route 1A Ramps and Neptune Road/Vienna Street.

Wetlands

The Boston Conservation Commission will evaluate the project's consistency with the Wetlands Protection Act and wetlands regulations, including stormwater standards. Wetland alterations are limited to 10–12 feet of coastal bank associated with repair and re-construction of the existing outfall pipe and work within the buffer zone to wetlands. The ENF indicates that the proposed drainage system will be designed to ensure that the peak rate of runoff rate for the post-development condition will not exceed the pre-development runoff rate. Stormwater from the eastern portion of the site will be directed to two detention basins and a bioswale constructed along the eastern edge of the site. They will be within a 50-foot vegetated buffer that will be maintained along the Wood Island Marsh. The detention basins will include a sediment forebay and extended detention to improve the quality of stormwater discharging from the site. Stormwater from the western side of the site will be collected in a drainage system consisting of deep-sump catch basins and sediment control structures. Outlets from the sediment control structures will be connected to the existing drainage system. Stormwater will be treated prior to discharge through the existing outfall. The ENF indicates that rooftop runoff may be infiltrated if soil testing indicates that it is feasible.

Comments from MassDEP indicate that wetland issues are expected to be addressed adequately through local review. The comments note that the ENF does not demonstrate consistency with all of the stormwater standards. Specifically, the Proponent will need to address whether adequate soil infiltration can be achieved and that the best management practices (BMPs) proposed for the western edge of the site will adequately remove Total Suspended Solids (TSS). I note that many commentors have expressed concern with the re-development of this site because of its proximity to the salt marsh. Based on a review of the information provided in the ENF, the project is designed to improve stormwater quality, reduce the quantity of stormwater flows and maintain an adequate buffer between wetland resources and the project site. As the project design proceeds, the Proponent should consider recommendations included in comment letters regarding the design of the vegetated buffers.

Wastewater

The project requires a Sewer Use Discharge Permit from the MWRA and, depending upon total wastewater flow, it may require filing of a self-certification with MassDEP or a Sewer Connection Permit. The ENF indicates that wastewater is associated with the administration offices, employee support services and bus washing.

The project will include a water reclamation system to reduce the water needed for vehicle washing. The ENF indicates that approximately 11,025 gallons of 16,525 gpd wastewater produced will be reclaimed. Fresh water and reclaimed water will be used in the washer. Used water will flow to a trench drain, collected in a sump pit, treated through a series of cyclonic filters and stored until it is needed. During high-use periods overflow from the sump pit will flow through an oil/water separator prior to discharge to the sanitary sewer. The sump pit will include an overflow invert approximately one foot below the inflow from the trench drain which will allow heavy particulates to settle and avoid discharging them to the oil/water separator. All discharge from the vehicle wash system will meet Massachusetts Water Resources Authority (MWRA) treatment standards prior to discharge to the sanitary sewer.

The ENF does not identify how wastewater flows were calculated. Comments from MassDEP indicate that the Proponent will need to quantify flows consistent with Title 5 during project permitting. Comments from the MWRA note that any discharge of groundwater to the sanitary sewer is prohibited.

Community Impacts

The ENF describes a number of measures that are included in the project design and operations to minimize air quality, visual and noise impacts associated with the project. A noise assessment was conducted (Appendix B: Noise Technical Report) to evaluate potential impacts

associated with the operation and construction of the project. Baseline noise conditions were established through field measurements at the residences closest to the site.
Project noise sources specified in the prediction model include stationary or idling buses, on-site bus movements, bus refueling and washing, maintenance activities and rooftop ventilation fans.

The noise analysis indicates that the future 24-hour day-night cumulative noise levels (L_{dn}) will be equivalent to Existing Conditions and will not exceed the FAA allowable increase criteria (page 12, Table 6). Peak-hour noise levels (maximum bus activity at 1:00 AM) will not exceed the MassDEP criteria of 10 decibels above the measured background (page 13, Table 7) or the City of Boston Air Pollution Control Committee's (APCC) nighttime threshold of 50 decibels.

Measures to minimize any noise impacts includes incorporation of quieter buses into the fleet (while idling and while accelerating), building layout and design to minimize visual and noise impacts to the neighborhood (e.g. containing maintenance activities within interior spaces), limiting maintenance to daytime hours from 7:00 am to 5:00 pm (with the exception of emergency repairs) and design of vehicular circulation to minimize the use of back-up alarms.

Some commentors have suggested that the noise impacts be re-modeled to assess specific conditions of concern and have suggested that the bus shed should also be enclosed or its location swapped with the bus storage barn which is fully enclosed. The ENF clearly describes Massport's rationale for the design of the facility, a major emphasis of which is to address noise concerns. The noise analysis and emphasis on noise mitigation is adequate to serve the purposes of this ENF review. I expect Massport will carefully review comments from the community regarding noise and refine the design as appropriate.

The proposed vegetated buffer between the facility and the neighborhood generated many comments. Many commentors, including BTD, urge the Proponent to extend the East Boston Greenway through the northern edge of the site to eventually provide a pedestrian and bicycle connection from Bremen Street Park to Constitution Beach. At the site visit, Massport indicated that it does not support public access on the site for security reasons and that East Boston Greenway connections can be provided via alternative routes. During the site visit and through comment letters, several abutters also expressed opposition to public access on this site. It appears that the site could support such a connection and it would improve bicycle and pedestrian access to the waterfront; however, security concerns must be considered seriously. In general, discussion and consideration of the relative benefits and impacts of providing public access through this site is more appropriately addressed at the local level between Massport, the City of Boston and the East Boston community rather than through the MEPA process. I note that the project, as proposed, would not preclude a Greenway connection and no additional MEPA review would be required if Massport chooses to incorporate it into its site design.

<u>Conclusion</u>

Pursuant to 301 CMR 13.02 (2), I am declining to require a Public Benefit Review for this project. The site is located within the airport boundary and has been and will be used for airport-related activities. As noted previously, the project is exempt from Chapter 91 and, therefore, does not require a Chapter 91 license.

Based on a review of the ENF and after consultation with relevant public agencies, I find that no further MEPA review is required at this time. The permitting process will provide adequate opportunities to address wetlands and wastewater issues identified in comment letters. I expect that Massport will continue to coordinate with the City of Boston and the East Boston community regarding project design and mitigation of local impacts. The Proponent should review comments from State agencies and be prepared to address these issues during permitting. The project may proceed to State permitting.

September 17, 2010
Date

Ian A. Bowles

Comments received:

9/10/10	Massachusetts Department of Environmental Protection (MassDEP)/Northeast Regional Office (NERO)
9/14/10	Massachusetts Water Resources Authority (MWRA)
9/10/10	City Councilor Salvatore LaMattina
9/15/10	City of Boston Environment Department
8/10/10	Boston Water and Sewer Commission (BWSC)
8/2/10	Boston Transportation Department (BTD)
9/13/10	The Boston Harbor Association
9/10/10	Airport Impact Relief, Inc./Friends of Belle Isle Marsh
9/10/10	Boston Natural Areas Network
9/10/10	Jeffries Point Neighborhood Association
9/10/10	JoAnn F. Cox
9/10/10	Jessica Curtis
9/10/10	Elizabeth Gagnon
9/10/10	Brian Gannon
9/10/10	Allyson Gray
9/10/10	Gail Miller
9/10/10	Colleen Manning and Robert Stubblebine
9/10/10	Christopher B. Marchi
9/11/10	Giordana Mecagni
8/10/10	Laura L. Modica
9/13/10	Matthew Morano
9/10/10	Michelle Muhlanger
9/10/10	Matthew Neave
9/10/10	Liz Nofziger
9/10/10	Beth Rochefort
9/11/10	Robert Sarno
8/11/10	Joseph E. Steffano, Jr.

9/7/10	Mary Ellen Welch
9/13/10	Melanie Gelling Zurek
9/3/10	Stephen and Sharon Scapicchio

IAB/CDB/cdb

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September 29, 2010

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
DRAFT ENVIRONMENTAL IMPACT REPORT

PROJECT NAME	: Boston-Logan International Airport Runway Safety Area Improvements Project
PROJECT MUNICIPALITY	: East Boston
PROJECT WATERSHED	: Boston Harbor
EOEA NUMBER	: 14442
PROJECT PROPONENT	: The Massachusetts Port Authority
DATE NOTICED IN MONITOR	: July 21, 2010

As Secretary of Energy and Environmental Affairs, I hereby determine that the Draft Environmental Impact Report (DEIR) submitted on the above project **adequately and properly** complies with the Massachusetts Environmental Policy Act (G. L., c. 30, ss. 61-62I) and with its implementing regulations (301 CMR 11.00). The Scope for the Final Environmental Impact Report (FEIR) provided below outlines the remaining issues.

Project Overview

The proposed project consists of enhancing the runway safety areas (RSAs) at the ends of Runway 33L and Runway 22R at Boston-Logan International Airport. The proposed improvements are required to enhance the RSAs to be consistent with the current Federal Aviation Administration's (FAA) airport design criteria for RSAs and to enhance rescue access in the event of an emergency. RSAs are safety measures designed exclusively to function in the event of an undershoot, overshoot or excursion from the runway. RSAs do not extend runways or have any effect on normal runway operations, runway capacity or types of aircraft which can use the runways. Typical RSAs are 1,000 feet long by 500 feet wide.

The existing RSA at the end of Runway 33L does not meet standard FAA design criteria for overrun and undershoot protection for the design aircraft for that runway, the Boeing 747-400. The existing RSA is 187.5 feet long and 500 feet wide and is therefore too short to provide protection consistent with FAA criteria. Within this area is a 158-foot long and 170-foot wide Engineered Material Arresting System (EMAS) bed constructed of collapsible concrete blocks with predictable deceleration forces, installed in 2006 as an interim safety measure. When an aircraft rolls into an EMAS bed, the tires of the aircraft collapse the lightweight concrete and the aircraft is slowed down in a way that minimizes damage to the aircraft. The proposed project is intended to enhance the Runway 33L RSA so that it provides overrun and undershoot protection consistent with the design criteria in the FAA's Airport Design Advisory Circular to the extent feasible.

The existing RSA at the end of Runway 22R meets the minimum FAA design criteria for overrun protection for the runway's design aircraft but does not comply with undershoot requirements. However, given that Runway 22R is very rarely used for arrivals and has an 815-foot displaced threshold, it is unlikely that aircraft would ever undershoot this end of the runway. Therefore, the Runway 22R RSA enhancement is intended to protect aircraft in the event that an aircraft arriving on Runway 4L overruns and fails to stop on the runway. The RSA is 215 feet long and 500 feet wide, and includes a 190-foot long and 170-foot wide EMAS bed. As a condition of approving the installation of the existing EMAS bed, the FAA required Massport to consider options for further enhancing the level of safety provided by the existing RSA. The current project proposal is consistent with that commitment.

As proposed, the two components of this project will have significant and permanent impacts upon coastal wetlands, salt marsh, and shellfish beds. While Massport is working to minimize adverse impacts, there are still unavoidable permanent impacts to coastal wetlands. At Runway End 22R, Massport is proposing to fill coastal bank (530 linear feet (LF)), salt marsh (35,040 square feet (SF)), coastal beach (26,630 SF), land containing shellfish (1.4 acres or 62,370 SF), land under ocean (700 SF) and Buffer Zone to create an Inclined Safety Area. At Runway End 33L, Massport is proposed to construct a pile-supported deck over coastal bank (395 LF), coastal beach (4,385 to 4,570 SF), land containing shellfish (460 SF to 1,175 SF), land under the ocean (395 to 1,045 SF) including 1.4 to 1.5 acres (60,100 to 66,600 SF) of eelgrass bed, and Buffer Zone (not quantified) to extend the existing EMAS. Also, fish and shellfish habitat would be displaced, altered or eliminated by the pilings for Runway 33L, and approximately 62,370 square feet of Land Containing Shellfish will be lost due to the placement of fill as part of Runway 22R safety improvements.

Comments submitted on the DEIR generally support the project and its public safety purposes. After reviewing the DEIR and the comments received, I find that Massport has adequately demonstrated that the project's preferred alternatives appropriately minimize environmental impacts to the greatest extent possible, subject to further refinement of design-alternatives for the Runway 33L deck construction and piling combinations in the FEIR. However, the FEIR needs to contain a greater level of detail and commitment to mitigation measures for the unavoidable environmental impacts associated with the preferred alternatives. The FEIR should fully respond to comments submitted on the DEIR and to the Scope provided below.

<u>State Permits and Jurisdiction</u>

This project is subject to a mandatory EIR pursuant to Section 11.03(3)(a)(2) of the MEPA regulations because it involves Agency Action and will result in wetland alterations that require a Variance in accordance with the Wetlands Protection Act. The project will require a 401 Water Quality Certificate and a Chapter 91 License from the Department of Environmental Protection (MassDEP). The proposed project may also require approval from the Massachusetts Natural Heritage and Endangered Species Program. To initiate public review under the state wetlands regulatory process, Massport has filed a Notice of Intent (NOI) with the Boston Conservation Commission to obtain an Order of Conditions pursuant to the Wetlands Protection Act (WPA). However, I note that the Wetland regulations, 310 CMR 10.23(3) does not allow salt marsh alteration or allow for any adverse effects on marine fisheries habitat or wildlife habitat caused by destruction of eelgrass beds, 310 CMR 10.25(6)(b). Massport has requested a Variance to the Wetlands Protection regulations to allow the proposed salt marsh and eelgrass alteration. Review of the Variance request has been suspended pending completion of the MEPA process and submission of additional information.

In addition, both the proposed RSA enhancements for Runway 33L and Runway 22R will require fill materials to be placed below the extreme high water line. Therefore, an Individual Section 10/ 404 permit from the U.S. Army Corps of Engineers (USACE) is required. The authority for these permits is Section 10 of the Rivers and Harbors Act for any structures or work within tidal waters up to mean high water and Section 404 of the Clean Water Act for placing fill or dredged material up to the extreme high water line or within adjacent wetlands. The proposed project may also be subject to Coastal Zone Management (CZM) federal consistency review, in which case the project must be found to be consistent with CZM's enforceable program policies. The project must comply with the National Pollutant Discharge Elimination System (NPDES) General Permit for stormwater discharges from a construction site.

The project will be undertaken by Massport, a State Agency, and financed in part by funds from the Commonwealth. Therefore, MEPA jurisdiction for this project is broad and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in the MEPA regulations.

<u>Joint Review/Working Groups</u>

The FAA determined that the proposed project required an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA). It is my view that the planning for this project has been served well by the coordinated review and the submission of a single set of documents to satisfy the requirements of both MEPA (Section 11.09(4)(c) and NEPA.

Therefore, I continue to allow the proponent to submit one set of documents that satisfies both the state and federal environmental processes for the Final EIR/EA process.

Massport established two working groups to discuss avoidance and minimization of impacts to coastal wetland resources, and ultimately mitigation options, as conceptual design of the proposed Runway 33L and Runway 22R Runway Safety Area improvements advanced. These Working Groups included local, state, and federal resource agency representatives, and met multiple times from April 2009 to June 2010 to provide advice and regulatory guidance to Massport regarding impacts and mitigation. I advise Massport that coordination with the Working Groups should continue through the Final EIR/EA and permitting processes, consistent with the Scope provided below.

REVIEW OF THE DEIR/SCOPE

<u>Format and Circulation</u>

The proponent should prepare and circulate the Final EIR (FEIR) in accordance with Sections 11.07 of the MEPA regulations, as modified by this Certificate. The FEIR should contain a copy of this Certificate and of each comment letter received. The proponent should circulate the FEIR in compliance with Section 11.16 of MEPA regulations, to those parties submitting written comments on the ENF, and to any state agencies from which the proponent will seek permits or approvals. The proponent should send a Notice of Availability of the FEIR to Massport's standard MEPA mailing list, as periodically updated. The proponent should also make a reasonable number of copies of the FEIR available on a first come, first served basis. A copy of the FEIR should be made available for public review at the Boston Public Library (East Boston Branch), the Revere Public Library, the Chelsea Public Library, the Everett Public Library and the Winthrop Public Library.

As noted previously in my Certificate on the Environmental Notification Form, because there will be potential impacts to shellfish, the FEIR should be distributed to the shellfishing industry and local shellfishing representatives. I have received several comments requesting enhanced outreach to the local shellfishing industry to ensure they are afforded an opportunity to participate in the environmental impact review process for this project. I ask that Massport commit to holding a briefing with local shellfishing representatives during the preparation of the FEIR to discuss potential impacts associated with the project. I suggest that Massport contact The Boston Harbor Association and/or the Division of Marine Fisheries to help facilitate that meeting. If those discussions have already taken place, the FEIR should describe the outreach to the shellfishing community and the outcome of the discussions in greater detail.

<u>Response to Comments</u>

In order to ensure that the issues raised by commenters are addressed, the FEIR should include a detailed response to comments. The FEIR should include a Response to Comments section which reprints comments in their entirety. The FEIR should include responses to individual comments, in an indexed format and/or direct response to individual points within comment letters. This directive is not intended to and shall not be construed to enlarge the scope of the FEIR beyond what has been expressly identified in this Certificate.

Alternatives Analysis

Runway 33L

The Preferred Alternative for the Runway 33L Runway Safety Area (RSA) improvements includes constructing a 600-foot long RSA with Engineered Materials Arresting System (EMAS) on a 300-foot wide pile-supported deck. The deck, extending over the water, would be 470 feet long. The Preferred Alternative also includes moving the existing offset localizer to a new pile-supported deck at the end of the RSA, and upgrading the approach light system to a Category III Instrument Landing System (Cat III ILS) which includes a High-intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2). Part of the existing timber light pier (approximately 560 feet) would be removed and the approach lights would be incorporated into the new deck. The existing EMAS bed would be extended to a total length of 500 feet. As part of this alternative, the existing 20-foot wide airport perimeter road would be relocated between the runway's threshold and the EMAS bed (it is currently located at the end of the existing EMAS bed). Emergency access ramps to the water would be installed on the north and south sides of the RSA and ladders or concrete steps would be provided on the sides and end of the RSA.

While the Preferred Alternative for Runway 33L RSA improvements would result in impacts to coastal wetland resources, including Coastal Bank, Coastal Beach, Land Under the Ocean, and Submerged Aquatic Vegetation (eelgrass), impacts from this alternative are less than that proposed for the three preliminary alternatives previously evaluated in the Environmental Notification Form (ENF). The Preferred Alternative would maintain runway utility and capacity, and would provide protection and functionality near equivalent to a RSA that fully meets the FAA design criteria. Massport and FAA retained this alternative based on the safety benefits achieved, reduced environmental impacts, and cost feasibility.

However, with respect to specific final design of the pile-supported deck, Massport has considered various pile types and configurations. Five of six construction options are considered in detailed in this DEIR. These alternate deck structures and piling combinations were evaluated at the conceptual design level to assess costs, minimize impacts, and evaluate constructability. Because the overall impacts of the different deck and piling configurations to coastal wetlands resources and coastal processes would be similar, all five options were retained to provide flexibility in the design-build process.

To summarize, all five deck and pile options would contain the following elements:

- A RSA approximately 600 feet long by 300 feet wide located partially on land and partially on the proposed deck with various pile supporting options.

- A deck structure approximately 470 feet long, with a surface area of approximately 141,000 square feet (3.2 acres);
- An EMAS bed approximately 500 feet long by 170 feet wide located within the RSA;
- Two 25-foot wide emergency access ramps located approximately 30 feet northeast and 70 feet southwest of the proposed deck protected by riprap placed around the edge of the ramps;
- A steel sheet pile cutoff wall approximately 350 feet long at the inshore limit of the deck to prevent settlement and erosion of the backland areas;
- A new deck to support the localizer, approximately 300 feet wide by 60 feet long, supported by thirty-three 16-inch diameter vertical piles;
- Finger pier extensions to the existing light pier to accommodate a lighting upgrade; and
- Relocating the existing perimeter road, utilities, and a portion of Taxiway C.

Massport may carry-forward the preferred alternative for Runway 33L and the remaining five design options for the pile-supported deck for further analysis in the FEIR.

Runway 22R

The proposed Runway 22R improvements enhance the existing RSA by constructing an inclined safety area (ISA). This Preferred Alternative was advanced to the conceptual design phase because it would enhance the existing RSA and rescue access in the event of an emergency, at a construction cost which appears to be feasible while minimizing impacts to environmental resources.

The proposed Runway 22R ISA would be similar to the ISA previously constructed at the Runway 22L end. It would require gravel fill to be placed approximately 130 feet north from the top of Coastal Bank and would be graded over the full 500-foot width of the extended safety area down to the mean lower low water elevation. The proposed Runway 22R ISA would include placing approximately 8,450 cubic yards of fill, contained within a perimeter wall of stone-filled gabions and surfaced with crushed stone. Emergency access ramps would not be required because the ISA itself would provide first responders with access between the water and the airfield. The perimeter road would not be relocated.

Massport may carry-forward the preferred alternative for Runway 22R for further analysis in the FEIR.

Wetland Resources

Impacts Associated With Runway 33L

The proposed Runway 33L RSA improvements would affect coastal wetlands resources of approximately 3.65 acres. The proposed Runway 33L safety improvements would result in permanent impacts to Coastal Bank, Coastal Beach/Tidal Flats, Land Containing Shellfish, Submerged Aquatic Vegetation (eelgrass), and Land Under the Ocean. A portion of this area is also defined as waters of the United States, and is subject to federal jurisdiction. There is a state-jurisdictional buffer zone extending 100 feet from the top of Coastal Bank. Work proposed within the buffer zone includes removing a segment of the existing perimeter road (which will be relocated outside of the buffer zone) and converting that area to grass. Work within the buffer zone also includes reconstructing the existing EMAS bed. The hydrological analysis described in the DEIR indicates that the proposed pile-supported deck would not change coastal currents or wave impacts in the vicinity of the Runway 33L RSA.

Each of the proposed Runway 33L deck construction options would result in the alteration of 315 linear feet of the man-made Coastal Bank to install the sheet piling and fill structure that would support the approach slab and landward end of the RSA deck. An additional 80 linear feet of the riprap slope would be altered for the emergency access ramps. This would convert the existing rip-rap bank to a sheet pile bank or crushed stone ramps, and would not affect the functions or significant interests of the Coastal Bank including storm damage prevention and flood control. The new sheet pile bank would maintain the stability of the Coastal Bank.

Each of the proposed Runway 33L construction options would also result in the alteration of Coastal Beach (the intertidal beach), ranging from 65 square feet (Option 3) to 250 square feet (Option 1), to install the fill structure that would support the approach slab and landward end of the RSA deck, and to install some of the deck pilings. An additional 4,320 square feet of Coastal Beach would be converted to two emergency access ramps.

The proposed Runway 33L RSA improvements would affect Land Under the Ocean, especially the protection of marine fisheries and wildlife habitat. Each of the construction options would result in the loss of Land Under the Ocean to install pilings needed to support the RSA deck (including the localizer). The area of loss is directly related to the size and number of pilings, and ranges from 395 square feet (Option 3) to 1,045 square feet (Option 5). Eelgrass (submerged aquatic vegetation) is a habitat type of the state-regulated Land Under the Ocean, and is also considered to be a Special Aquatic Site under the federal Section 404(b)(1) guidelines. The DEIR assumes that the entire portion of the eelgrass bed under the proposed Runway 33L deck would be shaded and would no longer receive sufficient light to survive. It is conservatively estimated that this would result in the loss or impairment of 60,100 square feet of eelgrass due to direct shading from the proposed deck (approximately 3 percent of the entire existing eelgrass bed), as this area would not receive enough light for eelgrass survival. An additional 6,500 square feet of eelgrass near the deck is expected to be indirectly affected by shading, although this is less certain. Each of the deck construction options would result in the same impacts to eelgrass, since the size of the RSA (and localizer) deck would be the same under all five construction options.

Each of the proposed Runway 33L construction options would also result in the alteration of Land Containing Shellfish (a state-regulated resource area that overlays Coastal Beach and Land Under the Ocean) as a result of placing pilings to construct the RSA improvements. Direct impacts range from 460 square feet (Option 3) to 1,175 square feet (Option 5).

Impacts Associated With Runway 22R

The proposed Runway 22R safety improvements would result in permanent impacts to Coastal Bank, Salt Marsh, Coastal Beach, Land Under the Ocean, Land Containing Shellfish, and Land Subject to Coastal Storm Flowage. A portion of this area is also defined as waters of the United States, and is subject to federal jurisdiction. There is a state-jurisdictional buffer zone extending 100 feet from the top of Coastal Bank. There are no permanent impacts to this buffer zone, which contains the perimeter road and a portion of the existing Runway 22R EMAS bed. The DEIR states that the ISA is not expected to change wave direction or velocity or to result in increased erosion or deposition because of its orientation.

The proposed Runway 22R ISA improvements would result in the alteration of 530 linear feet of Coastal Bank in order to construct the ISA. The DEIR states that the proposed ISA would maintain or improve the stability of the bank. Approximately 26,630 square feet of Coastal Beach/Tidal Flat would be lost due to the construction of the Runway 22R ISA. The DEIR states that it is not likely to impact any adjacent or downdrift Coastal Beach and will not interfere with littoral drift. Approximately 35,040 square feet of Salt Marsh (including 7,110 square feet of *Phragmites*-dominated Salt Marsh) would be lost due to the construction of the Runway 22R. The proposed Runway 22R ISA would impact the interests significant to Salt Marsh, and therefore, requires a WPA Variance because work would not meet the regulatory performance standards described in the WPA.

Approximately 700 square feet of Land Under the Ocean would be lost due to the placement of fill required to construct the inclined safety area. There are no eelgrass beds located within the proposed Runway 22R ISA improvements area. The proposed Runway 22R RSA improvements would have no adverse effects on marine fisheries and wildlife habitat protected by Land Under the Ocean, as high densities of polychaetes, mollusks, or macrophytic algae are not present in the vicinity of Runway 22R. Approximately 62,370 square feet of Land Containing Shellfish would be lost due to the placement of fill required to construct the inclined safety area. The proposed Runway 22R would affect the interests significant to Land Containing Shellfish mapped by the DMF as a conditionally restricted designated shellfish growing area.

With respect to quantification of impacts to the various wetland resource areas and types, I have received comments requesting clarification of discrepancies between the information provided in narratives and attached tables. I ask that Massport address these comments and clarify the correct numbers concerning the extent of impacts.

Variance from the Wetlands Protection Act (WPA)

Because of the extent of wetlands impacts outlined above, this project will require MassDEP to issue a Variance from the WPA Regulations. In order to grant a Variance request, section 310 CMR 10.05 of the regulations requires MassDEP to consider three main criteria: 1) that there are no reasonable conditions or alternatives that would allow the project to proceed in compliance with the wetlands regulations; 2) that mitigation measures are proposed that will allow the project to be conditioned so as to contribute to the protection of the interests identified in the Wetlands Protection Act; and 3) that the variance is necessary to accommodate an overriding community, regional, state or national public interest, or to avoid an unconstitutional taking of property without compensation. The FEIR should clearly describe how the project will comply with these requirements.

While the DEIR contained information and plans related to both runways, as described above, MassDEP has stated in its comments that the information required for consideration of a request for a Wetland Protection Act Variance has not been developed in sufficient detail for MassDEP to adequately review the variance request. Therefore as part of the FEIR, Massport should submit design-level plans depicting resource area impacts and mitigation in greater detail, as well as include detailed construction and operational specifications. I refer Massport to MassDEP's comment letter for further details on the information that will be required.

The majority of the information that needs to be provided in the FEIR concerning impacts to wetland resource areas concerns mitigation. The DEIR contained an analysis of the on-site mitigation options for wetland alterations. The DEIR also addressed the possibility of off-site mitigation if on-site mitigation is infeasible. The FEIR should contain further analysis for proposed mitigation sites and well as refined mitigation goals, based on public and agency feedback. MassDEP has stated in its comments that detailed mitigation design plans and specifications should be addressed in the FEIR for impacts to land under water (310 CMR 10.25), eelgrass beds (310 CMR 10.25(6)(b)), and salt marsh (310 CMR 10.32) discussed in detail below.

Land Under Water/Intertidal Areas

The DEIR did not clarify enough what is intended to be provided as mitigation for impacts to land under water/intertidal areas. I have received several comments requesting that Massport specifically identify what mitigation measures are associated with impacts to land under water/intertidal areas and mudflats/coastal beach. It is not clear whether salt marsh restoration will adequately compensate for the functions and values associated with these specific resource areas, and that topic should be addressed in the FEIR. I note that impacts to shellfish and aquatic habitat associated with these resource areas are addressed separately below.

Eelgrass

Massport should strive to minimize impacts to eelgrass in the Preferred Alternatives. The FEIR should identify, in consultation with the Eelgrass Mitigation Working Group and environmental and community representatives, the site of eelgrass re-establishment/restoration at a minimum of a 3:1 ratio, or higher. The FEIR should include a detailed protocol in order to achieve the required level of eelgrass mitigation and how Massport intends to choose suitable transplant sites. As requested in MassDEP's comments, the FEIR should include:

- Information on the collection of field data and the undertaking a site-selection modeling effort (as outlined in the VHB Memo Re: Logan RSA – Eelgrass Mitigation Strategy, dated August 16, 2010);
- An updated map of the aerial extent and density of eelgrass habitat in the project area conducted during the growing season prior to construction;
- The final estimates of direct eelgrass impacts from the project and indirect impacts from shading, sediment deposition outside of the footprint, changes in sediment distribution from alterations in water circulation, and anticipated impacts from construction barges;
- If vessels are to be anchored in eelgrass beds, a discussion of how "anchor sweep" impacts to eelgrass beds will be avoided or minimized; if impacts cannot be avoided, the effects of the anchor sweep need to be calculated and mitigation provided;
- A schedule to minimize and/or eliminate the risk of impacts from construction vessels (e.g. limiting barge use to periods of high tide to avoid grounding of barges on eelgrass habitat and the use buoys to mark construction corridors to contain vessels movements);
- Documentation that the proposed eelgrass mitigation plans are consistent with methodologies critical to the success of eelgrass restoration efforts;
- A discussion and assessment of the potential eelgrass sites (including the Deer Island Flats and Governor's Island Flats) identified by the Batelle study conducted as part of the HubLine project and how the findings of this study may assist Massport in choosing suitable transplant sites;
- A survey of any other sites in the outer harbor not assessed in the Batelle study with appropriate physical and biological site characteristics that optimize eelgrass survival;
- A discussion of how the eelgrass plant stock in the footprint of the construction area will be preserved for used as donor stock (i.e. harvested, transported, and transplanted – including possible transplanting into the less dense portion of the existing bed beyond the impacted area) and a timetable of the sequencing steps to ensure optimal eelgrass survival and transplanting success;
- A commitment to pre-construction and long term post-construction monitoring of any proposed mitigation site;
- Documentation from the U.S. Department of Agriculture - Wildlife Services as to whether eelgrass habitat constitutes an attractive wildlife nuisance as contemplate by FAA Advisory Circular: 150/5200-33B and whether a need exists to conduct a Wildlife Hazard Assessment (WHA) in accordance with Part 139;
- A monitoring plan to track the success of all eelgrass transplant efforts and the criteria (e.g. root/shoot density comparable to the existing eelgrass meadow and the targeted percent of re-established cover over a one, three, and five-year timeframe) to be used to measure the success of the restoration effort; and
- Remedial plans to be undertaken in the event that initial restoration efforts fail.

I note that comments from CZM raise the possibility of providing out-of-kind mitigation for impacts to eelgrass because of the poor historical track record for eelgrass transplanting and restoration. I agree with CZM that contributions to alternative types of mitigation strategies should at least be included in the ongoing discussions about mitigation. I ask that both Massport and the Eelgrass Mitigation Working Group strive to develop a mitigation strategy with the greatest possible benefits to eelgrass habitat in both Boston Harbor and beyond.

Salt Marsh

Massport should continue to further refine the Preferred Alternatives in an effort to minimize adverse impacts to the flora and fauna to the maximum degree possible. Because of bird hazard risks, the DEIR states that off-site, rather than on-site, mitigation of salt marsh impacts will be pursued. In the DEIR twelve sites are recommended for further review as potential mitigation sites. Seven of these sites are within Rumney Marsh Reservation. I remind Massport that for all mitigation, the expectation remains that the FEIR will include a short list of viable mitigation sites.

To compensate for adverse impacts to salt marsh resources which cannot be avoided, the FEIR should contain no less than a 2:1 ratio or higher ratio for emergent wetlands, with first priority for the restoration or re-establishment of existing wetlands, and a higher mitigation ratio, which should be determined by the Salt Marsh Mitigation Working Group, if enhancement of other salt marsh is required. In order to achieve at least the 2:1 salt marsh replacement ratio, the FEIR should document the protocol for how Massport intends to choose and develop suitable replication sites. As requested by MassDEP, the salt marsh replacement plans should include:

- Plan views, cross-sections, final planting plans, and a monitoring plan;
- The size and location of the existing and replicated wetland, at a scale in the range of 1"=10' to 1" = 40", and shall include easily identifiable landmarks such as surveyed flag locations, benchmarks, or structures;
- Contour lines at 2' intervals for existing areas and 1' intervals for proposed areas;
- Sufficient number of spot elevations to describe the topography of the wetland and the surrounding area including grade elevations below the highest spring tides of the year with portions below mean high tide
- The locations of soil test pits and vegetation plots;
- Cross-sections of the existing and proposed wetland subsurface, showing soil types, depths, and locations using both horizontal and vertical scales;
- Documentation that a minimum replacement area ratio of 2:1 be located in the same general area or water body as the area lost, unless a determination is provided from the U.S. Department of Agriculture - Wildlife Services that salt marsh habitat constitutes an attractive wildlife nuisance as contemplate by FAA Advisory Circular: 150/5200-33B and a need exists to conduct a Wildlife Hazard Assessment (WHA) in accordance with Part 139;
- Locations that are not tidally restricted by any pipe, culvert, bridge, roadway or other development and not colonized by invasive species;
- Internal sloped drainage creeks with suitable depths to provide killifish habitat; and
- Provisions for assessments of potential contamination if the proposed salt marsh

restoration sites containing dredged spoils;

MassDEP has indicated in its comments that depending on project specifics, proposed salt marsh restoration mitigation that involves the enlargement, removal, or replacement (with tide gates) of culvert tidal restrictions may be acceptable for meeting some portion of the salt marsh mitigation requirement.

I note that several comments support the idea of expanding the list of potential mitigation sites presented in the DEIR to include the possibility of in-lieu contributions to supplement funding of the on-going Broad Meadows project in Quincy. It is not clear whether the Broad Meadows project would provide mitigation for impacts to salt marsh, for impacts to land under water, or both. The FEIR should include an update on these discussions and clarify the specific impacts that would be mitigated. I recognize that the viability of the in-lieu fees for mitigation is dependent on the final determination of the U.S. Army Corps of Engineers concerning the acceptable parameters for in-lieu fee contributions. MassDEP has stated that if Broad Meadows is deemed to constitute satisfactory mitigation, further consideration would be required for compensation of intertidal and shellfish impacts. Shellfish mitigation plans, as discussed below, should be further refined in the FEIR to specify terms and procedures for the harvest and transplant of shellfish.

<u>Waterways and Tidelands Impacts</u>

The Preferred Alternatives for safety improvements to Runways 22R and 33L include proposed changes on both filled and flowed tidelands. Pursuant to 310 CMR 9.03(3)(b), no MassDEP authorization is required for Massport activities on filled tidelands at Logan Airport. However, portions of the proposed RSA enhancements seaward of the mean high water line (flowed tidelands) would require a Chapter 91 license. Although the proposed RSA improvements would involve work in Chapter 91 waterways and tidelands, the DEIR states that there are no significant impacts to the public's interests in these tideland areas. The only interests currently provided by the proposed RSA Project Sites are shellfishing, living marine resources, and water quality. Limited shellfishing will continue to be permitted within the Security Zone, in those areas that have historically supported that activity.

Runway 33L

The proposed RSA improvements for this runway would have permanent impacts to waterways and tidelands. Although the physical loss of tideland (based on the footprint of the area of natural substrate replaced by pilings) varies slightly among the proposed deck/piling options, the options would result in the same deck footprint. The DEIR states that the affected Chapter 91 resources are therefore considered to be the area of the deck footprint seaward of the mean high tide line, approximately 159,000 square feet (3.65 acres) and extending approximately 470 feet seaward of the high tide line.

Runway 22R

The proposed Runway 22R ISA improvements would have permanent impacts to waterways and tidelands. An area of approximately 1.4 acres below the mean high water line would be affected due to the construction of the ISA, a nonwater-dependent use. No public access is currently allowed within the proposed Project area. Limited shellfish harvesting by licensed clammers is allowed within the Security Zone with prior notice from DMF.

Licensing Requirements

MassDEP has determined that the portions of the proposed project subject to Chapter 91 jurisdiction are considered to be nonwater-dependent uses, since airports do not require direct access to tidelands. This finding is particularly significant in this instance since new fill and structures for nonwater-dependent use are generally prohibited seaward of the mean high water mark [310 CMR 9.32(1) (a)]. While there are limited exceptions to this prohibition which allow placement of fill in some cases, according to MasssDEP, they do not appear to be applicable to the proposed fill at Runway 22R. MassDEP has further indicated that the pile-supported structure for nonwater-dependent use proposed at the end of Runway 33L is likewise prohibited by the Waterways regulations. The project may therefore require a Variance from the Chapter 91 performance standards.

MassDEP has stated that the DEIR is generally responsive in the context of the Chapter 91 variance provisions. The DEIR shows that there are no alternatives that allow the project to proceed in compliance with 310 CMR 9.00; that the project includes measures to minimize interference with public interests in waterways and has proposed mitigation to compensate for any remaining detriments to the public interest in tidelands; and has made a good argument that the project is necessary to accommodate an overriding regional/state/federal interest.

The areas in which work is proposed are not currently accessible to the public and would not be accessible to the public for the foreseeable future. These areas are within the state-legislated Logan Airport security zone restrictions on public access. This security zone extends 500 feet seaward of the high water mark. The substantive standards that MassDEP will use to evaluate the project are those related to Nonwater-dependent Infrastructure Facilities found at 310 CMR 9.55. Since public access is restricted at this site due to security concerns, MassDEP's review would concentrate instead on the resource impacts to salt marsh, eelgrass, and loss of shellfish habitat and adequate mitigation of those impacts in accordance with 310 CMR 9.55(1)(b-c). The FEIR should further refine the proposed mitigation plan in anticipation of the filing of the variance license application.

Public Benefit Determination

In accordance with 301 CMR 13.03, the DEIR included information on how the project will meet the requirements for a positive Public Benefit Determination. The DEIR included information describing the nature of the tidelands affected by the project and the public benefit of the project, the purpose and effect of the project, the impact on abutters and the surrounding

community, enhancement to the property, benefits to the public trust rights in tidelands or other associated rights, environmental protection and preservation, public safety, and the general welfare. I acknowledge that the proposed project presents a somewhat unique circumstance where public access to tidelands is not possible. The FEIR should however address whether the project may be able to provide additional opportunities for access to tidelands for shellfishing in other locations, for example. The FEIR should also provide further information on the overall public benefits provided by the project since promoting access to tidelands is not appropriate.

Fisheries Species and Habitat Resources

The DEIR provided a summary of the project site's habitat assessment and identified the project's impact to state-listed species.

Impacts at Runway 33L

Approximately 3.65 acres of habitat that could be used by fish species would be altered by the proposed Runway 33L pilings and shaded by the deck. The NMFS has designated Essential Fish Habitat (EFH) within marine, estuarine and freshwaters of the U.S. that includes Boston Harbor. The DMF has recommended a time of year restriction for in-water, silt producing work extending from February 15th through June 30th for the protection of winter flounder, one of the fish species for which Boston Harbor is designated as EFH. Winter flounder use near-shore areas for spawning, larval settlement, and juvenile development.

Impacts at Runway 22R

The Coastal Bank at this location is dominated by the invasive common reed (*Phragmites australis*). Wetlands were identified based on the presence of Salt Marsh grasses (*Spartina alterniflora* and *S. patens*) and common glasswort (*Salicornia europaea*). The proposed Runway 22R ISA would replace a portion of the Coastal Beach/Tidal Flat present at Runway 22R with a stone substrate. This would alter habitat for benthic organisms. A small amount of intertidal habitat that could be used by fish species (approximately 1.4 acres, including salt marsh and coastal beach) would be altered.

The proposed Runway 22R ISA would require the removal of salt marsh grasses present at the end of Runway 22R, to be replaced with gravel fill. A stand of common reed (*Phragmites australis*) at the Runway 22R end would also be removed. The removal of common reed and salt marsh vegetation eliminate areas of potential wildlife hazards within the FAA-designated Wildlife Hazard Area, because these are potential roosting sites for starlings and red-winged blackbirds and potential habitat for shorebirds, brant, and seagulls.

The DEIR also explained some of the habitat enhancements as a result of the project. However, the FEIR needs to contain a greater level of information on this topic than what was provided in the DEIR and should address the detailed issues raised from federal, state, and city agencies concerning impacts to shellfish and to shellfishing. DMF has stated that the impact of shade on the underlying shellfish may be significant due to potential changes in fish foraging behavior, shellfish food availability and potential increase in fouling invasive tunicates under the structure. DMF has recommended that the FEIR include a survey of other large piers in the area to better understand the condition of underlying shellfish and benthic habitats and information of what monitoring will occur of invasive species and colonization by mussels after the construction. I ask that Massport work with the mitigation working groups to discuss a methodology for further assessment of impacts to shellfish.

The project site is part of a historically important area for Boston Harbor shellfishermen. The intertidal mudflats surrounding Logan Airport are part of shellfish area GBH5.3, conditionally restricted, available for commercial harvest. Several commenters have stated that in recent years, a number of shellfish beds near Logan Airport and the Town of Winthrop have re-opened to shellfishing, thanks to a cleaner Harbor. DMF has indicated in its comments that the mudflats on the project site support commercially harvested shellfish beds including soft-shell clams (*Mya arenaria*) and blue mussels (*Mytilus edulis*). According to DMF, the area's average production, calculated with several years of data, is over 5,130 bushels of soft shell clams per year. In addition, DMF states that the site is favored by shellfishermen because of its wide intertidal flat, enabling access to harvestable area on smaller tides. The FEIR should include a detailed account of the expected impacts to shellfishing from the project, and should proposed mitigation for those impacts as appropriate. As noted above, the FEIR should address outreach efforts to those potentially affected in the shellfishing community.

<u>Rare Species</u>

Review of the Massachusetts Natural Heritage Atlas indicates there is Priority Habitat in the Runway 33L RSA study area. Upland sandpiper (*Bartramia longicauda*), which is listed as endangered in Massachusetts, is known to occur in the large grassy uplands in the interior of the airfield. The DEIR included information indicating that the Massachusetts Natural Heritage and Endangered Species Program (NHESP) has stated that the proposed Project would not adversely affect the actual resource area habitat for upland sandpiper, a state-protected species.

The proposed Runway 33L RSA improvements would replace a portion of Coastal Beach/Tidal Flat, eliminating habitat for certain benthic organisms, but the pilings could provide attachment substrate for other benthic organisms. The DEIR indicates that USFWS has previously stated that there are no federally-listed or proposed, threatened or endangered species or critical habitat under its jurisdiction within the Runway 33L project area. Impacts to plants would include the loss of habitat (coastal beach and land under the ocean) for marine algae and eelgrass. The proposed Runway 33L RSA improvements are not likely to affect federally-listed whale species, including the North Atlantic right, the humpback, the fin, the sei, and the sperm whales, as the proposed RSA would be constructed in an area too shallow to be used by whales and none have been reported in the immediate vicinity of the proposed improvements.

Although sea turtles have never been reported in Boston Harbor, NMFS considers that sea turtles may be found seasonally in Boston Harbor. The proposed Runway 33L pile-supported deck could impact habitat potentially used by sea turtles, but there likely would be no direct impacts to the species. The five construction options would have a similar effect on eelgrass and

therefore on sea turtle habitats. The proposed Runway 22R ISA would result in the loss of approximately 1.4 acres of intertidal habitat and 700 square feet of subtidal habitat that could potentially be used by sea turtles. The FEIR should discuss the loss of this habitat and substrate in the Project area.

<u>Water Quality Certification and Stormwater</u>

Runway 33L

According to the DEIR, the proposed Runway 33L safety improvements would not generate pollutants or affect water quality. The existing and proposed EMAS bed would not be accessed by vehicles other than during an emergency, due to its composition. The DEIR states that runways, taxiways, and aprons are not sources of pollutants. Frequent sweeping of the paved portions of the site further reduces the quantity of sediments that are available for transport by stormwater runoff. All outfalls would continue to be regulated under the Airport's existing National Pollutant Discharge Elimination System (NPDES) permit. Stormwater sampling of the airfield outfalls is an ongoing requirement of the NPDES permit and would continue following the construction of the Runway 33L RSA improvements. Additionally, stone rip rap at these outfalls prevents erosion and sedimentation resulting from stormwater discharges. According to the DEIR, runoff from the perimeter roadway and portions of the existing Runway 33L RSA do not enter the closed drainage system and sheet flow across the rip rap slope into Boston Harbor. Massport has state that this overland sheet flow from the RSA and adjacent areas do not constitute regulated discharges under the NPDES permit.

All of the proposed Runway 33L deck construction options would have the same water quality impacts. The five construction options would have the same drainage system and potential effects on stormwater in the vicinity of Runway 33L. Stormwater runoff from the deck will be discharged via scuppers located beneath the deck at several locations to prevent erosive forces from disturbing sediment and impacting the receiving water. To comply with the regulatory requirement to improve existing condition, Massport proposes to install stormwater treatment units at an outfall adjacent to the work area. The proposed stormwater management system complies with the Massachusetts Stormwater Management Regulations.

Runway 22R

According to the DEIR, the proposed Runway 22R ISA would have no permanent impacts to water quality. No vehicles would operate on the proposed ISA, no new impervious surfaces and no new stormwater conveyance systems would be created and the proposed ISA would not result in any new discharge of untreated stormwater. There would be no change to the quality and quantity of stormwater runoff resulting because the proposed ISA is not an area with higher pollutant loading and would not generate permanent changes in total suspended solids (TSS).

Water Quality Certification

The Water Quality Certification application requires documentation of how the project meets the regulation requirements of 314 CMR 9.00 and the associated criteria for the evaluation of applications for discharge of dredged or fill material to salt marsh and land under water 310 CMR 9.06. State water quality standards contained in 314 CMR 9.00 and 314 CMR 4.00 would apply to the dredging that would be necessary to remove unsuitable substrate at the Runway 22R end, as well as to the potential temporary construction-period increases in sedimentation and turbidity from the construction activities at the ends of both the Runway 22R and 33L.

Sediment sampling/ testing information and a discussion of dredge material disposal options was not provided in the DEIR and must be developed as part of the FEIR. Specifically, Section 4.3.7.3 (pg. 4-93) indicated that the sediment related to Runway 22R ISA "were sampled and subjected to both physical and chemical analysis in accordance with Massachusetts Water Quality Certification Regulation [314 CMR 9.00] and compared to NOAA's Sediment Quality Guidelines." However, results of the sampling were not included in the DEIR. In addition, the DEIR states in the Temporary Construction Impacts stated that "any turbidity created would be quickly dispersed by the tides; therefore, the effects from the temporary construction-related turbidity are negligible." According to their comments, MassDEP does not consider "tide dispersion" as a Best Management Practices (BMPs) and will require a turbidity monitoring program during excavation/dredging of approximately 8,450 cubic yards of unsuitable material. MassDEP has also stated what the requirement of transporting dredged material on public roadways (314 CMR 9.7(5)) includes "no free liquid as determined by the paint filter test". The FEIR should include results of the sediment analysis, reconsideration of turbidity control BMPs, and consideration of on-site dredged material dewatering.

Stormwater

The Wetlands and 401 Water Quality Certification regulations, at 310 CMR 10.05(6) and 314 CMR 9.06(6), respectively, require compliance with ten Stormwater Standards to protect wetland interests. Unmanaged or improperly managed stormwater runoff causes detrimental effects to the interests protected in wetland resource areas including erosion, scour, sedimentation, changes to hydrology, changes to wetland plant communities, promotion of invasive plant species (e.g. Phragmites, an invasive plant species is now present at Logan Airport), and damaging effects to aquatic organisms including fin fish and shellfish. The velocity of the discharged stormwater is also of concern, since unchecked velocity may scour coastal beaches and lead to loss of aquatic plants, including the habitat aquatic plants provide to fin and shellfish.

For the 33L RSA, Massport proposes to collect and discharge stormwater runoff directly to wetland resource areas without any recharge or water quality treatment, which may impair interests protected by the Wetlands Protection Act, including fin fish and shellfish. Measures must be proposed in the FEIR to comply with the ten Stormwater Standards. MassDEP has

provided detailed comments on this subject that should be addressed in the FEIR including evaluation of Environmentally Sensitive Site Design (ESSD), such as including Low Impact Development (LID) measures. In addition, MassDEP has advised directing the runoff from the proposed deck to be recharged to groundwater because this will reduce velocity, volume, and scour effects, as well as freshwater impacts to the intertidal and tidal zones.

Runway End 22R must also comply with the ten Stormwater Standards specified at 310 CMR 10.05(6)(k)(1) – (10) and 314 CMR 9.06(6). The DEIR only included a proposal to improve conditions at Outfall A-12 to reduce scour. Alternative measures must be included in the FEIR to meet the required Stormwater Standards. The FEIR must address the comments related to stormwater issues raised during the review of the DEIR.

<u>Underwater Archaeological Resources</u>

The area under the current Logan International Airport was comprised of islands and mudflats throughout most of the historic period. The Massachusetts Board of Underwater Archaeological Resources (Board) has indicated in its record the occurrence of at least 32 shipwrecks in Boston Harbor during the period of 1738-1893. However, the Board has indicated that this project will have no adverse effect.

As described in the DEIR, there are no historic resources directly adjacent to the proposed Runway 33L RSA. The Build Alternative would not affect any known historic or archaeological resources. The Massachusetts Board of Underwater Archaeological Resources does not have any record of underwater archaeological resources in the project area and it is highly unlikely that a resource would be found during construction due to the type of construction and project location which are all on a previously-filled area. There will also be no change to the Runway 22R end that may cause an adverse effect to any known historical, archaeological, or cultural resource. The Massachusetts Board of Underwater Archaeological Resources does not have record of underwater archaeological resources in the project area and it is highly unlikely that a resource would be found because the Runway 22R ISA is located almost entirely landward of mean low water.

<u>Construction</u>

Water quality in the vicinity of the proposed RSA enhancement will be temporarily impacted by construction activities, particularly by dredging to remove unsuitable substrate materials. These activities could result in a temporary increase in suspended sediments the area of Boston Harbor in the immediate vicinity of the proposed work.

Coastal resources and benthic organisms in the immediate vicinity of the proposed RSA enhancement could also be temporarily impacted by short-term construction activities. The DEIR should discuss how construction would be under taken in a way that minimizes impacts to resources. Construction could also result in short -term increases in noise (from construction equipment) and air emissions from construction equipment.

Although there are no permanent construction-period impacts, construction activities may have temporary effects on water quality from sedimentation; traffic and the transportation network in the vicinity of Logan Airport; noise that would affect area residents; and emission of air pollutants during the construction period.

Construction is likely to disturb benthic sediments in the water column and increase turbidity in the vicinity of operations. Runway 33L deck construction Options 5 and 6 are expected to generate excavated sediment and use drilling fluid during drilling of caissons. The DEIR states that barges would transport most of the required construction equipment, personnel, and materials. The only materials expected to be delivered by truck to the airport would be the EMAS blocks, concrete and asphalt. The DEIR states that Massport's agreement with the Contractor will specify that direct construction truck traffic access to the Runway 33L construction site be through the North Gate for the duration of construction. The project anticipates 56 additional construction truck trips per day associated with the proposed Runway 33L RSA improvements. If necessary, Massport has committed to modify contractor schedules and access routes to minimize impacts.

Water quality in the vicinity of the proposed Runway 22R ISA improvements will be temporarily affected by short-term construction activities, particularly due to the excavation and dredging required to remove unsuitable substrate materials and to place new stone fill. The DEIR states that the perimeter of the inclined safety area would be protected from erosion by the placement of gabions (partioned, wire fabric containers filled with stone to form flexible, permeable structures for earth retention). Excavation of material within the intertidal zone would be completed during periods of low tide. The area would be surrounded by a siltation curtain/ debris boom to contain and minimize any debris or siltation. The DEIR also staes that the construction completed at the Runway 22R end would follow a comprehensive Soil Erosion and Sediment Control Plan to minimize temporary impacts. The gabions wrapped with filter fabric installed during construction would also act as a barrier to sediment releases and reduce resulting turbidity.

Unlike Runway 33L, construction of the proposed Runway 22R ISA would be primarily undertaken from the landside, as most of the materials and workers would arrive by truck. The majority of workers would be transported to the site by shuttle bus. The DEIR states that Massport has committed that the contractor for the proposed Runway 22R ISA would be under the same access restrictions for direct construction truck traffic access as the Runway 33L construction. Vehicular traffic flow on the airport roadway network during construction would be managed so that the quality of traffic flow would not deteriorate to unacceptable levels of service. If necessary, Massport has the ability to modify contractor schedules and access routes to minimize impacts.

The proposed construction of the Runway 33L RSA and Runway 22R is expected to generate short-term construction-related air emissions, including exhaust emissions from on-road construction vehicles, off-road construction equipment and marine transport vessels; evaporative emissions from asphalt placement and curing; and the generation of fugitive dust from disturbance of unpaved areas. The construction improvements would generate noise associated with construction activities. Construction equipment is expected to be used only during daytime hours (7 AM to 7 PM) consistently throughout the Project's construction phase to install the pile-supported deck.

Massport should make every effort to address the concerns raised in the Boston Transportation Department's (BTD) comment letter requesting a plan to keep construction traffic out of the neighborhoods surrounding Logan Airport. The FEIR should continue to strive to incorporate environmental sustainability measures, including short-term sustainability measures, such as those related to the construction phase, as well as long-term sustainability measures.

Conclusion

I find that the DEIR has met the standards for adequacy under the MEPA regulations. The proponent should prepare the FEIR in accordance with the Scope provided above.

September 29, 2010
Date

I. A. Bowles
Ian A. Bowles

Comments received:

07/27/2010	U.S. Department of Commerce National Marine Fisheries Service, 1st Comment
08/25/2010	The Board of Underwater Archaeological Resources
09/01/2010	Office of Coastal Zone Management
09/01/2010	Department of the Army, Corps of Engineers
09/02/2010	Department of Environmental Protection
09/03/2010	Division of Marine Fisheries
09/03/2010	The Boston Harbor Association
09/03/2010	City of Boston Environmental Department
09/03/2010	Gail C. Miller
09/07/2010	U.S. Department of Commerce National Marine Fisheries Service, 2nd Comment
09/07/2010	U.S. Environmental Protection Agency
09/09/2010	Boston Transportation Department

IAB/ACC/acc

The Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Deval L. Patrick
GOVERNOR

Timothy P. Murray
LIEUTENANT GOVERNOR

Ian A. Bowles
SECRETARY

Tel: (617) 626-1000
Fax: (617) 626-1181

December 1, 2010

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: East Boston-Chelsea Bypass
PROJECT MUNICIPALITY	: Boston (East Boston)
PROJECT WATERSHED	: Boston Harbor
EEA NUMBER	: 14661
PROJECT PROPONENT	: Massachusetts Port Authority (MassPort)
DATE NOTICED IN MONITOR	: October 22, 2010

Pursuant to the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62I) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **does not require** the preparation of an Environmental Impact Report (EIR).

Project Description

The proposed project consists of the construction of a 2,225-foot, two-lane roadway connecting Frankfort Street at Boston-Logan International Airport in the south to Chelsea Street in the north in an abandoned rail corridor recently acquired by the Massachusetts Department of Transportation (MassDOT). MassDOT will transfer ownership of a portion of this right-of-way to MassPort for the purpose of constructing the Bypass. The typical roadway width is proposed to be 32 feet with a cross-section of two 12-foot travel lanes and four-foot shoulders on either side. The proposed East Boston-Chelsea Bypass is intended to reduce roadway congestion and improve traffic safety in East Boston by providing a new limited access roadway connection between the airport and Chelsea Street near the new Chelsea Street Bridge, where it crosses the Chelsea Creek into the City of Chelsea. The Bypass would provide an alternative to existing connections through East Boston's Day Square and Neptune Road, which have closely-spaced

intersections, irregular roadway geometry, and significant vehicular congestion. The Bypass will accommodate commercial vehicles, cargo vehicles, Massport shuttle buses, and Massachusetts Bay Transportation Authority (MBTA) buses serving the airport. The Bypass will ease congestion on neighborhood streets by shifting these vehicles, which are typically large and slow-moving, to the new roadway, thereby yielding operational, safety and air quality benefits. I note the several comment letters submitted in support of the project, as it is expected to yield tangible quality-of-life benefits and economic development benefits to both East Boston and Chelsea.

MEPA Jurisdiction

The project is undergoing MEPA review because it is being undertaken by a State Agency and exceeds a MEPA review threshold, specifically Section 11.03(6)(b)(1)(a) of the MEPA regulations because it will result in the construction of a New roadway one-quarter or more miles in length.

The project will require an Order of Conditions from the Boston Conservation Commission (and a Superceding Order from the Massachusetts Department of Environmental Protection (MassDEP), if appealed) and a National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) from the United States Environmental Protection Agency (U.S. EPA) for construction activities which disturb one acre or more of land. The project will also require review and approval of its site plan and stormwater management plan by the Boston Water and sewer Commission (BWSC). Otherwise, the project does not require any State Agency Permits. Because the project is being undertaken by a State Agency, MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause Damage to the Environment as defined in the MEPA regulations.

Review of the ENF

Transportation

Comments I have received from MassDOT, the MBTA, and the Boston Transportation Department indicate that they strongly support the proposed project. This project is also consistent with MassDOT's efforts to develop enhanced circumferential bus service between underserved areas in Chelsea and the MBTA Blue Line Airport Station, and is integral to the long-term planning for implementation of the Urban Ring. As described in numerous MEPA filings under EEA #12565, the Urban Ring is a proposed Bus Rapid Transit (BRT) system that would run in an approximately circular ring through densely developed portions of Boston, Brookline, Cambridge, Chelsea, Everett, and Somerville. The Bypass is an integral component of the Urban Ring's Northern Tier and constitutes an early action item as the project will be able to accommodate the largest transit vehicles expected to operate in the Urban Ring corridor. It may also allow the MBTA to serve Logan Airport directly via its Route 112 bus service, which currently terminates at the MBTA Blue Line Wood Island Station. The Bypass will also provide a more direct connection to many airport-related freight and shipping business that have relocated to Chelsea, thereby enabling the airport to provide competitive air freight services.

The Bypass will also intersect the East Boston Greenway, which connects Bremen Street Park and Constitution Beach, at Frankfurt Street. MassPort should ensure that the design of the Bypass provides for safe bicycle and pedestrian crossings at this intersection. I have received several comments on the ENF expressing concerns about the project's impact on the East Boston Greenway and about the design of this intersection as well as expressing interest in designing other local connections to the Greenway. In general, as I stated in the Certificate on the ENF for the Green Bus Depot (EEA #14629) issued on September 17, 2010, discussion and consideration of providing safe bicycle and pedestrian connections can be more appropriately addressed at the local level between Massport, the City of Boston and the East Boston community rather than through the MEPA process. Massport should continue to work closely with the City and with local residents to address these ongoing issues. I note that the project, as proposed, does not preclude the provision of a safe bicycle and pedestrian crossing at Frankfurt Street.

MassPort should also work in cooperation with MassDOT to address its concerns regarding safety issues at the Curtis Street ramps to and from Route 1A, and with the Boston Transportation Department (BTD) to address its concerns regarding procedures for removal of stalled vehicles from the Bypass.

Air Quality and Noise

The ENF included air quality mesoscale and microscale analyses which concluded that, by lowering traffic volumes on most of the local roadways, the proposed Bypass would yield a net benefit in reducing emissions of nitrous oxide and volatile organic compounds, as compared to the No-Build Condition. The ENF also included a noise analysis which concluded that the Bypass would have a minimal impact (less than one decibel) on two residential properties located along the corridor.

Wetlands and Stormwater

According to the ENF, the project will alter 7,740 cubic yards of land subject to coastal storm flowage (LSCSF). The project site is located in a depression such that water overtops Chelsea Street from the Chelsea Creek and the Inner Harbor. The proposed fill of LSCSF associated with the project could cause inundation of an adjacent area that is not currently subject to flooding. Therefore, MassPort should make every effort to design and build the Bypass so as to maintain or reduce – but not increase – the lateral extent of flooding in nearby locations. MassPort should address this issue, including a discussion of the potential impacts of future sea level rise, in preparing the Notice of Intent for this project. The NOI should also address MassDEP's comments concerning potential impacts to wildlife.

The ENF indicates that the project will include a comprehensive stormwater management system designed to handle a ten-year storm, including bioswales and underground drainage pumps that will direct stormwater to Logan Airport's west outfall. The ENF also indicates that the project would be considered to be redevelopment under the stormwater regulations and standards. In order to qualify as redevelopment, MassPort must document that the project will not increase impervious surfaces. Otherwise, the project would be subject to the standards for new development. The ENF indicates that the project will create 1.8 acres of new impervious

surfaces. MassPort should address this issue in consultation with MassDEP and the Boston Conservation Commission, as well as other issues raised in their comment letters, including potential soil and groundwater contamination.

MassPort should address the issues raised by the Boston Water and Sewer Commission in its comment letter, including requirements for site plan review and approval, stormwater management plan review and approval, and the issuance of a Hydrant Permit.

Conclusion

Based on review of the ENF and comments received, I have determined that no further MEPA review is required.

December 1, 2010
DATE

Ian A. Bowles, Secretary

Comments received:

11/15/10	Boston Transportation Department
11/15/10	Eagle Air Freight, Inc.
11/16/10	City of Chelsea
11/22/10	Boston Water and Sewer Commission
11/22/10	InterPark
11/22/10	Patricia D'Amore
11/23/10	A Better City
11/23/10	Beth Israel Deaconess Medical Center
11/23/10	Friends of East Boston Greenway and Boston Natural Areas Network
11/24/10	Massachusetts Department of Transportation
11/24/10	Massachusetts Department of Transportation Rail and transit Division
11/24/10	MASCO
11/24/10	Air, Inc.
11/24/10	Gail Miller
11/29/10	City Councilor Salvatore LaMattina
11/29/10	Mary Ellen Welch
11/29/10	Boston Environment Department

IAB/RAB/rab

B

Comment Letters and Responses

- The four comment letters received by the Massachusetts Environmental Policy Act (MEPA) Office on the *2009 Environmental Data Report (2009 EDR)* are reprinted here in the order shown below. As requested in the Secretary of the Executive Office of Energy and Environmental Affairs' Certificate, Massport has provided responses to substantive comments raised in the following letters:
  - Robert Healy, City of Cambridge
  - Jerome Falbo, City of Winthrop and member of the Citizen Advisory Committee
  - Darryl Pomicter, member of the Citizen Advisory Committee
  - Nancy Timmerman, P.E., consultant in Acoustics and Noise Control

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AC

CITY OF CAMBRIDGE • EXECUTIVE DEPARTMENT

Robert W. Healy, City Manager *Richard C. Rossi, Deputy City Manager*

November 5, 2010

Ian A. Bowles, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street
Boston, MA 02114

RECEIVED
NOV 5 2010
MEPA

Re: EOEA #3247 Logan Airport 2009 EDR

Dear Secretary Bowles:

The City of Cambridge is pleased to have the opportunity to submit comments on Massport's 2009 Logan Environmental Data Report (EDR).

Cambridge continues to be greatly concerned about the increased use of runway 33L, which began in 2007, continued in 2008 and 2009, and has resulted in significantly higher levels of noise and disturbance in all parts of the City. While flights over Cambridge decreased slightly in 2009 compared with 2008, there are still significantly more over-flights than prior to 2007. This increase is illustrated in Table 6-4 which shows that between 2004 and 2009, the use of runway 33L for departures has increased from 6% to 16% (peaking at 19% in 2008). During the same time period use of runway 27 for departures decreased dramatically from 18% to 6%. The increase in flights over Cambridge is a continuing source of frustration to residents and workers in the City and, like last year, the 2007 EDR fails to explain and adequately justify shifting the burden of noise from one group of communities to another without an environmental evaluation being conducted. B-1 B-2

Not shown in the EDR but occurring more recently in October of 2010, is the increase in low flying flights over the central and northern parts of the city. MassPort and FAA should monitor this situation and take corrective actions immediately. This may be partially related to flight tracks for non-jet departures shown in Figure 6-11, which shows significant activity over Cambridge and should be further explained and quantified in the EDR. B-3

In the 2008 EDR certificate, the Secretary strongly advised MassPort to consider and address noise related concerns, including those of the City of Cambridge, but it is not clear that there has been any follow through on Cambridge's concerns about the lack of an environmental review process of the changes in runway use affecting the City, outside of the noise study process which will not be concluded in the near term. B-4

I appreciate the MEPA office's consideration of these concerns and look forward to your efforts to address them. Please feel free to contact Bill Deignan at 617-349-4632 if you have any questions in regard to these comments.

Very truly yours,

Robert W. Healy
City Manager

cc: Bill Deignan, City of Cambridge

795 Massachusetts Avenue, Cambridge, Massachusetts 02139

CITY OF CAMBRIDGE
COMMUNITY DEVELOPMENT DEPARTMENT

SUSAN M. GLAZER
Acting Assistant City
Manager for Community
Development

FAX COVER SHEET

To: Anne Canaday Date: 11/5/10

Company: MEPA Office

Fax Number: 617-626-1181

From: Bill Deignan

Remarks: Original is in the mail. Thanks!

Total Number of pages (including cover):

If there are any problems with the transmission of this fax, please call 617.349.4600.

344 Broadway
Cambridge, MA 02139
Voice: 617 349-4600
Fax: 617 349-4669
TTY: 617 349-4621
www.cambridgema.gov

Comment #	Author	Topic	Comment	Response
B.1	City of Cambridge	Noise	Cambridge continues to be greatly concerned about the increased use of Runway 33L, which began in 2007, continued in 2008 and 2009, and has resulted in significantly higher levels of noise and disturbance in all parts of the City.	The Federal Aviation Administration (FAA) assigns runway usage based on existing air traffic and meteorological conditions. Departures from Runway 33L decreased in 2010 due to increased use of Runway 15R and Runway 27. The FAA prepared the Airside Improvements Planning Project EIS prior to the opening of Runway 14-32 which included increased use of Runways 33L in its analysis. In addition the ongoing Boston Logan Airport Noise Study (BLANS) project is reviewing flight paths from departing aircraft at Logan Airport.
B.2	City of Cambridge	Noise	The increase in flights over Cambridge is a continuing source of frustration to residents and workers in the City, and like last year, the [2009] EDR fails to explain and adequately justify shifting the burden of noise from one group of communities to another without an environmental evaluation being conducted.	FAA assigns runway usage based on air traffic and meteorological conditions. During 2009 there was no increase in jet aircraft runway use on Runway 33L. *Chapter 6, Noise Abatement,* documents runway usage in 2010. FAA, Massport, and the Community Advisory Committee (CAC) are looking at various alternatives as part of the ongoing BLANS.
B.3	City of Cambridge	Noise	Not shown in the EDR but occurring more recently in October of 2010, is the increase in low flying flights over the central and northern parts of the city. Massport and FAA should monitor this situation and take corrective actions immediately. This may be partially related to flight tracks for non-jet departures shown in Figure 6-11, which shows significant activity over Cambridge and should be further explained and quantified in the EDR.	As in previous years, there are annual variations in runway use due to seasonal variation in wind and weather patterns, operational fleet mix, and FAA day to day operational decision making. This corridor is being reviewed as part of the BLANS.
B.4	City of Cambridge	Noise	In the 2008 EDR certificate, the Secretary strongly advised Massport to consider and address noise related concerns, including those of the City of Cambridge, but it is not clear that there has been any follow through on Cambridge's concerns about the lack of an environmental review process of the changes in runway use effecting the City, outside of the noise study process which will not be conducted in the near term.	The FAA is responsible for aircraft in flight. These concerns related to Runway 33L corridor and flights over Cambridge are being considered in the FAA’s BLANS.

#3247

AC

RECEIVED
NOV 9 2010
MEPA

October 13, 2010

Massachusetts Environmental Protection Agency
Consultation Representatives
Regarding Single Engine Taxing

~~Dear Sir/Madam~~: Secretary Ian A. Bowles;

C-1

I would like to take this opportunity to bring to your attention an issue relative to Massport's commitment to MEPA in 2001. Despite its commitment to MEPA and the F.A.A.'s Record of Decision (ROD) of 2002 Massport has rejected the Single Engine Taxi concept based on safety issues. F.A.A. and Massport will not mandate pilot discretionary items. However, many carriers now use the procedures to save engine, wear and reduce fuel usage/omissions.

C-2

"To develop and implement a program to encourage the use of Single Engine Taxi Procedures by all its tenant airlines". This sentence was contained in Massport's commitment to such a program to MEPA in 2001. This sentence was also included by the F.A.A. in its Record of Decision in 2002 which authorized the construction of Runway 14/32. Words of similar impact contained in every Massport EDR (Environmental Data Report) from 2004-2008. The City of Boston Transportation Department and the City of Boston's Environmental Department, have sent requests to Massport to implement a strong program but neither Massport nor F.A.A. has done anything to strongly encourage such a program. A letter was sent to the airline on August 20, 2006 and one brief meeting in 2009 is the extent of Massport's "encourage and implement a program of Single

Engine Taxi". The F.A.A. has been a non –player to see that its decision in the ROD is being carried out. In addition Massport had commissioned a Study by MIT which demonstrated the proper use of Single Engine Taxing by the tenants at Logan Airport. C-2

Below is a chronology of Massport's and the F.A.A.'s failure to develop a program:

1. June 15, 2001: **The Secretary of EOEA directed Massport to develop a program to maximize the use of Single Engine Taxi Procedures by all its tenant airlines.**
2. August 2, 2002: **The F.A.A.'s Record of Decision requiring Massport develop and implement a program to encourage the use of Single Engine Taxi Procedure by all its tenant airlines.**
3. June 9, 2006: Massport announced it was in the process of developing a program to maximize a program reducing engine taxing.
4. August 30, 2006: Massport sends letter to airlines referred to earlier herein in which Massport explained the Single Engine process but stated it would make further contact with the airlines. No further contact was made with the airlines except for a brief meeting in 2009.
5. December 27, 2006: The title of "Single Engine Taxi Procedure" in Massport 2005 EDR Report stated "Develop and implement a program designed to maximize the use of Single Engine Procedures by all tenant airlines with safety requirements, pilot judgment and the requirement of Federal Laws".

6. January 31, 2007: City of Boston Transportation Department sends a letter to Massachusetts Energy and Environmental Affairs commenting on the Massport 2005 EDR. "However, with a strong support program on the part of Massport, we believe the airlines would take the plan more serious than the previous attempt in the late 1970's and give it greater effort".
7. February 12, 2007: Boston Environmental Department, letter to Massachusetts Energy and Environmental Affairs letter commenting on Massport of 2005 EDR "this department asked in the 2004 ESPR comment that the cited issues of safety and practicality be discussed at a program that was to be implemented and be outlined. The letter to airlines would not seem to represent a program and does not, therefore meet the AIPP Mitigation requirement". It is apparent that the City was referring to the letter of Massport sent to all the airlines operating at Logan Airport in 2006.
8. October 5, 2009: Boston Logan Airport Noise Study (BLANS), Level I Screening Analysis; Measure G-B Single Engine Taxi on aircrafts side away from the nearest Community. This was eliminated by the FAA which assumed that the suggested Measure was to be mandatory. The FAA states that this Measure would present safety issues from the perspective of the FAA runway safety program. FAA & Massport can not require Single Engine Taxing which will increase chances of runway incursion based on pilot work load and aircraft performance.

9. October 29, 2009: Massport 2008 EDR; "Single Engine Taxi Procedure, "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 considered the procedure implemented by virtue of a single letter sent out to the airlines.

October 29, 2009: Massport 2008 EDR; "Single Engine Taxi Procedure, "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 considered the procedure implemented by virtue of a single letter sent out to the airlines

I would sincerely hope and trust that MEPA would apply more pressure that Massport develop a much more comprehensive program to encourage this Single Engine Taxing by the tenants at Logan International Airport. C-3

I am forwarding this letter as Vice President of the CAC.

Respectfully Submitted,
Jerome E Falbo
Jerome E. Falbo

Comment #	Author	Topic	Comment	Response
C.1	Mr. Jerome Falbo	Noise	I would like to take this opportunity to bring to your attention an issue relative to Massport's commitment to MEPA in 2001. Despite its commitment to MEPA and the FAA's Record of Decision (ROD) of 2002, Massport has rejected the Single Engine Taxi concept based on safety issues. FAA and Massport will not mandate pilot discretionary items. However, many carriers now use the procedures to save engine, wear and reduce fuel usage/[emissions].	Massport is working with FAA and the BLANS team to review a voluntary single engine taxiing measure. Massport continues to encourage its use and, based on recent surveys, airlines are deploying this strategy on a voluntary basis where possible. In 2011, Massport issued a memorandum to air carriers encouraging the use of single engine taxiing when consistent with safety. Refer to Appendix M.
C.2	Mr. Jerome Falbo	Noise	"To develop and implement a program to encourage the use of Single Engine Taxi Procedures by all its tenant airlines." This sentence was contained in Massport's commitment to such as program to MEPA in 2001. This sentence was also included by the FAA in its Record of Decision in 2002 which authorized the construction of Runway 14/32. Words of similar impact contained in every Massport EDR (Environmental Data Report) from 2004-2008. The City of Boston Transportation Department and the City of Boston's Environmental Department have sent requests to Massport to implement a strong program but neither Massport nor FAA has done anything to strongly encourage such a program. A letter was sent to the airline on August 20, 2006 and one brief meeting in 2009 is the extent of Massport's "encourage and implement a program of Single Engine Taxi." The FAA has been a non-player to see that its decision in the ROD is being carried out. In addition, Massport had commissioned a study by MIT which demonstrated the proper use of Single Engine Taxi by the tenants at Logan Airport.	Single engine taxiing can only be used when safety conditions allow. Massport continues to support the use of single engine taxiing under safe conditions. See response to Comment C.1 for further detail.
C.3	Mr. Jerome Falbo	Noise	I would sincerely hope and trust that MEPA would apply more pressure that Massport develop a much more comprehensive program to encourage this Single Engine Taxiing by the tenants of Logan International Airport.	Please refer to the response to Comment C.2.

Canaday, Anne (EEA)

From: Darryl Pomicter [dpomic@aol.com]
Sent: Thursday, November 04, 2010 8:56 AM
To: 'Jerry'
Cc: 'Sandra Kunz'; Canaday, Anne (ENV)
Subject: RE: FAA & Massport 2009 EDR, EOEA #3247

Hi Jerry,

As I mentioned at our meetings last week, I went to the MEPA consultation session October 20. But no one was there from MEPA! It seems there was an emergency, and MEPA chose not to reschedule.

It was security sign-in and escort to the same Logan training room, at 4 on Thursday—difficult for public to attend. Stewart Dalzell, Massport Deputy Director, Environmental Planning, now responsible for this report annually was in charge. (More than 10 years ago he was a consultant to Massport on the airside study, and knows me from then on the Technical subcommittee.) There was only a woman who works for him, another Massport woman who used to be responsible for the report, and a young man and woman consultants to Massport.

For the record, I gave them half an hour, which Stewart is supposed to summarize for the meeting notes, on:

1. Massport MEPA Section 61 emissions PROGRAM requirement continues to not be fulfilled—only a letter after 5 years and a voluntary survey after another 3 years—despite MEPA and Boston urgings/complaints, and without any FAA enforcement. D-1
2. Massport noise complaints continue to not be ADDRESSED; only being recorded and reported by community—with no responsive action (ever?). D-2
3. Massport is compromising SAFETY with short takeoffs not in compliance with FAA Minimum Safe Altitudes over Downtown and Inner-City Boston—frequently below 1000 feet, rather than above 1,600 feet Downtown and 2,000 feet Back Bay, within 2,000 feet of towers—increasing noise and emissions, as well as decreasing safety and security—as they fixate on maximum efficiency and maximum capacity, 24/7. D-3
4. Massport documents, including this annual report, not easily ACCESSIBLE online—buried in listings of press releases, without search, with some broken links, and with some links opening only to first section and not complete document. D-4

A few eyes seemed to widen, not having heard the other side facts before. I mentioned your supporting letter and waved it, but did not submit it to them. You should send it directly, by November 5, Friday, to:

Secretary Ian A. Bowles
Executive Secretary of Energy and Environmental Affairs
Attn: MEPA Office
Anne Canaday, EEA No. 3247
100 Cambridge Street, Suite 900
Boston, MA 02114

With the dense Logan CAC and BOSTAC meetings with the FAA and Massport last week, I cannot spend more time now summarizing my comments. Flavio Leo was very clear last week that Massport considers this done, by the airlines without Massport; and no need for Massport to do anything now—that they have fulfilled their responsibility for a Program, without a program.

Thanks,

Darryl

Darryl Pomicter
136 Myrtle St
Boston, MA 02114-4447
H: +1 (617) 227-1153
C: +1 (617) 755-0151

From: Darryl Pomicter [mailto:dpomic@aol.com]
Sent: Wednesday, 13 October, 2010 16:11
To: 'Jerry'
Cc: 'Sandra Kunz'
Subject: RE: FAA & Massport

Great if Bob can make it.

My goal is to get MEPA more involved. So to focus on Massport's non-compliance with MEPA requirements. And, their disregard and disdain of MEPA requests. With collusive support by FAA New England.

D-5 Depending on the situation, I may note their disregard and disdain of the FAA's national Minimum Safe Altitudes. That short takeoffs turning low over Downtown Boston, ad banner towing planes circling low over the Back Bay, and helicopters ignoring the published recommended routes and hovering low over the dense urban neighborhoods too far from possible emergency landing areas are major areas of safety, security, health emissions and noise violations. And, FAA New England even issued a letter to airmen advising that 1,100 feet satisfies the Minimum Safe Altitude (1,000ft above within 2,000ft) "most of the time"—ignoring the 600ft towers Downtown and the 1,000ft towers in the Back Bay!

D-6 These are violations which are not required to operate Logan Airport. Logan Massport and FAA New England operate with "maximum efficiency/capacity" procedures 24/7, even though forecast operations is only 75% of capacity in only 3 hours during peak periods. And, Logan has a safety incursion rate history in the top four nationally—much greater than it should be with passengers 19th and operations 21st. They need to slow down and be more safety and health considerate.

Darryl

From: Jerry [mailto:lawfsg@verizon.net]
Sent: Wednesday, 13 October, 2010 12:25
To: dpomic@aol.com
Cc: 'Sandra Kunz'
Subject: FAA & Massport

Darryl:

As usual I agree with your condemnation of FAA and Massport in their failure for meaningful noise abatement procedures and especially your e-mail relative to the problems of incursions at Logan and the supposed remedy of the new electronic system.

I think it's a great idea that you are going to attend the MEPA Session next week. Unfortunately, I will be out of state from the 18-26th which is the day before our CAC Meeting. I have asked Bob Driscoll if he could attend in my place. In the meantime enclosed is a letter you can present from me on behalf of the CAC as well as the Winthrop Airport Hazards Committee if you see fit.

D-7 Incidentally, are you going to raise issues concerning helicopters and small engine aircraft?

Regards,

Jerry

From: Darryl Pomicter [mailto:dpomic@aol.com]
Sent: Monday, 11 October, 2010 23:50
To: 'jerry falbo'
Subject: Massport 2009 EDR--MEPA session Wednesday, Oct 20 @ 4

Jerry,

We're getting nothing from the FAA and Massport in their Measures, despite the additional merry-go-round—no actual actions and results realistically.

I'm planning to go to this MEPA consultation session next week. To try to put some public pressure on for a single engine taxiing ***"program designed to maximize the use of single engine procedures by all tenant airlines".*** Not just a letter after five years and a voluntary survey after another three years. D-8

They are labeling this "Implemented". Next year it will be complete and gone by, dropped....

Any chance to see you there?

Best,
Darryl

A MEPA consultation session on the *2009 EDR* is scheduled for 4:00 PM on October 20, 2010, at the Logan Office Center, One
Harborside Drive, East Boston (Logan Airport).

<u>2009 Environmental Data Report</u>
Page 249
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 to better understand the use of single engine taxiing. MIT completed its survey and issued a paper in March 2010 (provided in *Appendix L*). 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 Boston Logan. 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. An update of this effort will be reported in the *2010 EDR*.

Comment #	Author	Topic	Comment	Response
D.1	Mr. Darryl Pomicter	Mitigation	Massport MEPA Section 61 emissions PROGRAM requirement continues to not be fulfilled - only a letter after 5 years and voluntary survey after another 3 years - despite MEPA and Boston urgings/complaints, and without FAA enforcement.	Massport is working with FAA and the BLANS team to review a voluntary single engine taxiing measure. Massport continues to encourage its use. Based on recent surveys, this measure is being widely used.
D.3	Mr. Darryl Pomicter	Safety	Massport is compromising SAFETY with short takeoffs not in compliance with FAA Minimum Safe Altitudes over Downtown and Inner-City Boston - frequently below 1000 feet, rather than above 1,600 feet Downtown and 2,000 feet Back Bay, within 2,000 feet of towers - increasing noise and emissions, ad well as decreasing safety and security - as they fixate on maximum efficiency and maximum capacity, 24/7.	The FAA advises pilots on which runways to use and when. The FAA (Air Traffic Control) is also responsible for safe flight procedures and directs aircraft to fly in a safe and efficient manner.
D.4	Mr. Darryl Pomicter	Public Outreach	Massport documents, including this annual report, not easily ACCESSIBLE online - buried in listings of press releases, without search, with some broken links, and with some links opening only to first section and not complete document.	Massport provides a link to the current Environmental Data Report (EDR) on its website, www.massport.com/environment/environmental_reporting/Pages/EnvironmentalReporting.aspx. The links have been tested for accuracy.
D.5	Mr. Darryl Pomicter	Safety	Depending on the situation, I may note their disregard and disdain of the FAA's national Minimum Safe Altitudes. That short takeoffs turning low over Downtown Boston, ad banner towing planes circling low over the Back Bay, and helicopters ignoring the published recommended routes and hovering over the dense urban neighborhoods too far from possible emergency landing areas are major areas of safety, security, health emissions and noise violations. And FAA New England even issues a letter to airmen advising that 1,100 feet satisfies the Minimum Safe Altitude (1,000 feet above within 2,000 feet) "most of the time" - ignoring the 600 ft towers Downtown and the 1,000 ft towers in the Back Bay!	Please refer to the response to Comment D.3.
D.7	Mr. Darryl Pomicter	Noise	Incidentally, are you going to raise issues concerning helicopters and small engine aircraft?	The vast majority of helicopter traffic over the City of Boston is not bound for nor originates from Logan Airport. Helicoper and non-jet aircraft from Logan Airport follow FAA established flight procedures. Helicopter and fixed wing aircraft not associated with Logan Airport are being reviewed as part of the BLANS.

Comment #	Author	Topic	Comment	Response
D.8	Mr. Darryl Pomicter	Noise	To try to put some public pressure on for a single engine taxiing "program designed to maximize the use of single engine procedures by all tenant airlines." Not just a letter after five years and a voluntary survey after another three years. They are labeling this "Implemented." Next year it will be complete and gone by, dropped...	Please refer to the response to Comment D.1.

Nancy S. Timmerman, P.E.
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November 5, 2010

The Honorable Ian A. Bowles, Secretary
MEPA Office
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Subject: EOEA #3247-Logan Airport 2009 Environmental Data Report (EDR)

Dear Secretary Bowles:

These comments are being transmitted by email.

I have reviewed the 2009 Environmental Data Report (EDR), EOEA #3247 and offer the following comments and questions, with particular reference to the Noise sections (6 and H).

Will Massport and its consultants use 2010 census data for evaluating population impact in the next report? E-1

It is encouraging to see that use of daily meterological data (instead of annual) has brought the Integrated Noise Model (INM) predictions into closer agreement with the measured data. E-2

In view of the recommendations in the National Academy of Engineering's "Technology for a Quieter America" (Oct, 2010), and international standards, this reviewer recommends that the DNL contours be evaluated down to 55 dBA, not the 60 dBA which has been used, and is used in the current report. E-3

In the next Environmental Status and Planning Report (ESPR), if not before, Massport and its consultants should provide a discussion of likely speech and sleep interference from the jet arrivals and departures from Boston-Logan International Airport. E-4

It is disturbing to note, from Table 6-6 that even with fewer flights, there are still 238 people exposed to 70 to 75 DNL, according to the model. Since these homes were sound insulated about 30 years ago, the windows may no longer be "tight". What steps, if any, E-5

Member Firm, National Council of Acoustical Consultants

E-5 might be taken by Massport and/or the Town of Winthrop to make this area (above 70 DNL) more noise-compatible?

E-6 On Page H-20, in the discussion of Noise complaints, there is no Figure H-3. What are the categories of complaints which are tracked? "Aircraft off course" and "aircraft too low" are reported in the text, and is each complaint assigned to just one category or can they be assigned to more than one?

E-7 From Page H-37, since the Runway 27 "performance" did not improve with the implementation of WYLYY SEVEN, did the FAA revert to the previous procedure? It is terrible that the compliance is only 50%. As in years past, the "problem" is still compliance at the first gate, A.

Thank you for giving me the opportunity to comment on this report.

Sincerely,

Nancy S. Timmerman, P.E.

cc: J. Hansen, Massport
S. Dalzell, Massport
Letter to MEPA Office/EOEA #3247--2009EDR

Comment #	Author	Topic	Comment	Response
E.1	Ms. Nancy S. Timmerman, P.E.	Noise	Will Massport and its consultants use 2010 census data for evaluating population impact in the next report?	The 2010 U.S. Census data was used in the preparation of the *2010 EDR* and will be used in future reports. The noise analysis compares the 2000 and 2010 Census data/model inputs to identify changes that are associated with the census data and those that are related to changes in the noise environment.
E.2	Ms. Nancy S. Timmerman, P.E.	Noise	It is encouraging to see that use of daily meteorological data (instead of annual) has brought the Integrated Noise Model (INM) predictions into closer agreement with the measured data.	Thank you for your comment.
E.3	Ms. Nancy S. Timmerman, P.E.	Noise	In view of the recommendations in the National Academy of Engineering's "Technology for a Quieter America" (Oct, 2010), and international standards, this reviewer recommends that the DNL contours be evaluated down to 55 dBA, not the 60 dBA which has been used, and is used in the current report.	Massport acknowledges and notes your comment. Massport is required to produce the 60 - 75 day-night sound level (DNL) contours for the EDR. Neither the FAA or the Massachusetts Environmental Policy Act (MEPA) use the 55 DNL for any reporting.
E.4	Ms. Nancy S. Timmerman, P.E.	Noise	In the next Environmental Status and Planning Report (ESPR), if not before, Massport and its consultants should provide a discussion of likely speech and sleep interference from the jet arrivals and departures from Boston-Logan International Airport.	This issue is more appropriate for national research led by the FAA, industry groups and universities, and not for a single airport's EDR/ESPR. This topic has or is currently being studied by groups such as the Transportation Research Board's Airport Cooperative Research Program (ACRP), and FAA's Center of Excellence - Partnership for Air Transportation Noise and Emissions Reduction (PARTNER).
E.5	Ms. Nancy S. Timmerman, P.E.	Noise	What steps, if any, might be taken by Massport and/or the Town of Winthrop to make this area (above 70 DNL) more noise-compatible?	All eligible homes within the DNL 65 dB noise contour for which the owners have chosen to participate have been programmed for sound insulation by Massport. Massport is one of the few airports in the country to have such a comprehensive soundproofing program. Since the inception of Massport's Sound Insulation program, 11,219 homes have been received sound insulation treatment in East Boston, South Boston, Winthrop, Revere, and Chelsea.
E.6	Ms. Nancy S. Timmerman, P.E.	Noise	On Page H-20, in the discussion of Noise complaints, there is no Figure H-3. What are the categories of complaints which are tracked? "Aircraft off course" and "aircraft too low" are reported in the text, and is each complaint assigned to just one category or can they be assigned to more than one?	The reference to Figure H-3 on page H-20 is an error. It should reference Figure H-2 on page H-20. There are nine predefined categories of complaints along with an area for writing additional comments. These are reviewed by the Noise Office staff and one category is selected to store in the database. The online form is on Massport's website.

Comment #	Author	Topic	Comment	Response
E.7	Ms. Nancy S. Timmerman, P.E.	Noise	From Page H-37, since the Runway 27 "performance" did not improve with the implementation of WYLYY SEVEN, did the FAA revert to the previous procedure? It is terrible that the compliance is only 50%. As in years past, the "problem" is still compliance at the first gate, A.	Massport continues to work with FAA on the review of this procedure. Massport provides the FAA with information regarding compliance with the procedure. FAA continues to work with the community and procedure designers to achieve greater conformance.

C

Proposed Scope for the 2011 ESPR

PROJECT NAME:	*Logan Airport 2011 Environmental Status and Planning Report*
PROJECT LOCATION:	East Boston, Massachusetts
EOEA NUMBER:	3247
PROJECT PROPONENT:	Massachusetts Port Authority (Massport)

Massport respectfully submits this proposed scope for the *Logan Airport 2011 Environmental Status and Planning Report (ESPR)* for public review and comment. Massport has evaluated the cumulative impacts associated with Logan Airport activities through preparation of an ESPR every five years and provides data updates annually through the Environmental Data Reports (EDRs).

Purpose of the *Logan Airport 2011 ESPR*

The environmental review process at Logan Airport is structured to occur on two levels: airport-wide and project-specific. The ESPR provides a "big picture" analysis for environmental impacts associated with current and anticipated levels of activities, and presents an overall strategy aimed at minimizing or avoiding increases in such impacts. The ESPR complements the project-specific Environmental Notification Forms (ENFs) and, if necessary, Environmental Impacts Reports (EIRs) to help focus the review processes and to ensure that segmented project review does not occur in the context of Massachusetts Environmental Policy Act (MEPA) review at Logan Airport.

Contents of the *2011 ESPR*

Generally, the *2011 ESPR* will follow the format of the *2004 ESPR*, presenting an overview of the role of Logan Airport in the regional planning context. The *2011 ESPR* will report on 2011 passenger and aircraft operation activity levels. This will be followed by a status report on Massport's proposed planning initiatives and projects and mitigation. In this way, Massport will provide necessary background information to allow the reviewer to understand the environmental policies and planning which form the context of the environmental reporting, technical studies, and environmental mitigation initiatives at Logan Airport.

In addition, the ESPR will report on updated passenger and operations activity forecasts for Logan Airport and Massport's other airports, Hanscom Field and Worcester Regional Airport. The new forecast used 2011 as the base year and projected activity forecasts forward to calendar year 2030. In addition, the *2011 ESPR* will use the results of the *2010 Logan Airport Air Passenger Survey* and the findings of the Sustainable Ground Access Strategy and Service Plan effort to inform future access planning.

The technical studies in the *2011 ESPR* will include reporting on and analysis of key indicators of airport activity levels, the regional transportation system, ground access, noise, air quality, environmental management, and project mitigation tracking. Each chapter's contents are described below.

1. Introduction/Executive Summary

This chapter of the *2011 ESPR* will include:

- Overview of Logan Airport and place it in its environmental, geographic, and regulatory context
- Overview of the EDR/ESPR cycle
- Summary of passenger activity levels and operations
- Description of the analysis framework for the environmental reporting and technical studies to be conducted
- Discussion of updated operations and passenger forecasts through the planning horizon year, 2030
- National perspective on changes in the airline industry including airline consolidation trends and growth of low-cost carriers
- Description of the organization of the *2011 ESPR*

2. Activity Levels

A primary purpose of this chapter will be to report on airport activity levels for 2011, including:

- Aircraft operations, including fleet mix and scheduled airline services at Logan Airport
- Passenger activity levels
- Cargo and mail activities
- Compare 2011 aircraft operations, cargo/mail operations, and passenger activity levels to 2010 activity levels
- Report on national aviation trends in 2011 and compare to trends at Logan Airport

This chapter will also report on Massport's forecasts that become the basis for the planning and impact sections that follow and for Massport's planning initiatives over the next few years. Future year analyses will be based on the new 2030 forecast. This chapter will update the aircraft operations and passenger activity forecasts, and will provide a discussion of analysis methodologies and assumptions, including anticipated fleet mix changes and other trends in the aviation industry. The section will report on the following:

- Compare 2011 operations to historic trends (to 2000) and forecasts for planning horizon year 2030
- Present updated forecasts of Logan Airport's passenger volume, aircraft operations, and fleet mix
- Compare forecast activity levels to historic trends, prior Logan Airport forecasts, and Federal Aviation Administration (FAA) forecasts for Logan Airport and the U.S. industry

3. Airport Planning

Massport continues to assess planning strategies for improving Logan Airport's operations and services in a safe, secure, more efficient, and environmentally sensitive manner. As owner and operator of Logan Airport, Massport also must accommodate and guide tenant development. This chapter will describe the status of planning initiatives for the following areas:

- Roadway Corridor Project
- Airport Parking
- Terminal Area
- Airside Area
- Service and Cargo Areas
- Airport Buffers and Landscaping

The status of long-range planning activities also will be provided. The chapter will report on the status of public works projects implemented by other agencies within the boundaries of Logan Airport. The chapter will also report on the status and effectiveness of the ground access related changes including roadway and parking projects, which consolidate and direct airport-related traffic to centralized locations and minimize airport-related traffic on external streets in adjacent neighborhoods.

4. Regional Transportation

The *2011 ESPR* will describe Logan Airport's role in the region's intercity transportation system by reporting on the following:

<u>Regional Airports</u>

- 2011 regional airport operations, passenger activity levels, and schedule data within an historical context
- Status of plans and new improvements as provided by the regional airport authorities
- Ground access improvements to the regional airports
- The role that Worcester Regional Airport and Hanscom Field play in the regional aviation system and Massport's efforts to promote these airports, including the updated 2030 forecasts for both airports.

<u>Regional Transportation System</u>

- Overview of the restructured Massachusetts Department of Transportation (MassDOT) and Massport's role in managing the regional transportation facilities
- Massport's cooperation with other transportation agencies to promote efficient regional highway and transit operations
- Report on metropolitan and regional rail initiatives and ridership

5. Ground Access to and from Logan Airport

The chapter will report on 2011 conditions and provide a comparison of 2011 findings to those of 2010 for the following:

- Detailed description of compliance with Logan Airport Parking Freeze
- High occupancy vehicle (HOV) ridership (including Blue Line, Silver Line, Scheduled, Unscheduled, Water Transportation, and Logan Express)
- Logan Airport Employee Transportation Management Association (Logan TMA) services
- Logan Airport gateway volumes
- On-airport traffic volumes
- On-airport vehicle miles traveled (VMT).
- Parking demand and management (including rates and duration statistics)
- Status of long-range ground access management strategy planning
- Results of the *2010 Logan Airport Air Passenger Survey*

This chapter will present a discussion of analysis methodologies and assumptions and report on future year conditions for 2030 the following ground transportation indicators:

- Traffic volumes
- On-airport VMT
- Parking demand

This chapter also will present a discussion of the following topics:

- Definition of HOV
- Massport's target HOV mode share along with incentives
- Non-Airport through-traffic.
- Massport's cooperation with other transportation agencies to increase transit ridership to and from Logan Airport via the Blue Line and Silver Line
- Report on Logan Express usage and efforts to increase capacity and usage.
- Progress on enhancing water transportation to and from Logan Airport.
- Progress on rental car consolidation.
- Report on results of ground access study
- Strategies for enhancing services and increasing employee membership in the Logan Airport TMA.

6. Noise Abatement

This chapter will provide an overview of the environmental regulatory framework affecting aircraft noise, the changes in aircraft noise, and the updates in noise modeling. The chapter will report on 2011 conditions and compare 2011 conditions to those of 2010 for the following:

- Fleet Mix, including Stage II, Recertified (Hushkitted) Stage III, newly manufactured Stage III, and qualifying Stage IV aircraft
- Nighttime operations
- Runway utilization (report on aircraft and airline adherence with runway utilization goals)
- Preferential runway advisory system (PRAS) tracking
- Flight tracks

The chapter will report on 2011 conditions and compare those to 2010 conditions for the following noise indicators:

- Using the Federal Aviation Administration's (FAA) most current version of the Integrated Noise Model (INM), and RealContours™ and RealProfiles™, produce an accurate set of Day-Night Sound Level (DNL) noise contours. Adjustments made to account for over-water sound propagation and the propagation of sound to areas of higher terrain will be reported
- Noise-impacted population (using the 2010 Census data)
- Measured versus modeled noise values, including reasons for differences and any improvements attributable to the use of RealContours™ and RealProfiles™
- Cumulative Noise Index (CNI)
- Times-Above for 65, 75, and 85 dBA threshold values/Dwell and Persistence of noise levels
- Installation and benefits of the new noise monitoring system
- Flight track monitoring noise quarterly reports

The chapter will also report on noise abatement efforts, results from Boston Logan Airport Noise Study (BLANS) study, and provide a status update on the new noise and operations monitoring system.

This chapter will present a discussion of analysis methodologies and assumptions, including fleet mix and runway use assumptions, and report on future year conditions for 2030 for the following noise indicators:

- Runway utilization
- DNL noise contours
- Population counts

7. Air Quality/Emissions Reductions

This chapter will begin with an overview of the environmental regulatory framework affecting aircraft emissions, changes in aircraft emissions, and the changes in air quality modeling. The chapter will provide discussion on progress on the national and international levels to decrease air emissions to provide context for this chapter. The chapter will also discuss analysis methodologies and assumptions and report on 2011 conditions using the most recent versions of the Emissions Dispersion Modeling System (EDMS) and MOBILE motor vehicle emissions. The chapter will include:

- Emissions inventory for carbon monoxide (CO)
- Emissions inventory for oxides of nitrogen (NO_x)
- Emissions inventory for volatile organic compounds (VOCs)
- Emissions inventory for particulate matter (PM)
- Nitrogen dioxide (NO_2) monitoring
- NO_x emissions by airline

This chapter will also report on the following air quality initiatives (AQI) for 2011:

- Air Quality Initiative Tracking
- Massport's and Tenant's Alternative Fuel Vehicle Programs
- The status of Logan Airport air quality studies undertaken by Massport or others, as available

This chapter will include an inventory of greenhouse gas (GHG) emissions from Logan Airport in 2011. GHG emissions will be quantified for aircraft, GSE, motor vehicles and stationary sources using emission factors and methodologies outlined in the Greenhouse Gas Emissions Policy and Protocol issued by Executive Office of Energy and Environmental Affairs (EEA) and the Transportation Research Board's *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories* (Airport Cooperative Research Program (ACRP) Report 11, Project 02-06). The results of the 2011 GHG emissions inventory will be compared to the 2010 results.

This chapter will present a discussion of analysis methodologies and assumptions and report on future year condition for 2030 for the following air quality indicators:

- Emissions Inventory for CO
- Emissions Inventory for NOx
- Emissions Inventory for VOCs
- Emissions Inventory for GHGs

This chapter will also include an update on Massport's efforts to encourage the use of single engine taxiing under safe conditions.

8. Water Quality/Environmental Compliance and Management

This chapter will report on the 2011 status of:

- National Pollutant Discharge Elimination System (NPDES) Permit and monitoring results for Logan Airport's outfalls and the Fire Training Facility
- Jet fuel usage and spills
- Massachusetts Contingency Plan (MCP) Activities
- Tank management
- Update on the environmental management plan
- Fuel spill prevention

The chapter will also present a discussion of the following topics:

- Future stormwater management improvements (if any)
- Future MCP and tank management activities

9. Project Mitigation Tracking

This chapter will report on the status of mitigation commitments for specific Massport and tenant projects at Logan Airport that have undergone MEPA review and other commitments and have commenced construction. The status of mitigation commitments made in the Section 61 Findings for the following projects will be reported:

- West Garage/Central Garage
- International Gateway
- Runway Ends 22R and 33L Runway Safety Area Improvements
- Replacement Terminal A
- Logan Airside Improvements Planning
- Southwest Service Area Redevelopment Program

This chapter will update the status of Massport's mitigation commitments and also will identify projects for which mitigation is complete.

Appendices

MEPA Documentation

These appendices will include a copy of the Secretary's Certificate and comment letters received on the *2010 EDR*. Individual responses to items raised in the Secretary's Certificate on the *2010 EDR* and comments in reviewers' letters will be provided. A distribution list for the *2011 ESPR* (indicating those receiving documents or CDs) will be provided. The document will also contain copies of any MEPA Certificates issued for projects at Logan Airport in 2011.

Supporting Technical Documentation

Supporting technical appendices will be provided as necessary.

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D

Distribution

This *2010 Environmental Data Report* (*2010 EDR*) has been distributed to federal, state, and city agencies and to parties listed in this appendix. The list includes those entities that the Massachusetts Environmental Policy Act (MEPA) requires as part of the review of the document, representatives of governmental agencies, commentors on the *2009 EDR*, and community groups concerned with airport activities.

The *2010 EDR* also is available on Massport's website at www.massport.com and electronically on compact disc (CD). Limited CD or printed copies of the *2010 EDR* may be requested from Christina Bocchino, Massport, Suite 200S, Logan Office Center, One Harborside Drive, East Boston, MA 02128, telephone (617) 568-3507, e-mail: cbocchino@massport.com. Printed and electronic copies of this report are available for review at the following public libraries:

Table D-1 Libraries

	Library	Address		Library	Address
P,C	Boston Public Library Main Branch	666 Boylston Street Boston, MA 02117	P,C	Boston Public Library Charlestown Branch	179 Main Street Charlestown, MA 02129
P,C	Boston Public Library Connolly Branch	433 Centre Street Jamaica Plain, MA 02130	P,C	Boston Public Library East Boston Branch	276 Meridian Street East Boston, MA 02128
P,C	Boston Public Library Orient Heights Branch	18 Barnes Avenue East Boston, MA 02128	P,C	Boston Public Library South Boston Branch	646 East Broadway South Boston, MA 02127
P,C	Bedford Public Library	7 Mudge Way Bedford, MA 01730	P,C	Cary Memorial Library	1874 Massachusetts Avenue Lexington, MA 02420
P,C	Chelsea Public Library	569 Broadway Chelsea, MA 02150	P,C	Concord Public Library	129 Main Street Concord, MA 01742
P,C	Lincoln Public Library	3 Bedford Road Lincoln, MA 01773	P,C	Milton Public Library Main Branch	476 Canton Avenue Milton, MA 02186
P,C	Quincy Public Library Thomas Crane Branch	40 Washington Street Quincy, MA 02169	P,C	Revere Public Library	179 Beach Street Revere, MA 02151
P,C	Winthrop Public Library	2 Metcalf Square Winthrop, MA 02151	P,C	State Transportation Library	10 Park Plaza Boston, MA 02116-3973
P,C	Medford Public Library	111 High St. Medford, MA 02155	P,C	Everett Public Library	410 Broadway Everett, MA 02149
P,C	Somerville Public Library	79 Highland Ave. Somerville, MA 02143	P,C	Cambridge Main Library	449 Broadway Cambridge, MA 02138

C CD sent
P Printed volume sent

Some parties listed in Table D-2 have been provided a hard copy of the document along with a CD of the complete document. A second group of parties have been provided with a CD only.

Table D-2 Distribution

Commentors on the *2009 EDR*

[P,C] Robert Healy
City Manager
City of Cambridge
795 Massachusetts Avenue
Cambridge, MA 02139

[P,C] Jerome Falbo
Town of Winthrop
Noise, Air Pollution & Airport Hazards Committee
Town Hall, 1 Metcalf Square
Winthrop, MA 02152

[P,C] Darryl Pomicter
136 Myrtle Street
Boston, MA 02114-4447

[P,C] Nancy S. Timmerman, P.E.
Consultant in Acoustics and Noise Control
25 Upton Street
Boston, MA 02218

Federal Government

United States Senators and Representatives

[C] U.S. Representative Michael E. Capuano
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Cambridge, MA 02141

[C] U.S. Representative Niki Tsongas
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Lowell, MA 01852

[C] U.S. Representative Barney Frank
29 Crafts Street
Newton, MA 02158

[C] U.S. Representative William Keating
1250 Hancock Street, Suite 802-N
Quincy, MA 02169

[C] U.S. Representative John Tierney
17 Peabody Square
Peabody, MA 01960

[C] U.S. Senator Scott Brown
2400 J.F. Kennedy Federal Building
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[C] U.S. Representative Edward J. Markey
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[C] U.S. Representative James McGovern
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Worcester, MA 01608

[C] U.S. Senator John F. Kerry
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[C] U.S. Representative Steven Lynch
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Environmental Protection Agency

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[C] Lucy Edmondson
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Table D-2 Distribution (Continued)

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Department of Transportation
Federal Aviation Administration
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P,C Richard Doucette
Manager, Environmental Programs
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C Deborah James
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C Ralph Nicosia-Rusin
Capacity Program Manager
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P,C Michel Hovan
Acting Manager, Airports Division
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United States Army Corps of Engineers

C Colonel Charles P. Samaris
Division Engineer
U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

United States Postal Service

C Dale Bierstaker
Support Services
United States Postal Service
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Boston, MA 02205-9991

United States Fish and Wildlife Service

C Wendi Weber
Acting Regional Director
U.S. Fish and Wildlife Service
Department of the Interior
300 Westgate Center Drive
Hadley, MA 01035-9589

C NE Field Office
U.S. Fish and Wildlife Service
Department of the Interior
70 Commercial St., Suite 300
Concord, NH 03301-5087

State Government

Department of Environmental Protection

C Kenneth L. Kimmell
Commissioner
Department of Environmental Protection
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Boston, MA 02108

C Nancy Baker
MEPA Coordinator
Northeast Regional Office
Department of Environmental Protection
205B Lowell Street
Wilmington, MA 01887

C Rachel Freed
Section Chief
Wetlands and Waterways - NERO
Department of Environmental Protection
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C Iris Davis
Bureau of Waste Site Cleanup
Section Chief
Permits/Risk Reduction - NERO
Department of Environmental Protection
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C Christine Kirby
Transportation Programs
Department of Environmental Protection
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Boston, MA 02108

Table D-2 Distribution (Continued)

Senate/House of Representatives

C Senate President Therese Murray
Massachusetts State House, Room 332
Boston, MA 02133

C Senator Thomas McGee
Chair, Joint Committee on Transportation
Massachusetts State House, Room 190C
Boston, MA 02133

C Senator Sal DiDomenico
Massachusetts State House, Room 218
Boston, MA 02133

C Senator John A. Hart
Massachusetts State House, Room 109B
Boston, MA 02133

C Speaker of the House Robert A. DeLeo
Massachusetts State House, Room 356
Boston, MA 02133

C Representative Kathi-Anne Reinstein
Massachusetts State House, Room 481
Boston, MA 02133

C Representative William M Straus
Chair, Joint Committee on Transportation
Massachusetts State House, Room 134
Boston, MA 02133

C Representative Martha Walz
Massachusetts State House, Room 238
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C Representative Nick Collins
Massachusetts State House, Room 26
Boston, MA 02133

C Representative Eugene L. O'Flaherty
Massachusetts State House, Room 136
Boston, MA 02133

C Senator Anthony Petruccelli
Massachusetts State House, Room 424
Boston, MA 02133

C Representative Carlo Basile
Massachusetts State House, Room 254
Boston, MA 02133

C Representative Byron Rushing
Massachusetts State House, Room 121
Boston, MA 02133

C Representative Charles Murphy
Massachusetts State House, Room 235
Boston, MA 02133

Executive Office of Energy and Environmental Affairs

P,C Richard K. Sullivan, Jr., Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge St, 9th Floor
Boston, MA 02114

P,C Richard Bourre
MEPA Assistant Director
Executive Office of Energy and Environmental Affairs
100 Cambridge St, 9th Floor
Boston, MA 02114

P,C Anne Canaday
Environmental Analyst
Executive Office of Energy and Environmental Affairs
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Department of Public Health

C Suzanne K. Condon
Associate Commissioner
Executive Office of Health and Human Services
Attn: Margaret Round
Department of Public health
250 Washington Street
Boston, MA 02108

Department of Conservation and Recreation

C Edward M. Lambert, Jr.
Commissioner
Department of Conservation and Recreation
251 Causeway Street, Suite 600
Boston, MA 02114-2104

C Priscilla E Geiges, Director
Division of State Parks
Department of Conservation and Recreation
251 Causeway Street, Suite 600
Boston, MA 02114

Table D-2 Distribution (Continued)

- **Department of Fisheries, Wildlife and Environmental Law Enforcement**

C Environmental Reviewer
Mass. Wildlife &
Environmental Law Enforcement
Field Headquarters
1 Rabbit Hill Road
Westborough, MA 01581

- **Department of Housing and Community Development**

C Debra Jean
Coordinator, State Clearinghouse
Department of Housing and Community Development
One Congress Street, Suite 1001
Boston, MA 02114-2023

- **Massachusetts Water Resources Authority**

C Frederick A. Laskey
Executive Director
Mass. Water Resources Authority
Charlestown Navy Yard
100 First Avenue
Charlestown, MA 02129

- **Coastal Zone Management**

C Bruce K. Carlisle
Director
Massachusetts Office of Coastal Zone Management
251 Causeway St. Suite 900
Boston, MA 02114-2119

- **Central Transportation Planning Staff**

C Robin Mannion
Deputy Director
Central Transportation Planning Staff
10 Park Plaza, Room 2150
Boston, MA 02116

- **Metropolitan Area Planning Council**

P,C Joel Barrera
Deputy Executive Director
Metropolitan Area Planning Council
60 Temple Place, 6th Floor
Boston, MA 02111

- **Massachusetts Department of Transportation (MassDOT)**

C Richard A. Davey
Secretary of Transportation, MassDOT
10 Park Plaza, Suite 3170
Boston, MA 02116

C Jonathan Davis
Acting Administrator
MassDOT Rail & Transit
10 Park Plaza, Suite 3910
Boston, MA 02116

C Frank DePaola
Administrator, MassDOT Highway
10 Park Plaza, Suite 3510
Boston, MA 02116

C Christopher J. Willenborg
Administrator, MassDOT Aeronautics
Logan Office Center
One Harborside Drive
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C David Mohler
Executive Director
MassDOT Office of Transportation Planning
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C Kevin Walsh
Director of Environmental Services
MassDOT
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C Ronald Killian
Manager of Environmental Permits & Procedures, MassDOT
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Boston, MA 02111

C Andrew Brennan
Director of Environmental Affairs, MBTA
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Boston, MA 02116

Table D-2 Distribution (Continued)

■ **Massachusetts Executive Office of Health and Human Services**

C Dr. JudyAnn Bigby, Secretary
Executive Office of Health and Human Services
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Boston, MA 02108

■ **Department of Public Health**

C Margaret Round, Environmental Analyst
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Center for Environmental Health
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■ **Massachusetts Department of Public Safety**

C Thomas G. Gatzunis
Commissioner
Massachusetts Department of Public Safety
One Ashburton Place, Room 1301
Boston, MA 02108

■ **Massachusetts Port Authority Board of Directors**

C Richard A. Davey
Massport Board of Directors
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

C Michael Angelini
Massport Board of Directors
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

C Douglas Husid
Massport Board of Directors
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

C Ranch C. Kimball
Massport Board of Directors
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

C Paul J. McNally
Massport Board of Directors
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

C Frederic Mulligan
Massport Board of Directors
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

C Kathryn West
Massport Board of Directors
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

Municipalities

■ **City of Boston**

Office of the Mayor

C Thomas Menino
Mayor
City of Boston
One City Hall Square
Boston, MA 02201

Boston Transportation Department

P,C Robert D'Amico
Senior Planner
Boston Transportation Department
One City Hall Plaza, Room 721
Boston, MA 02201

P,C Tom Tinlin
Commissioner
Boston Transportation Department
One City Hall Square, Room 721
Boston, MA 02201

Boston Redevelopment Authority

P,C John Palmieri
Director
Boston Redevelopment Authority
One City Hall Square, Room 959
Boston, MA 02201

Boston Parks and Recreation Department

C Antonia Pollak
Commissioner
Boston Parks and Recreation Department
1010 Massachusetts Avenue
Boston, MA 02118

Table D-2 Distribution (Continued)

City Clerk's Office

C Rosaria Salerno
Boston City Clerk
One City Hall Square
Boston, MA 02201

Boston Public Health Commission

C Dr. Barbara Ferrer
Executive Director
Boston Public Health Commission
1010 Massachusetts Avenue
Boston, MA 02118

Boston Environment Department

C Bryan Glascock
Director
City of Boston Environment Department
One City Hall Plaza, Room 805
Boston, MA 02201

C Maura Zlody
City of Boston Environment Department
One City Hall Plaza, Room 805
Boston, MA 02201

Environmental Services Cabinet

C Nancy Grilk
Environmental Services Cabinet
Chief of Staff
City Hall, Room 603
Boston, MA 02201

C James Hunt
Chief of Environmental and Energy Services
City Hall, Room 603
Boston, MA 02201

Boston Water and Sewer Commission

C Vincent G. Mannering
Executive Director
Boston Water and Sewer Commission
980 Harrison Avenue
Boston, MA 02119

C John Lopes
Boston Water and Sewer Commission
980 Harrison Avenue
Boston, MA 02119

C Charlie Jewel
Boston Water and Sewer Commission
980 Harrison Avenue
Boston, MA 02119

Boston City Council

C Stephen Murphy
Council President
Boston City Council
Boston, City Hall
Boston, MA 02201

C Sal LaMattina
District Councilor, 1
Boston City Council
Boston City Hall
Boston, MA 02201

C Bill Linehan
District Councilor, 2
Boston City Council
Boston, City Hall
Boston, MA 02201

C Maureen E. Feeney
District Councilor, 3
Boston City Council
Boston, City Hall
Boston, MA 02201

C Charles C. Yancey
District Councilor, 4
Boston City Council
Boston, City Hall
Boston, MA 02201

C Robert Consalvo
District Councilor, 5
Boston City Council
Boston City Hall
Boston, MA 02201

C Matt O'Malley
District Councilor, 6
Boston City Council
Boston, City Hall
Boston, MA 02201

C Tito Jackson
District Councilor, 7
Boston City Council
Boston, City Hall
Boston, MA 02201

C Michael P. Ross
District Councilor, 8
Boston City Council
Boston, City Hall
Boston, MA 02201

C Mark Ciommo
District Councilor, 9
Boston City Council
Boston, City Hall
Boston, MA 02201

C Felix Arroyo
Councilor-At-Large
Boston City Council
Boston, City Hall
Boston, MA 02201

C John Connolly
Councilor-At-Large
Boston City Council
Boston, City Hall
Boston, MA 02201

Table D-2 Distribution (Continued)

C Ayanna Pressley
Councilor-At-Large
Boston City Council
Boston, City Hall
Boston, MA 02201

Town of Milton

C Robert C. Sweeney
Chair, Board of Selectmen
Milton Town Hall
525 Canton Avenue
Milton, MA 02186

C Kevin Mearn
Town Administrator
Milton Town Hall
525 Canton Avenue
Milton, MA 02186

City of Chelsea

C Jay Ash
City Manager
Chelsea City Hall
500 Broadway
Chelsea, MA 02150

C Deborah Washington
Councilor District 7
500 Broadway
Chelsea, MA 02150

C Daniel Cortell
Councilor District 8
500 Broadway
Chelsea, MA 02150

C Deborah Clayman
City Clerk
Chelsea City Hall
500 Broadway
Chelsea, MA 02150

C Leo Robinson
Council President
500 Broadway
Chelsea, MA 02150

C Stephen Sarikas, Chairman
Chelsea Conservation Commission
Chelsea City Hall
500 Broadway
Chelsea, MA 02150

C Paula S. Barton
Councilor District 4
500 Broadway
Chelsea, MA 02150

C Richard Maronski
Councilor District 3
500 Broadway
Chelsea, MA 02150

C Roseann T. Bongiovanni
Councilor-At-Large
500 Broadway
Chelsea, MA 02150

C Brian B. Hatleberg
Councilor District 5
Chelsea City Hall
500 Broadway
Chelsea, MA 02170

C Mike MeKonnen Tsegaye
Councilor District 2
500 Broadway
Chelsea, MA 02150

C John DePriest
Director of Planning and Development and
Chelsea Conservation Commission
City of Chelsea
500 Broadway, Room 101
Chelsea, MA 02150

C Marilyn Vega-Torres
Councilor District 6
Chelsea City Hall
500 Broadway
Chelsea, MA 02150

C Luis Prado, MSPIH
Director, Department of Health and Human
Services
Chelsea City hall
500 Broadway
Chelsea, MA 02150

C Kathleen Bishop
Councilor District 1
500 Broadway
Chelsea, MA 02150

C Calvin T. Brown
Councilor-At-Large
Chelsea City Hall
500 Broadway
Chelsea, MA 02150

Table D-2 Distribution (Continued)

- **City of Quincy**

C Thomas Koch
Mayor
Quincy City Hall
1305 Hancock Street
Quincy, MA 02169

C Kevin F. Coughlin
President, City Council
Quincy City Hall
1305 Hancock Street
Quincy, MA 02169

C Joseph Shea
City Clerk
Quincy City Hall
1305 Hancock Street
Quincy, MA 02169

- **City of Revere**

C Thomas G. Ambrosino Jr., Mayor
Revere City Hall
281 Broadway
Revere, MA 02151

C Ashley Melnik, City Clerk
Revere City Hall
281 Broadway
Revere, MA 02151

- **Town of Winthrop**

C James McKenna
Town Manager
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Peter Roche, Chair
Winthrop Planning Board
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Jerome Falbo
Town of Winthrop Air Pollution, Noise and Airport Hazards Committee
One Metcalf Square
Winthrop, MA 02152

C Mary Kelley Chair,
Winthrop Conservation Commission
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Jeffrey Rosario Turco
Council President
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Phillip Boncore
Councilor-At-Large
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C J. Larry Powers
Councilor-At-Large
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Paul Varone
Councilor- Precinct 1
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C James Letterie
V.P. and Councilor- Precinct 2
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Nicholas DelVento
Councilor- Precinct 3
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Jeanne Maggio
Councilor- Precinct 4
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Russell Sanford
Councilor- Precinct 5
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

C Linda Calla
Councilor- Precinct 6
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

- **Town of Bedford**

C Walter J. St. Onge, Chair
Board of Selectmen
Town of Bedford
10 Mudge Way
Bedford, MA 01730

C Richard T. Reed
Town Manager
Town of Bedford
10 Mudge Way
Bedford, MA 01730

Table D-2 Distribution (Continued)

- **Town of Lexington**

C Jeanne Krieger
Board of Selectmen
Lexington Town Hall
1625 Massachusetts Avenue
Lexington, MA 02173

C Hank Manz
Board of Selectmen, HFAC Rep.
Lexington Town Hall
1625 Massachusetts Avenue
Lexington, MA 02173

C Carl Valente
Town Manager
Lexington Town Hall
1625 Massachusetts Avenue
Lexington, MA 02173

- **Town of Concord**

C Anne D. Shapiro
Hanscom Field Advisory Committee Rep
Town of Concord
34 Tarbell Spring Road
Concord, MA 01742

C Christopher Whelan
Town Manager
Town of Concord
22 Monument Square, PO Box 535
Concord, MA 01742

C Elise F. Woodward
Concord Board of Selectman, Chair
22 Monument Square, PO Box 535
Concord, MA 01742

- **Town of Lincoln**

C Timothy Higgins
Town Administrator
16 Lincoln Road
Lincoln, MA 01773

C Gary A. Taylor
Board of Selectmen, Chair
16 Lincoln Road
Lincoln, MA 01773

C Sara Mattes
Board of Selectmen,, HATS Chair
16 Lincoln Road
Lincoln, MA 01773

- **Town of Hull**

C Domenico Sestito
Hull Board of Selectman, Town Hall
253 Atlantic Avenue
Hull, MA 02045

C Phillip Lemnois Town Manager
253 Atlantic Avenue
Hull, MA 02045

- **City of Cambridge**

C Susan Glazer
Deputy Director - Community Development
344 Broadway
Cambridge, MA 02139

C Robert W. Healy, City Manager
Cambridge City Hall
795 Massachusetts Avenue
Cambridge, MA 02139

C Planning Board
Cambridge City Hall
795 Massachusetts Avenue
Cambridge, MA 02139

- **City of Somerville**

C Monica Lamboy
Executive Director, Community Development
93 Highland Avenue
Somerville, MA 02143

C Joseph A. Curtatone
Mayor-City of Somerville
93 Highland Avenue
Somerville, MA 02143

C Planning Board
City of Somerville
93 Highland Avenue
Somerville, MA 02143

- **City of Everett**

C Marzie Galazka, Director
Office of Community Development
484 Broadway
Everett, MA 02149

C Carlo DeMaria, Jr, Mayor
Everett City Hall
484 Broadway
Everett, MA 02149

C Planning Board
Everett City Hall
484 Broadway
Everett, MA 02149

- **City of Medford**

C Lauren DiLorenzo
Director of Community Development
85 George Hassett Drive, Room 308
Medford, MA 02155

C Michael J. McGlynn, Mayor
Medford City Hall
85 George P. Hassett Drive, Room 202
Medford, MA 02155

C Planning Board
Medford City Hall
85 George P. Hassett Drive
Medford, MA 02155

Table D-2 Distribution (Continued)

Community Groups and Interested Parties

- **Citizens Advisory Committee (CAC)**

C Gary Banks
128 Indian Trail
Scituate, MA 02066

C Declan Boland
338 Main Street
Hingham, MA 02043

C Frank Chin
171 Tremont Street
Boston, MA 02111

C Frank Ciano
65 Woodside Lane
Arlington, MA 02474

C Robert Clifford
37 Shepard Avenue
Swampscott, MA 01907

C Larry Costello
100 Furbush Road
West Roxbury, MA 02132

C Bill Deignan
City of Cambridge Planning Department
344 Broadway
Cambridge, MA 02139

C Ralph Dormitzer
111 Atlantic Avenue
Cohasset, MA 02025

C Bob Driscoll
179 Grovers Avenue
Winthrop, MA 02152

C Jerome Falbo
80 Jefferson Street
Winthrop, MA 02152

C Patti Fine
25 Sackville Street
Charlestown, MA 02129

C MaryAnn Frye
2 Beach Lane
Hingham, MA 02043

C Alex Geourntas
39 Iona Street
Roslindale, MA 02131

C David Godine
196 School Street
Milton, MA 02186

C Ron Hardaway
118 Bayswater Street
East Boston, MA 02128

C Rod Hobson
31 Deep Run
Cohasset, MA 02025

C Judith Kennedy
170 Atherton Street
Milton, MA 02186

C Sandra Kunz
89 Hollingsworth Avenue
Braintree, MA 02184

C Michael Lindstrom
Melrose City Hall, 562 Main Street
Melrose, MA 02176

C Anastasia Lyman
18 Greenough Avenue
Jamaica Plain, MA 02130

C Will Lyman
18 Greenough Avenue
Jamaica Plain, MA 02130

C James MacDonald
29 Arlington Road
Dedham, MA 02026

C Matt MacIver
29 Green Street
Hingham, MA 02043

C Bernice Mader
108 Connell Street
Quincy, MA 02169

C Russ Maguire, Airport Manager
Norwood Memorial Airport
125 Access Road
Norwood, MA 02062

C Terry McAteer
266 Pine Street
South Weymouth, MA 02190

C Paul Meleedy
63 Montgomery Street
Lakeville, MA 02347

C Jillian Middleton
85 Little Nahant Road
Nahant, MA 01908

C Endri Misho
25 Golden Avenue
Medford, MA 02155

C Joseph Moccia
73 Little Nahant Road
Nahant, MA 01908

C Dick Morrison
Morrison Market Strategies
34 Tremont Street
Chelsea, MA 02150

C David Nagle
711 East Second Street
South Boston, MA 02127

C Martin Nee
109 Atlantic Avenue
Cohasset, MA 02025

C Michael Parker
197 8th Street, Flagship Unit 515
Charlestown, MA 02129

C Darryl Pomicter
136 Myrtle Street
Boston, MA 02114

C Susan Rasmussen
Cambridge Planning Department
344 Broadway
Cambridge, MA 02139

Table D-2 Distribution (Continued)

C Yelena Shulkina
8 Ninth Street, Unit 64
Medford, MA 02155

C Rodney Singleton
44 Cedar Street
Roxbury, MA 02119

C Pamela Smith
641 Adams St
Dorchester, MA 02122

C John Stewart
37 Greenwich Park
Boston, MA 02118

C Allison Stieber
14 Wyatt Street
Somerville, MA 02143

C William Sweeney
79 Chestnut Road
Halifax, MA 02338

C Mona Thaler
22 Cushing Road
Brookline, MA 02146

C Jonathan Walzer
864 South River Street
Marshfield, MA 02050

C Leo White
12 Stewart Lane
Beverly, MA 01915-1112

C Jonathan Witten
156 Duck Hill Road
Duxbury, MA 02332

C Alan Wright
57 Arborough Road
Roslindale, MA 02131

C Wig Zamore
13 Highland Avenue #3
Somerville, MA 02143

■ **Charlestown Community**

C Tom Cunha
Chairman
Charlestown Neighborhood Council
427 Bunker Hill Street
Charlestown, MA 02129

C Dave Whelan
First Vice Chairman
Charlestown Neighborhood Council
23 Ferrin Street
Charlestown, MA 02129

C Danielle Valle Fitzgerald
Mayor's Office of Neighborhood Services
1 City Hall Square, Room 708
Boston, MA 02201

■ **Chelsea Community**

C Juan Vega
Executive Director
Centro Latino de Chelsea
267 Broadway
Chelsea, MA 02150

C Gladys Vega
Chelsea Collaborative
318 Broadway
Chelsea, MA 02150

C Kenneth Webber
President
Chelsea Rotary
PO Box 505647
Chelsea, MA 02150-5647

C Joseph McNamee
President
Chelsea Chamber of Commerce
308 Broadway
Chelsea, MA 02150

■ **Jamaica Plain Community**

C Nancy Brooks and Maura Meagher
92 Bourne St
Jamaica Plain, MA 02130

C Marvin Kabakott
98 Bourne St
Jamaica Plain, MA 02130

C Martha Merson
19 Roseway St
Jamaica Plain, MA 02130

C Susan Morony
33 Bournedale Rd
Jamaica Plain, MA 02130

C Robyn Ochs
79 Eastland Road
Jamaica Plain, MA 02130

C Craig Sonnenberg
Aircraft Noise Action Committee
18 Southborne Road
Jamaica Plain, MA 02130

Table D-2 Distribution (Continued)

■ East Boston Community

C Thomas Briand, President
East Boston Residents &
Homeowners Assoc.
83 Byron Street
East Boston, MA 02128

C Karen Buttiglieri
56 Beachview Road
East Boston, MA 02128

C Neffo Cappucio
President
East Boston Chamber of Commerce
175 McClellan Highway, Suite 1
East Boston, MA 02128

C Mary Catino
71 Liverpool Street
East Boston, MA 02128

C Debra Cave
ONE East Boston
106 White Street
East Boston, MA 02128

C Alice Christopher
972 Bennington Street
East Boston, MA 02128

C Dean Hashimoto
East Boston Neighborhood Health Center
153 Westchester Road
Newton, MA 02158

C Lucy Ferullo
23 Haynes Street
East Boston, MA 02128

C Tom Bruno
Orient Heights Neighborhood Association
21 Annavoy Street
East Boston, MA 02128

C Mary Ellen Welch
East Boston Greenways
225 Webster Street, Apt 4
East Boston, MA 02128

C Roberta Horn
65 St. Andrews Road
East Boston, MA 02128

C Ida Lamattina
President
Gove Street Citizens Committee
123 Cottage Street, Apt 1
East Boston, MA 02128

C Bernadette Centelugo
156 Porter Street Association
156 Porter Street
East Boston, MA 02128

C George Loring
237 Marion Street
East Boston, MA 02128

C Karen Maddalena
Chairperson
Jeffries Point Neighborhood Assoc.
4 Lamson Street
East Boston, MA 02128

C Robert Strielitz
East Boston Piers PAC
1 Brigham Street
East Boston, MA 02128

C Richard Lynds
Executive Director,
East Boston Foundation
1216 Bennington Street
East Boston, MA 02128

C Clark Moulaison
East Boston Main Streets
146 Maverick Street, No 1-2
East Boston, MA 02128

C Ron Hardaway
118 Bayswater Street
East Boston, MA 02128

C Gail Miller
232 Orient Ave
East Boston, MA 02128

C Jack Scalcione
Commander, East Boston Veteran's Council
36 Frankfort Street
East Boston, MA 02128

C Bill Manning
1 Webster Street
East Boston, MA 02128

C Fran Riley
193 Trenton Street
East Boston, MA 02128

C Fran Rowan
7 Thurston Street
East Boston, MA 02128

C Ernani DeAraujo
Mayor's Office of Neighborhood Services
Boston City Hall, Room 205
Boston, MA 02201

C James Bowen
385 Meridien Street
East Boston, MA 02128

C Diane Modica
24 Haynes Street
East Boston, MA 02128

C Deborah J. Jackson, President and COO
East Boston Savings Bank
10 Meridian Street
East Boston, MA 02128

C Vincent R. Tino
95 Faywood Avenue
East Boston, MA 02128

C Maria Conti
Secretary, EB Piers PAC
44 Saratoga Street
East Boston, MA 02128

Table D-2 Distribution (Continued)

C Commodore
Jeffries Yacht Club
565 Sumner Street
East Boston, MA 02128

C John Cradock
East Boston Neighborhood Health Center
10 Gove Street
East Boston, MA 02128

C John Kelly
East Boston Social Centers
68 Central Sq.
East Boston, MA 02128

C Joe Mason
East Boston Land Use Council
2 Neptune Road, Suite 352
East Boston, MA 02128

C Mary Berninger
156 St. Andrew Road
East Boston, MA 02128

C David Arinella
20 Thurston Street
East Boston, MA 02128

C Fran Carbone
174 Bayswater Street
East Boston, MA 02128

- **Revere Community**

C Ben Leone
245 Bellingham Avenue
Revere, MA 02151

C Michael Callahan
265 Crescent Avenue
Revere, MA 02151

C James Furlong
Roughans Point Association
c/o 12 Pier View Avenue
Revere, MA 02151

C Elaine Hurley
Pines Riverside Association
c/o 21 River Avenue
Revere, MA 02151

C Joseph James
Friends of Rumney Marsh
10 Rice Avenue
Revere, MA 02151

C Michael Kelleher
Revere Beach Assoc.
681 Revere Beach Boulevard
Revere, MA 02151

C Kristina Nappi, President
Point of Pines Beach Assoc.
c/o 66 Bickford Avenue
Revere, MA 02151

C Rose LaQuaglia
Oak Island Civic Association
5 Oak Island Road
Revere, MA 02151

C Carl Shalachman
72 Whitin Ave
Revere, MA 02151

C Laura D'Amico
President, Revere Chamber of Commerce
270 Broadway
Revere, MA 02151

C Joseph Felzani
42 Goodwin Ave
Point of Pines
Revere, MA 02151

C Jim Page
162 Endicott Avenue
Revere, MA 02151

- **Roslindale Community**

C Pauline Sickels-George
50 Halliday St
Roslindale, MA 02131

Table D-2 Distribution (Continued)

■ **South Boston Community**

C Thomas McGrath
President-South Boston Citizens Association
P.O. Box 74
South Boston, MA 02127

C Casey Hines
Mayor's Office of Neighborhood Services
1 City Hall Plaza
Boston, MA 02201

C Lucky Devlin
South Boston Environmental & Health Coalition
718 East Second Street
South Boston, MA 02127

C Timothy Hayes, Chair
"M" Street Park Association
23 M Street
South Boston, MA 02127

C Alice O'Leary
Publisher, South Boston Tribune
314 West Broadway
South Boston, MA 02127

C Seaport Alliance for a Neighborhood Design
300 Summer Street
Boston, MA 02210

C Mr. William Spain
President
Castle Island Association
PO Box 342
South Boston, MA 02127

■ **Winthrop Community**

C Eleanor Casey
308 Bowdoin Street
Winthrop, MA 02152

C Richard D. Dimes
Winthrop Hazards Committee
105 Johnson Ave.
Winthrop, MA 02152

C Barbara Bishop, President
Friends of Belle Isle Marsh
P.O. Box 575
East Boston, MA 02128

C Bernice MacIntrye
President
Winthrop Chamber of Commerce
207 Hagman Road
Winthrop, MA 02152

C Eric Gaynor
Executive Director
Winthrop Chamber of Commerce
207 Hagman Road
Winthrop, MA 02152

C Robert Pulsifer
1050 Shirley Street
Winthrop, MA 02152

C Brian Perrin, Vice President
Winthrop Chamber of Commerce
207 Hagman Road
Winthrop, MA 02152

C Marie Turner
283 Court Road
Winthrop, MA 02152

C John Vitagliano
19 Seymour Street
Winthrop, MA 02152

■ **West Roxbury Community**

C Larry Boran
40 Vershire Street
West Roxbury, MA 02132

C Carl Corcy
88 Bellevue Street
West Roxbury, MA 02132

C Keith Davison
37 Hastings Street, #206-ME
West Roxbury, MA 02132

■ **Other Communities**

C Jeffrey Weeden
107 Gardiner Street
Lynn, MA 01905

C Daniel McCormack
Weymouth Town Hall (Health Department)
75 Middle Street
Weymouth, MA 02189

C Kristen O'Brien
45 Badger Circle
Milton, MA 02186

C John Yaney
81 West Street
Whitman, MA 02382

Table D-2 Distribution (Continued)

- **Organizations and Other Interested Parties**

C Association for Public Transportation, Inc.
P.O. Box 51029
Boston, MA 02205-1029

C Eric Bourassa
Metro Area Planning Commission
60 Temple Place, Fl. 6
Boston, MA 02111

C Valerie Burns
Director
Boston Natural Areas Network, Inc.
62 Sumner Street, 2nd Floor
Boston, MA 02110-1008

C John E. Drew
President, Drew Company, Inc.
2 Seaport Lane, 9th Floor
Boston, MA 02210

C Ross B. Capon
National Assoc. of Railroad Passengers
900 Second Street, Suite 308
Washington, DC 20002-3557

C Jay Walsh
Director
Mayor's Office of Neighborhood Services
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Technical Appendices

- Appendix E – Activity Levels
- Appendix F – Regional Transportation
- Appendix G – Ground Access
- Appendix H – Noise Abatement
- Appendix I – Air Quality/Emissions Reduction
- Appendix J – Water Quality/Environmental Compliance and Management
- Appendix K – 2010 Peak Period Pricing Monitoring Report
- Appendix L – Demonstration of Reduced Airport Congestion through Pushback Rate Control
- Appendix M –Reduced/Single Engine Taxiing at Logan Airport Memorandum

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E

Activity Levels

This appendix provides detailed tables in support of *Chapter 2, Activity Levels*:

- Table E-1 Logan Airport Historic Air Passenger and Operations Data
- Table E-2 Logan Airport Changes in Domestic Passenger Operations by Carrier
- Table E-3 Logan Airport Changes in International Passenger Operations by Carrier
- Table E-4 Logan Airport Scheduled Passenger Departures by Destination

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Table E-1	Logan Airport Historic Air Passenger and Operations Data				
Year	**Operations**	**Air Passengers**	**Year**	**Operations**	**Air Passengers**
1980	258,167	14,722,363	1996	456,226	25,134,826
1981	251,961	14,827,684	1997	482,542	25,567,888
1982	244,468	15,867,722	1998	507,449	26,526,708
1983	288,956	17,848,797	1999	494,816	27,052,078
1984	318,959	19,417,971	2000	487,996	27,726,833
1985	349,518	20,448,424	2001	463,125	24,474,930
1986	363,995	21,862,718	2002	392,079	22,696,141
1987	414,968	23,369,002	2003	373,304	22,791,169
1988	407,479	23,732,959	2004	405,258	26,142,516
1989	388,797	22,272,860	2005	409,066	27,087,905
1990	424,568	22,878,191	2006	406,119	27,725,443
1991	430,403	21,450,143	2007	399,537	28,102,455
1992	474,378	22,723,138	2008	371,604	26,102,651
1993	493,093	23,579,726	2009	345,306	25,512,086
1994	458,623	24,468,178	2010	352,643	27,428,962
1995	466,327	24,192,095			

Table E-2 Logan Airport Changes in Domestic Passenger Operations by Carrier

Airline	2005	2006	2007	2008	2009	2010	2009-2010 Change	2009-2010 Percent Change
Scheduled Jet Carriers	190,991	199,281	198,879	189,739	184,181	203,081	18,900	10.3%
AirTran Airlines	14,580	19,761	18,685	14,665	13,645	13,672	27	0.2%
Alaska Airlines	1,088	1,097	1,423	1,969	1,818	1,733	-85	-4.7%
America West Airlines	4,467	4,220	2,874				-	-
American Airlines	27,712	24,631	23,589	22,827	22,766	21,313	-1,453	-6.4%
American Trans Air	2,294						-	-
Continental Airlines	13,546	13,972	14,090	13,930	11,823	10,869	-954	-8.1%
Delta Subtotal	36,388	31,880	30,913	28,892	24,349	28,980	4,631	19.0%
Delta Air Lines Mainline	*14,317*	*18,472*	*21,799*	*19,977*	*17,170*	*21,926*	*4,756*	*27.7%*
Delta Shuttle	*9,588*	*9,000*	*9,114*	*8,915*	*7,179*	*7,054*	*-125*	*-1.7%*
Delta Song	*12,483*	*4,408*					-	-
Independence Air	*4,676*	*45*					-	-
JetBlue	15,069	31,993	34,933	36,887	38,146	49,981	11,835	31.0%
Midwest / Frontier	3,570	4,287	4,672	4,070	1,723	3,055	1,332	77.3%
Northwest Airlines	9,685	8,652	8,368	7,931	7,745		-7,745	-100.0%
Southwest Airlines					2,602	13,727	11,125	427.6%
Spirit Airlines		683	1,796	1,902	1,942	3,023	1,081	55.7%
Sun Country					254	313	59	23.2%
United Airlines	18,304	21,153	20,140	18,568	17,531	16,314	-1,217	-6.9%
US Airways	39,612	36,907	37,396	38,098	36,466	36,678	212	0.6%
Virgin America					3,371	3,394	23	0.7%
Regional/Commuter Carriers	137,203	130,298	124,014	112,881	107,615	94,535	-13,080	-12.2%
American Eagle Airlines	37,394	31,227	23,638	19,561	18,665	15,291	-3,374	-18.1%
Cape Air	25,018	27,278	26,546	33,806	36,670	35,899	-771	-2.1%
Continental Connection Subtotal				23	1,289	1,809	520	40.3%
Colgan Air (Continental Connection)				*23*	*1,289*	*1,809*	*520*	*40.3%*
Continental Express Subtotal	12,544	8,297	2,843	152	106	529	423	399.1%
Chautauqua Airlines (Continental Express)				*152*	*106*	*529*	*423*	*399.1%*
Commutair (Continental Express)	*12,544*	*8,297*	*2,843*				-	-
Delta Connection Subtotal	26,557	28,223	37,750	27,453	21,095	18,445	-2,650	-12.6%
Atlantic SE (Delta Connection)			*182*	*118*	*162*	*943*	*781*	*482.1%*
Big Sky Airlines (Delta Connection)			*6,929*	*173*			-	-
Chautauqua Airlines (Delta Connection)	*1,938*	*1,882*	*2,187*	*2,309*	*1,811*	*1,794*	*-17*	*-0.9%*
Comair Airlines (Delta Connection)	*24,619*	*26,341*	*27,196*	*23,130*	*16,576*	*10,255*	*-6,321*	*-38.1%*
Compass Airlines (Delta Connection)						*1,053*	*1,053*	-
Freedom Airlines (Delta Connection)			*610*	*1,467*	*16*		*-16*	*-100.0%*
Mesaba Airlines (Delta Connection)						*1,078*	*1,078*	-
Pinnacle Airlines (Delta Connection)				*117*	*124*	*1,278*	*1,154*	*930.6%*
Shuttle America (Delta Connection)			*646*	*139*	*2,406*	*2,044*	*-362*	*-15.0%*
Midwest/Republic				244	1,729	258	-1,471	-85.1%
Northwest Airlink Subtotal	5,034	3,912	3,547	3,839	4,601		-4,601	-100.0%
Compass Airlines (Northwest Airlink)				*1,631*	*2,384*		*-2,384*	*-100.0%*
Pinnacle Airlines (Northwest Airlink)	*5,034*	*3,912*	*3,547*	*2,208*	*2,217*		*-2,217*	*-100.0%*
United Express Subtotal	3,178	4,416	2,832	1,587	1,618	2,802	1,184	73.2%
Air Wisconsin (United Express)	*1,699*						-	-
Atlantic SE (United Express)						*574*	*574*	-
Chautauqua Airlines (United Express)	*103*		*484*	*598*	*642*		*-642*	*-100.0%*
Mesa Airlines (United Express)	*1,376*	*3,806*	*2,348*	*989*	*797*	*434*	*-363*	*-45.5%*
Shuttle America (United Express)					*179*	*1,561*	*1,382*	*772.1%*
Trans States Airlines (United Express)		*610*				*233*	*233*	-
US Airways Express Subtotal	27,478	26,945	26,858	26,216	21,842	19,502	-2,340	-10.7%
Air Wisconsin (US Airways Express)	*174*	*1,381*	*7,289*	*7,551*	*7,590*	*6,266*	*-1,324*	*-17.4%*
Allegheny (US Airways Express)							-	-
Chautauqua Airlines (US Airways Express)	*7,852*	*8,954*	*3,117*	*907*	*1,597*	*3*	*-1,594*	*-99.8%*
Colgan Air (US Airways Express)	*12,583*	*13,088*	*14,004*	*11,906*	*8,368*	*9,256*	*888*	*10.6%*
Mesa Airlines (US Airways Express)	*4*	*16*	*72*				-	-
MidAtlantic Express (US Airways Express)	*150*	*130*	*40*				-	-
Piedmont Airlines (US Airways Express)	*3,165*	*2,870*	*1,496*	*1,327*	*1,117*	*963*	*-154*	*-13.8%*
PSA (US Airways Express)	*526*	*246*	*109*	*2*	*2*	*2*	-	*0.0%*
Republic (US Airways Express)	*46*	*260*	*731*	*4,523*	*3,168*	*3,012*	*-156*	*-4.9%*
Trans States Airlines (US Airways Express)	*2,978*						-	-
Non-Scheduled Operations (Incl. Charter)	325	369	570	582	412	501	89	21.6%
Business Jet Solutions				62	162	162	0	0.0%
Champion Air	21	56	68	48			-	-
Gold Transportation			58	40			-	-
Miami Air	30	52	94	84	81	81	0	0.0%
North American Airways	148	92	81	6	9	9	0	0.0%
Other Nonscheduled Carriers	126	169	269	342	160	249	89	55.6%
Total Domestic Operations	328,519	329,948	323,463	303,202	292,208	298,117	5,909	2.0%

Note: Excludes general aviation and all-cargo operations.
Source: Massport

Table E-3 Logan Airport Changes in International Passenger Operations by Carrier

Airline	2005	2006	2007	2008	2009	2010	2009-2010 Change	2009-2010 Percent Change
Scheduled Jet Carriers	24,550	22,081	22,834	22,768	22,065	20,771	-1,294	-5.9%
Aer Lingus Shannon	1,016	1,020	1,221	1,347	1,268	1,097	-171	-13.5%
Aeromexico	534	210	131				-	-
Air Canada	5,782	3,950	3,377	3,215	2,988	3,895	907	30.4%
Air France	1,334	1,207	957	902	911	995	84	9.2%
Air Jamaica	349						-	-
Air One				140			-	-
Alitalia	986	810	886	667	638	624	-14	-2.2%
American Airlines	4,672	4,824	4,700	4,115	3,167	2,422	-745	-23.5%
British Airways	2,151	2,190	2,160	2,134	2,116	2,082	-34	-1.6%
Delta Air Lines	749	851	829	848	781	1,614	833	106.7%
Finnair	44	49	66	48	47		-47	-100.0%
FlyGlobespan			225				-	-
Iberia Airlines			304	466	500	435	-65	-13.0%
Icelandair	811	807	869	821	777	816	39	5.0%
JetBlue		555	1,363	1,839	2,293	2,262	-31	-1.4%
Lufthansa German Airlines	1,564	1,522	1,515	1,667	1,722	1,657	-65	-3.8%
Northwest Airlines	727	734	1,081	1,438	1,154	61	-1,093	-94.7%
SATA International Airlines	315	334	393	360	372	403	31	8.3%
SWISS International (formerly Swiss Air)	704	708	727	722	664	720	56	8.4%
TACA	327	236					-	-
TACV - Cabo Verde	154	139	165	154	210	240	30	14.3%
US Airways	1,607	1,208	1,133	1,155	1,722	667	-1,055	-61.3%
Virgin Atlantic Airways	724	727	732	730	735	707	-28	-3.8%
Regional/Commuter Carriers	13,112	12,922	15,474	12,770	11,813	12,494	681	5.8%
Air Canada Regional	5,120	7,676	8,499	8,478	7,542	7,065	-477	-6.3%
American Eagle Airlines	4,637	2,712	3,312	3,311	2,783	2,480	-303	-10.9%
Delta Connection Subtotal	3,355	2,534	3,663	981	865	81	-784	-90.6%
Big Sky Airlines (Delta Connection)			*1,468*				-	-
Comair Airlines (Delta Connection)	*3,355*	*2,534*	*2,195*	*981*	*865*	*81*	*-784*	*-90.6%*
Porter Airlines					615	2,868	2,253	366.3%
Non-Scheduled Operations	981	727	527	375	320	305	-15	-4.7%
Aerovias de Mexico					8	38	30	375.0%
Aviation Technology	160						-	-
Empresa Peru					110	115	5	4.5%
Miami Air	18	63	232	138	115	46	-69	-60.0%
North American Airways	323	275	112	8			-	-
Ryan International	303	143					-	-
XTRA Aviation		145	103				-	-
Other Nonscheduled Carriers	177	101	80	229	87	106	19	21.8%
Total International Operations	38,643	35,730	38,835	35,913	34,198	33,570	-628	-1.8%

Note: Excludes general aviation and all-cargo operations.
Source: Massport

Table E-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2005	2006	2007	2008	2009	2010	2009-2010 Change	Percent Change
Domestic		163,844	166,256	163,366	152,091	146,993	149,962	2,969	2.0%
New York La Guardia	LGA	13,368	12,619	12,579	12,287	11,574	11,705	132	1.1%
Washington National	DCA	10,697	9,587	9,594	9,242	9,597	9,419	-177	-1.8%
Chicago O'Hare	ORD	7,421	7,251	7,422	7,134	7,092	7,403	311	4.4%
New York JFK	JFK	4,981	8,839	8,473	7,905	8,103	7,054	-1,050	-13.0%
Baltimore	BWI	5,033	6,787	5,820	4,910	4,999	7,053	2,054	41.1%
Philadelphia	PHL	7,021	7,107	6,442	6,968	5,960	6,548	588	9.9%
Atlanta	ATL	6,016	5,742	5,777	5,987	6,104	5,548	-556	-9.1%
Washington Dulles	IAD	6,155	6,803	5,417	4,507	4,386	4,625	240	5.5%
Charlotte	CLT	3,292	3,171	3,434	3,576	3,703	4,180	477	12.9%
Nantucket	ACK	3,445	3,619	3,501	3,837	3,336	3,884	549	16.4%
San Francisco	SFO	2,593	2,179	2,619	2,650	3,370	3,711	341	10.1%
New York Newark	EWR	5,633	5,598	4,278	3,993	3,717	3,666	-51	-1.4%
Los Angeles	LAX	2,658	2,667	2,798	2,288	3,259	3,382	123	3.8%
Raleigh/Durham	RDU	4,115	5,054	4,322	4,053	4,232	3,259	-973	-23.0%
Martha's Vineyard	MVY	2,227	2,610	2,557	2,765	2,670	3,218	548	20.5%
Orlando	MCO	3,528	3,084	3,673	3,411	3,094	3,179	85	2.8%
Dallas/Fort Worth	DFW	3,545	3,445	3,155	3,061	2,917	2,938	21	0.7%
Denver	DEN	1,992	2,445	2,514	2,086	1,825	2,812	987	54.1%
Provincetown	PVC	1,657	2,062	2,277	2,492	1,767	2,410	643	36.4%
Fort Lauderdale/Hollywood	FLL	3,075	2,619	2,610	2,801	1,972	2,370	398	20.2%
Detroit	DTW	2,832	2,888	2,850	2,391	2,322	2,353	30	1.3%
Pittsburgh	PIT	2,023	2,058	2,183	2,464	2,213	2,312	99	4.5%
Miami	MIA	2,075	2,101	1,946	2,190	2,190	2,238	48	2.2%
Milwaukee	MKE	2,184	1,670	1,695	1,731	1,889	2,213	324	17.2%
Buffalo	BUF	1,226	2,096	2,994	2,388	2,327	2,181	-146	-6.3%
Minneapolis	MSP	1,792	1,697	1,678	1,725	1,878	1,927	49	2.6%
Chicago Midway	MDW	1,340	1,131	1,086	363	834	1,756	921	110.4%
Lebanon	LEB				366	2,190	1,734	-456	-20.8%
Houston Intercontinental	IAH	1,753	1,857	1,913	1,804	1,749	1,717	-32	-1.8%
Fort Myers	RSW	1,531	1,618	1,693	1,667	1,485	1,587	102	6.9%
West Palm Beach	PBI	1,131	1,492	1,479	1,707	1,518	1,450	-68	-4.5%
Richmond	RIC	1,409	1,557	1,599	1,494	1,387	1,431	43	3.1%
Cleveland	CLE	1,262	1,314	1,387	1,457	1,377	1,369	-8	-0.6%
Cincinnati	CVG	2,640	2,014	2,012	2,004	1,876	1,364	-512	-27.3%
Phoenix	PHX	944	1,322	1,277	1,069	1,230	1,348	118	9.6%
Rockland	RKD	1,375	1,357	1,268	897	1,279	1,301	22	1.7%
Tampa	TPA	1,949	1,779	1,819	1,746	1,464	1,246	-218	-14.9%
Saranac Lake	SLK	800	940	544	1,019	1,095	1,174	79	7.2%
Hyannis	HYA	1,057	996	1,177	963	1,095	1,165	70	6.4%
Indianapolis	IND	2,079	1,862	1,833	1,816	1,813	1,121	-692	-38.2%
Rutland	RUT	644	626	704	1,095	1,095	1,095	-	0.0%
Memphis	MEM	1,035	1,053	1,007	891	984	1,048	64	6.5%
Plattsburgh AFB	PBG			27	969	1,095	1,025	-70	-6.4%
Seattle/Tacoma	SEA	609	394	975	996	927	1,001	75	8.1%
Augusta	AUG	622	600	617	656	991	1,000	9	0.9%
Presque Isle	PQI	1,018	1,018	1,004	991	991	991	0	0.0%
Syracuse	SYR	1,762	1,762	1,121	969	991	991	0	0.0%
Columbus	CMH	2,118	1,792	1,828	1,551	1,269	972	-296	-23.4%
St. Louis	STL	1,462	1,523	1,089	874	857	934	77	9.0%
Rochester	ROC	1,183	1,562	1,264	1,112	1,109	908	-200	-18.1%
Bar Harbor	BHB	1,153	1,179	1,176	1,121	744	815	71	9.5%
Las Vegas	LAS	1,679	1,762	1,725	1,394	1,060	756	-304	-28.7%
Salt Lake City	SLC	730	709	721	708	704	669	-34	-4.9%
Albany	ALB	1,074	661	1,254	533	711	647	-64	-9.0%
San Diego	SAN	365	365	549	608	592	571	-21	-3.5%
Harrisburg	MDT	887	744	685	726	630	551	-79	-12.5%
Newport News	PHF	670	948	945	721	660	549	-111	-16.8%
Atlantic City	ACY					245	536	291	118.7%
Akron/Canton	CAK	731	726	575	457	488	475	-13	-2.7%
Long Beach	LGB	853	840	813	736	647	459	-188	-29.1%

Table E-4	Logan Airport Scheduled Passenger Departures by Destination								
Destination Airport	Code	2005	2006	2007	2008	2009	2010	2009-2010 Change	Percent Change
Myrtle Beach	MYR	265	265	730	625	457	365	-92	-20.1%
Austin	AUS		352	365	365	365	365	-	0.0%
Jacksonville	JAX	426	722	712	665	348	365	17	5.0%
Portland	PDX			122	365	365	352	-13	-3.5%
New Orleans	MSY	191		4	253	339	348	9	2.7%
Kansas City	MCI	239	513	715	635	287	313	26	9.0%
San Jose	SJC	244	365	365	247		232	232	-
Oakland	OAK	852	813	518	510	488	195	-293	-60.0%
Sarasota/Bradenton	SRQ	30	35	8	25	21	82	61	289.2%
Bangor	BGR	2,949	2,532	2,447	1,084	555		-555	-100.0%
Charleston	CHS	61	287	382	176	92		-92	-100.0%
Westchester County	HPN	2,258	2,053	1,233	735			-	-
Islip	ISP	1,579	1,192	1,030	646			-	-
Norfolk	ORF	1,035	704	647	254			-	-
Greensboro	GSO	1,122	657	600	176			-	-
Nashville	BNA		318	422	158			-	-
Trenton	TTN		61	943	152			-	-
Watertown	ART			707	152			-	-
Savannah	SAV	78	278	348	141			-	-
Burlington	BTV	1,631	931	452	118			-	-
Allentown/Bethlehem	ABE	622	779	417	101			-	-
Louisville	SDF			122	86			-	-
Manchester	MHT				72			-	-
Massena	MSS				28			-	-
Dayton	DAY		98	270				-	-
Plattsburgh	PLB			26				-	-
Portland, ME	PWM	1,396		4				-	-
Wilkes-Barre Scranton	AVP	417						-	-

Table E-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2005	2006	2007	2008	2009	2010	2009-2010 Change	Percent Change
International		19,848	18,638	20,014	18,295	17,671	18,764	1,093	6.2%
Toronto	YYZ	3,880	4,054	4,235	4,207	3,685	3,603	-82	-2.2%
London Heathrow	LHR	2,136	2,153	2,151	2,120	2,204	2,331	127	5.8%
Montreal Dorval	YUL	2,575	1,836	1,959	2,016	1,863	2,008	145	7.8%
Toronto Island Apt	YTZ					370	1,535	1,165	314.8%
San Juan	SJU	1,240	1,292	1,413	1,239	1,024	1,294	270	26.3%
Halifax	YHZ	1,892	1,605	1,622	1,161	1,091	852	-239	-21.9%
Ottawa	YOW	866	874	931	942	878	744	-133	-15.2%
Paris De Gaulle	CDG	853	787	671	633	632	710	78	12.3%
Frankfurt	FRA	574	544	549	579	541	548	8	1.5%
Bermuda	BDA	518	513	685	655	506	532	26	5.2%
Amsterdam	AMS	365	365	549	717	569	457	-112	-19.7%
Aruba	AUA	339	289	304	343	475	407	-69	-14.5%
Reykjavik	KEF	361	361	418	413	396	404	9	2.2%
Zurich	ZRH	357	361	361	365	335	365	30	9.0%
Dublin	DUB			231	313	313	348	35	11.1%
Munich	MUC	208	213	214	266	335	313	-21	-6.4%
Rome Leonardo Da Vinci-Fi	FCO	135	78	79	258	326	313	-13	-4.0%
Cancun	CUN	209	70	209	286	326	307	-19	-5.8%
Santo Domingo	SDQ	174	160	170	86	144	305	161	111.5%
Madrid	MAD			157	219	248	218	-31	-12.3%
Shannon	SNN	735	796	383	365	339	213	-126	-37.1%
Nassau	NAS	100	431	211	232	185	180	-4	-2.4%
Ponta Delgada	PDL	39	109	148	126	170	165	-5	-2.8%
Montego Bay	MBJ	239	39	47	43	103	126	22	21.6%
Saint Thomas	STT	108	117	99	82		125	125	-
Praia, Cape Verde	RAI	9	78	83	74	109	121	13	11.6%
Punta Cana	PUJ		17	13	13	164	95	-69	-42.0%
Saint Maarten	SXM					61	39	-22	-35.8%
Providenciales	PLS	44	48	39	17	100	39	-61	-61.3%
Lisbon	LIS		26	35	31	26	26	0	0.5%
Terceira	TER		13	17	17	17	17	-	0.0%
Grand Cayman	GCM	31	43	13	43	26	17	-9	-33.7%
Sao Vicente	VXE						4	4	-
Charlottetown	YYG			62	92	83		-83	-100.0%
Helsinki	HEL				26	26		-26	-100.0%
Milan Malpensa	MXP	344	335	361	191			-	-
Fredericton	YFC	687	365	579	62			-	-
Quebec	YQB	30	213	579	62			-	-
Manchester	MAN	239	244	214				-	-
Glasgow	GLA			79				-	-
Knock	NOC			44				-	-
Stockholm-Arlanda	ARN		26	39				-	-
Santiago	STI			31				-	-
Mexico City	MEX	235	52	17				-	-
Las Palmas	LPA			13				-	-
San Salvador	SAL	178	131					-	-
Vancouver	YVR	61						-	-
Ilha Do Sal, Cape Verde	SID	57						-	-
Nykoping, Sweden	NYO	30						-	-
Total Scheduled Carrier Operations		183,692	184,894	183,380	170,386	164,663	168,726	4,062	2.5%

Source: OAG Schedules.

F

Regional Transportation

This appendix provides detailed tables in support of *Chapter 4, Regional Transportation*:

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Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2010

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Worcester Regional	Tweed-New Haven	Pease International Tradeport	Hanscom Field	Subtotal	Logan[2]	Total
2000													
Commercial	132,062	103,750	61,506	47,609	45,745	21,446	4,029	5,260	6,104	6,572	434,083	452,763	886,846
General Aviation[1]	31,863	52,184	45,740	56,571	59,377	34,831	46,518	56,200	31,601	204,512	619,397	35,233	654,630
Military & Other	5,811	2,764	586	2,072	10,241	26,507	495	328	9,973	1,287	60,064	0	60,064
Total	169,736	158,698	107,832	106,252	115,363	82,784	51,042	61,788	47,678	212,371	1,113,544	487,996	1,601,540
2001													
Commercial	128,638	100,606	61,669	47,770	47,261	18,286	5,631	4,581	4,485	6,414	425,341	434,386	859,727
General Aviation[1]	30,478	45,095	44,358	62,014	61,986	35,230	45,464	56,092	30,148	197,770	608,635	28,739	637,374
Military & Other	5,913	2,635	607	2,259	11,821	26,623	917	437	8,221	1,252	60,685	0	60,685
Total	165,029	148,336	106,634	112,043	121,068	80,139	52,012	61,110	42,854	205,436	1,094,661	463,125	1,557,786
2002													
Commercial	113,194	96,595	62,346	45,899	38,929	24,412	4,062	3,827	5,059	6,603	400,926	366,476	767,402
General Aviation[1]	27,838	45,473	29,549	57,720	59,679	35,711	52,277	62,163	28,333	210,221	608,964	25,596	634,560
Military & Other	6,085	2,587	376	2,162	12,167	27,297	418	593	8,220	1,424	61,329	0	61,329
Total	147,117	144,655	92,271	105,781	110,775	87,420	56,757	66,583	41,612	218,248	1,071,219	392,072	1,463,291
2003													
Commercial	103,917	84,301	68,184	42,658	38,293	25,626	868	3,705	4,552	2,956	375,060	344,644	719,704
General Aviation[1]	27,115	42,878	29,552	44,036	50,461	36,706	55,972	54,224	24,866	190,789	556,599	28,660	585,259
Military & Other	4,214	2,496	324	1,449	11,466	32,938	378	776	7,720	1,142	62,903	0	62,903
Total	135,246	129,675	98,060	88,143	100,220	95,270	57,218	58,705	37,138	194,887	994,562	373,304	1,367,866
2004													
Commercial	108,823	83,496	75,360	46,474	41,719	24,970	0	4,501	3,981	4,308	393,632	374,022	767,654
General Aviation[1]	32,269	34,878	27,438	41,547	54,709	29,884	61,343	58,881	25,962	175,301	542,212	31,236	573,448
Military & Other	4,100	346	749	1,338	12,404	29,676	530	1,010	7,797	1,195	59,145	0	59,145
Total	145,192	118,720	103,547	89,359	108,832	84,530	61,873	64,392	37,740	180,804	994,989	405,258	1,400,247
2005													
Commercial	119,048	88,374	76,342	42,661	43,987	25,976	2,727	6,137	3,197	3,627	412,076	377,830	789,906
General Aviation[1]	33,341	28,138	26,369	36,191	49,888	30,016	62,743	60,893	25,446	165,424	518,449	31,236	549,685
Military & Other	3,701	241	479	1,405	11,468	24,154	519	1,063	7,669	904	51,603	0	51,603
Total	156,090	116,753	103,190	80,257	105,343	80,146	65,989	68,093	36,312	169,955	982,128	409,066	1,391,194
2006													
Commercial	111,341	81,282	67,326	38,663	41,342	23,466	3,793	5,177	3,981	3,057	379,428	374,675	754,103
General Aviation[1]	34,548	25,510	25,074	35,572	44,471	29,848	56,770	51,702	25,962	167,560	497,017	31,444	528,461
Military & Other	4,348	229	738	1,536	9,299	22,359	609	1,157	7,797	1,433	49,505	0	49,505
Total	150,237	107,021	93,138	75,771	95,112	75,673	61,172	58,036	37,740	172,050	925,950	406,119	1,332,069
2007													
Commercial	107,097	80,525	69,134	41,450	39,928	22,571	3,162	4,594	4,270	3,477	376,208	370,905	747,113
General Aviation[1]	29,308	22,984	23,959	31,724	47,521	25,542	61,296	51,200	27,000	160,992	481,526	28,632	510,158
Military & Other	5,097	242	644	1,384	9,528	20,949	879	944	8,017	1,438	49,122	0	49,122
Total	141,502	103,751	93,737	74,558	96,977	69,062	65,337	56,738	39,287	165,907	906,856	399,537	1,306,393
2008													
Commercial	98,194	73,096	63,505	40,834	37,832	19,282	2,553	4,013	1,347	104	340,760	347,784	688,544
General Aviation[1]	22,908	19,470	16,198	31,869	46,391	27,143	43,763	44,642	31,051	164,195	447,630	23,820	471,450
Military & Other	3,637	187	840	974	9,688	20,449	886	243	7,993	1,590	46,487	0	46,487
Total	124,739	92,753	80,543	73,677	93,911	66,874	47,202	48,898	40,391	165,889	834,877	371,604	1,206,481
2009													
Commercial	82,021	62,233	54,336	35,909	31,068	16,485	2,527	3,096	422	0	288,097	333,064	621,161
General Aviation[1]	19,586	19,438	14,354	25,473	16,009	19,558	41,700	37,722	25,161	148,696	367,697	12,242	379,939
Military & Other	2,726	260	1,163	778	4,104	16,267	17	486	6,851	1,215	33,867	0	33,867
Total	104,333	81,931	69,853	62,160	51,181	52,310	44,244	41,304	32,434	149,911	689,661	345,306	1,034,967
2010													
Commercial	80,418	60,128	53,971	35,035	29,538	16,190	1,639	3,201	1,516	0	281,636	337,961	619,597
General Aviation[1]	18,759	21,096	13,636	19,224	18,464	20,142	41,843	31,884	25,674	161,942	372,664	14,682	387,346
Military & Other	3,028	347	933	384	4,776	15,525	572	381	7,707	1,795	35,448	0	35,448
Total	102,205	81,571	68,540	54,643	52,778	51,857	44,054	35,466	34,897	163,737	689,748	352,643	1,042,391

1 Includes itinerant and local general aviation operations at the regional airports. There are no local (touch-and-go training) operations at Logan Airport.
2 Includes international operations.
Note: 2001 General Aviation data for New Haven includes general aviation, military, and other operations.
Source: Massport, Federal Aviation Administration (FAA) Tower Counts, and individual airport records.

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2010

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Worcester Regional	Tweed-New Haven	Pease International Tradeport	Hanscom Field	Subtotal	Logan[2]	Total
2000 to 2001													
Commercial	(2.59%)	(3.03%)	0.27%	0.34%	3.31%	(14.73%)	39.76%	(12.91%)	(26.52%)	(2.40%)	(2.01%)	(4.06%)	(3.06%)
General Aviation[1]	(4.35%)	(13.58%)	(3.02%)	9.62%	4.39%	1.15%	(2.27%)	(0.19%)	(4.60%)	(3.30%)	(1.74%)	(18.43%)	(2.64%)
Military & Other	1.76%	(4.67%)	3.58%	9.03%	15.43%	0.44%	85.25%	33.23%	(17.57%)	(2.72%)	1.03%	-	1.03%
Total	(2.77%)	(6.53%)	(1.11%)	5.45%	4.95%	(3.20%)	1.90%	(1.10%)	(10.12%)	(3.27%)	(1.70%)	(5.10%)	(2.73%)
2001 Percent of Total	10.59%	9.52%	6.85%	7.19%	7.77%	5.14%	3.34%	3.92%	2.75%	13.19%	70.27%	29.73%	100.00%
2001 to 2002													
Commercial	(12.01%)	(3.99%)	1.10%	(3.92%)	(17.63%)	33.50%	(27.86%)	(16.46%)	12.80%	2.95%	(5.74%)	(15.63%)	(10.74%)
General Aviation[1]	(8.66%)	0.84%	(33.39%)	(6.92%)	(3.72%)	1.37%	14.99%	10.82%	(6.02%)	6.30%	0.05%	(10.94%)	(0.44%)
Military & Other	2.91%	(1.82%)	(38.06%)	(4.29%)	2.93%	2.53%	(54.42%)	35.70%	(0.01%)	13.74%	1.06%	-	1.06%
Total	(10.85%)	(2.48%)	(13.47%)	(5.59%)	(8.50%)	9.09%	9.12%	8.96%	(2.90%)	6.24%	(2.14%)	(15.34%)	(6.07%)
2002 Percent of Total	9.92%	4.22%	0.61%	3.53%	19.84%	44.51%	0.68%	0.97%	13.40%	2.32%	100.00%	0.00%	100.00%
2002 to 2003													
Commercial	(8.20%)	(12.73%)	9.36%	(7.06%)	(1.63%)	4.97%	(78.63%)	(3.19%)	(10.02%)	(55.23%)	(6.45%)	(5.96%)	(6.22%)
General Aviation[1]	(2.60%)	(5.71%)	0.01%	(23.71%)	(15.45%)	2.79%	7.07%	(12.77%)	(12.24%)	(9.24%)	(8.60%)	11.97%	(7.77%)
Military & Other	(30.75%)	(3.52%)	(13.83%)	(32.98%)	(5.76%)	20.67%	(9.57%)	30.86%	(6.08%)	(19.80%)	2.57%	-	2.57%
Total	(8.07%)	(10.36%)	6.27%	(16.67%)	(9.53%)	8.98%	0.81%	(11.83%)	(10.75%)	(10.70%)	(7.16%)	(4.79%)	(6.52%)
2003 Percent of Total	9.89%	9.48%	7.17%	6.44%	7.33%	6.96%	4.18%	4.29%	2.72%	14.25%	72.71%	27.29%	100.00%
2003 to 2004													
Commercial	4.72%	(0.95%)	10.52%	8.95%	8.95%	(2.56%)	(100.00%)	21.48%	(12.54%)	45.74%	4.95%	8.52%	6.66%
General Aviation[1]	19.01%	(18.66%)	(7.15%)	(5.65%)	8.42%	(18.59%)	9.60%	8.59%	4.41%	(8.12%)	(2.58%)	8.99%	(2.02%)
Military & Other	(2.71%)	(86.14%)	131.17%	(7.66%)	8.18%	(9.90%)	40.21%	30.15%	1.00%	4.64%	(5.97%)	-	(5.97%)
Total	7.35%	(8.45%)	5.60%	1.38%	8.59%	(11.27%)	8.14%	9.69%	1.62%	(7.23%)	0.04%	8.56%	2.37%
2004 Percent of Total	10.37%	8.48%	7.39%	6.38%	7.77%	6.04%	4.42%	4.60%	2.70%	12.91%	71.06%	28.94%	100.00%
2004 to 2005													
Commercial	9.40%	5.84%	1.30%	(8.20%)	5.44%	4.03%	-	36.35%	(19.69%)	(15.81%)	4.69%	1.02%	2.90%
General Aviation[1]	3.32%	(19.32%)	(3.90%)	(12.89%)	(8.81%)	0.44%	2.28%	3.42%	(1.99%)	(5.63%)	(4.38%)	0.00%	(4.14%)
Military & Other	(9.73%)	(30.35%)	(36.05%)	5.01%	(7.55%)	(18.61%)	(2.08%)	5.25%	(1.64%)	(24.35%)	(12.75%)	-	(12.75%)
Total	7.51%	(1.66%)	(0.34%)	(10.19%)	(3.21%)	(5.19%)	6.65%	5.75%	(3.78%)	(6.00%)	(1.29%)	0.94%	(0.65%)
2005 Percent of Total	11.22%	8.39%	7.42%	5.77%	7.57%	5.76%	4.74%	4.89%	2.61%	12.22%	70.60%	29.40%	100.00%

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2010

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Worcester Regional	Tweed-New Haven	Pease International Tradeport	Hanscom Field	Subtotal	Logan[2]	Total
2005 to 2006													
Commercial	(6.47%)	(8.02%)	(11.81%)	(9.37%)	(6.01%)	(9.66%)	39.09%	(15.64%)	24.52%	(15.72%)	(7.92%)	(0.84%)	(4.53%)
General Aviation[1]	3.62%	(9.34%)	(4.91%)	(1.71%)	(10.86%)	(0.56%)	(9.52%)	(15.09%)	2.03%	1.29%	(4.13%)	0.67%	(3.86%)
Military & Other	17.48%	(4.98%)	54.07%	9.32%	(18.91%)	(7.43%)	17.34%	8.84%	1.67%	58.52%	(4.07%)	-	(4.07%)
Total	(3.75%)	(8.34%)	(9.74%)	(5.59%)	(9.71%)	(5.58%)	(7.30%)	(14.77%)	3.93%	1.23%	(5.72%)	(0.72%)	(4.25%)
2006 Percent of Total	10.83%	7.94%	7.18%	5.71%	7.42%	5.29%	5.00%	4.34%	3.01%	12.70%	69.42%	30.58%	100.00%
2006 to 2007													
Commercial	(3.81%)	(0.93%)	2.69%	7.21%	(3.42%)	(3.81%)	(16.64%)	(11.26%)	7.26%	13.74%	(0.85%)	(1.01%)	(0.93%)
General Aviation[1]	(15.17%)	(9.90%)	(4.45%)	(10.82%)	6.86%	(14.43%)	7.97%	(0.97%)	4.00%	(3.92%)	(3.12%)	(8.94%)	(3.46%)
Military & Other	17.23%	5.68%	(12.74%)	(9.90%)	2.46%	(6.31%)	44.33%	(18.41%)	2.82%	0.35%	(0.77%)	-	(0.77%)
Total	(5.81%)	(3.06%)	0.64%	(1.60%)	1.96%	(8.74%)	6.81%	(2.24%)	4.10%	(3.57%)	(2.06%)	(1.62%)	(1.93%)
2007 Percent of Total	10.83%	7.94%	7.18%	5.71%	7.42%	5.29%	5.00%	4.34%	3.01%	12.70%	69.42%	30.58%	100.00%
2007 to 2008													
Commercial	(8.31%)	(9.23%)	(8.14%)	(1.49%)	(5.25%)	(14.57%)	(19.26%)	(12.65%)	(68.45%)	(97.01%)	(9.42%)	(6.23%)	(7.84%)
General Aviation[1]	(21.84%)	(15.29%)	(32.39%)	0.46%	(2.38%)	6.27%	(28.60%)	(12.81%)	15.00%	1.99%	(7.04%)	(16.81%)	(7.59%)
Military & Other	(28.64%)	(22.73%)	30.43%	(29.62%)	1.68%	(2.39%)	0.80%	(74.26%)	(0.30%)	10.57%	(5.36%)	-	(5.36%)
Total	(11.85%)	(10.60%)	(14.08%)	(1.18%)	(3.16%)	(3.17%)	(27.76%)	(13.82%)	2.81%	(0.01%)	(7.94%)	(6.99%)	(7.65%)
2008 Percent of Total	10.34%	7.69%	6.68%	6.11%	7.78%	5.54%	3.91%	4.05%	3.35%	13.75%	69.20%	30.80%	100.00%
2008 to 2009													
Commercial	(16.47%)	(14.86%)	(14.44%)	(12.06%)	(17.88%)	(14.51%)	(1.02%)	(22.85%)	(68.67%)	(100.00%)	(15.45%)	(4.23%)	(9.79%)
General Aviation[1]	(14.50%)	(0.16%)	(11.38%)	(20.07%)	(65.49%)	(27.94%)	(4.71%)	(15.50%)	(18.97%)	(9.44%)	(17.86%)	(48.61%)	(19.41%)
Military & Other	(25.05%)	39.04%	38.45%	(20.12%)	(57.64%)	(20.45%)	(98.08%)	100.00%	(14.29%)	(23.58%)	(27.15%)	-	(27.15%)
Total	(16.36%)	(11.67%)	(13.27%)	(15.63%)	(45.50%)	(21.78%)	(6.27%)	(15.53%)	(19.70%)	(9.63%)	(17.39%)	(7.08%)	(14.22%)
2009 Percent of Total	10.08%	7.92%	6.75%	6.01%	4.95%	5.05%	4.27%	3.99%	3.13%	14.48%	66.64%	33.36%	100.00%
2009 to 2010													
Commercial	(1.95%)	(3.38%)	(0.67%)	(2.43%)	(4.92%)	(1.79%)	(35.14%)	3.39%	259.24%	-	(2.24%)	1.47%	(0.25%)
General Aviation[1]	(4.22%)	8.53%	(5.00%)	(24.53%)	15.34%	2.99%	0.34%	(15.48%)	2.04%	8.91%	1.35%	19.93%	1.95%
Military & Other	11.08%	33.46%	(19.78%)	(50.64%)	16.37%	(4.56%)	3264.71%	(21.60%)	12.49%	47.74%	4.67%	-	4.67%
Total	(2.04%)	(0.44%)	(1.88%)	(12.09%)	3.12%	(0.87%)	(0.43%)	(14.13%)	7.59%	9.22%	0.01%	2.12%	0.72%
2010 Percent of Total	9.80%	7.83%	6.58%	5.24%	5.06%	4.97%	4.23%	3.40%	3.35%	15.71%	66.17%	33.83%	100.00%

1 Includes itinerant and local general aviation operations at the regional airports. There are no local (touch-and-go training) operations at Logan Airport.
2 Includes international operations.
Note: 2001 to 2002 General Aviation data for New Haven includes general aviation, military, and other operations.
Source: Massport, Federal Aviation Administration (FAA) Tower Counts, and individual airport records.

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures 2005	Departures 2006	Departures 2007	Departures 2008	Departures 2009	Departures 2010	Departures '09-'10 Change	Departures '09-'10 Pct. Change	Departing Seats 2005	Departing Seats 2006	Departing Seats 2007	Departing Seats 2008	Departing Seats 2009	Departing Seats 2010	Departing Seats '09-'10 Change	Departing Seats '09-'10 Pct. Change
Jet Carriers																		
America West	Phoenix	PHX	366	364	61				-	-	54,627	54,558	7,517				-	-
American	Chicago O'Hare	ORD	1,574	957					-	-	204,054	123,444					-	-
American	Dallas/Fort Worth	DFW	1,055	1,078	1,087	1,061	1,039	1,052	12	1.2%	137,038	143,630	153,940	157,006	153,802	160,983	7,181	4.7%
American	Miami	MIA	366	365	364	364	364	413	49	13.6%	50,059	52,558	51,527	53,831	53,831	63,559	9,728	18.1%
American	San Juan	SJU	366	364	364	364	364	365	1	0.4%	54,594	81,473	70,683	65,470	56,740	55,856	-884	-1.6%
Continental	Cleveland	CLE	131	91	130	104	74		-74	-100.0%	16,182	9,803	16,108	12,626	9,084	0	-9,084	-100.0%
Continental	Houston Intercontinental	IAH	314	225	229	117			-	-	34,139	26,361	26,162	13,458			-	-
Continental	New York Newark	EWR			4				-	-			450				-	-
Delta	Atlanta	ATL	3,133	2,399	2,152	2,139	2,096	2,099	3	0.1%	480,501	346,019	325,893	326,798	298,991	300,185	1,194	0.4%
Delta	Cancun	CUN				30	30	35	4	14.5%				5,092	4,547	5,470	924	20.3%
Delta	Cincinnati	CVG	1,378	766	559	658	251	0	-251	-100.0%	197,099	102,413	81,465	96,442	37,939	0	-37,939	-100.0%
Delta	Detroit	DTW					957	1,003	46	4.8%					113,429	129,228	15,800	13.9%
Delta	Fort Lauderdale	FLL		472	667	476	281	237	-44	-15.7%		78,602	96,975	69,968	39,966	33,674	-6,292	-15.7%
Delta	Fort Myers	RSW		30	143	121	121	99	-22	-18.5%		4,304	20,290	17,216	17,459	13,104	-4,354	-24.9%
Delta	Las Vegas	LAS		108				9	-	-		16,238				1,394	-	-
Delta	Los Angeles	LAX		208	286	134		83	-	-		31,890	42,867	20,481		13,257	-	-
Delta	Minneapolis	MSP					650	758	109	16.7%					84,175	99,431	15,256	18.1%
Delta	Orlando	MCO		524	823	688	671	704	33	4.9%		87,704	118,140	105,951	93,277	99,129	5,852	6.3%
Delta	Salt Lake City	SLC	26	207					-	-	3,915	31,176					-	-
Delta	Tampa	TPA		450	658	468	442	252	-190	-43.0%		72,060	93,459	66,474	58,282	33,625	-24,657	-42.3%
Delta	West Palm Beach	PBI		242	355	368	364	283	-81	-22.3%		38,130	50,938	53,610	47,985	37,536	-10,449	-21.8%
Frontier Airlines	Denver	DEN			303	208			-	-			40,009	27,435			-	-
JetBlue	Fort Lauderdale	FLL						101	101	-						15,086	15,086	-
JetBlue	Orlando	MCO						101	101	-						15,086	15,086	-
Northwest	Amsterdam	AMS			182	273			-	-			29,098	43,646			-	-
Northwest	Detroit	DTW	1,456	1,394	1,368	1,182			-	-	192,970	180,912	177,669	151,611			-	-
Northwest	Minneapolis	MSP	1,046	1,057	1,057	996			-	-	140,375	146,804	142,440	129,207			-	-
Song	Fort Lauderdale	FLL	676	242					-	-	134,176	48,254					-	-
Song	Los Angeles	LAX	100	82					-	-	19,910	16,372					-	-
Song	Orlando	MCO	1,099	364					-	-	218,144	72,380					-	-
Song	Tampa	TPA	680	229					-	-	135,041	45,669					-	-
Song	West Palm Beach	PBI	519	121					-	-	103,012	24,127					-	-
Southwest	Baltimore	BWI	3,104	3,104	3,126	2,866	2,702	2,700	-2	-0.1%	424,316	424,877	427,904	392,120	369,838	367,534	-2,304	-0.6%
Southwest	Chicago Midway	MDW	954	1,031	1,057	1,026	935	923	-13	-1.3%	130,513	141,184	144,743	139,681	128,133	126,412	-1,722	-1.3%
Southwest	Denver	DEN						306	306	-						41,922	41,922	-
Southwest	Fort Lauderdale	FLL						70	70	-						9,551	9,551	-
Southwest	Las Vegas	LAS	366	364	364	364	364	361	-3	-0.9%	50,060	49,830	49,830	49,830	49,830	49,398	-431	-0.9%
Southwest	Nashville	BNA	366	364	364	364	364	361	-3	-0.9%	50,060	49,830	49,830	49,505	49,830	49,398	-431	-0.9%
Southwest	Orlando	MCO	1,112	1,104	1,087	1,074	1,044	1,016	-27	-2.6%	151,967	151,269	148,380	147,116	142,964	139,212	-3,752	-2.6%
Southwest	Philadelphia	PHL	1,595	1,074	173				-	-	218,118	147,116	23,728				-	-
Southwest	Tampa	TPA	698	727	727	732	424	570	146	34.4%	95,352	99,659	99,023	100,252	58,135	78,129	19,995	34.4%
United	Chicago O'Hare	ORD	1,818	1,810	1,793	1,632	1,360	1,296	-63	-4.7%	259,712	253,288	258,562	236,531	200,314	198,709	-1,605	-0.8%
United	Washington Dulles	IAD	728	940	1,108	1,070	1,005	1,192	187	18.7%	81,728	111,047	133,277	130,359	131,329	155,750	24,421	18.6%
US Airways	Charlotte	CLT	2,197	1,654	1,511	1,091	1,100	1,588	488	44.4%	351,454	227,078	218,427	164,215	145,973	228,119	82,146	56.3%
US Airways	Fort Lauderdale	FLL	126						-	-	15,503						-	-
US Airways	Orlando	MCO	31	30					-	-	3,863	3,741					-	-
US Airways	Philadelphia	PHL	2,110	927	442	346	580	361	-220	-37.9%	301,864	139,404	63,694	46,790	57,987	49,914	-8,073	-13.9%
US Airways	Phoenix	PHX			238	333			-	-			28,578	40,009			-	-
US Airways	Pittsburgh	PIT	26						-	-	3,132						-	-
US Airways	Washington National	DCA	1,068	944	1,087	961	753	361	-393	-52.1%	141,279	129,831	142,725	120,045	84,660	51,434	-33,226	-39.2%
USA 3000 Airlines	Cancun	CUN	26	30	22				-	-	4,307	5,092	3,637				-	-
USA 3000 Airlines	Punta Cana	PUJ	13	22	17				-	-	2,114	3,637	2,910				-	-
Subtotal			30,623	26,464	23,906	21,611	18,333	18,695	362	2.0%	4,461,178	3,771,764	3,340,876	3,032,775	2,488,499	2,622,086	133,588	5.4%

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures 2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change	Departing Seats 2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change
Regional/Commuter Carriers																		
Air Canada Express	Montreal Dorval	YUL	1,042	1,018	1,039	1,018	1,005	1,021	16	1.6%	19,496	19,333	19,745	19,333	19,087	19,399	312	1.6%
Air Canada Express	Toronto	YYZ	1,347	1,278	1,273	1,234	1,282	1,287	5	0.4%	38,289	42,044	41,490	40,126	38,303	36,960	-1,343	-3.5%
American Connection	St. Louis	STL	950	892	953	823	212	0	-212	-100.0%	44,361	44,599	43,187	36,199	9,335	0	-9,335	-100.0%
American Eagle	Chicago O'Hare	ORD	0	697	1,819	1,290	1,031	1,501	471	45.7%	0	33,921	80,018	57,295	50,202	79,594	29,392	58.5%
American Eagle	Raleigh/Durham	RDU	1,369	1,364	1,182	1,147	1,039	257	-782	-75.3%	54,597	52,133	44,586	43,971	44,997	10,774	-34,223	-76.1%
American Eagle	Saint Louis	STL	0	0	0	0	91	0	-91	-100.0%	0	0	0	0	4,547	0	-4,547	-100.0%
Continental Connection	Albany	ALB	51	0	0	0	0	0	0	-	961	0	0	0	0	0	0	-
Continental Connection	New York Newark	EWR	0	0	0	667	372	608	235	63.2%	0	0	0	49,345	27,556	22,485	-5,071	-18.4%
Continental Express	Cleveland	CLE	1,107	1,156	1,147	1,139	1,160	1,208	48	4.1%	55,075	57,806	57,316	56,714	58,022	60,400	2,378	4.1%
Continental Express	New York Newark	EWR	1,356	1,360	1,381	693	840	465	-375	-44.6%	67,529	67,981	66,474	34,021	42,001	23,264	-18,737	-44.6%
Delta Connection	Atlanta	ATL	0	82	0	4	0	0	0	-	0	5,789	0	303	0	0	0	-
Delta Connection	Cincinnati	CVG	0	100	797	710	1,083	1,218	136	12.5%	0	4,980	49,795	40,615	60,620	61,642	1,022	1.7%
Delta Connection	Washington National	DCA	0	0	0	0	0	166	166	-	0	0	0	0	0	11,324	11,324	-
Delta Connection	Columbus	CMH	998	619	593	191	0	0	0	-	49,299	27,582	29,604	9,526	0	0	0	-
Delta Connection	Detroit	DTW	0	0	0	0	801	1,004	202	25.2%	0	0	0	0	53,337	54,265	928	1.7%
Delta Connection	New York J F Kennedy	JFK	0	542	1,173	1,044	792	365	-427	-53.9%	0	20,026	48,483	52,177	39,620	18,250	-21,370	-53.9%
Delta Connection	Fort Lauderdale/Hollywood	FLL	0	0	0	52	0	0	0	-	0	0	0	3,637	0	0	0	-
Delta Connection	Fort Myers	RSW	612	359	0	4	0	0	0	-	42,840	25,157	0	303	0	0	0	-
Delta Connection	Orlando	MCO	0	87	0	0	0	0	0	-	0	6,062	0	0	0	0	0	-
Delta Connection	Tampa	TPA	0	0	0	78	0	0	0	-	0	0	0	5,456	0	0	0	-
Delta Connection	West Palm Beach	PBI	0	0	0	9	0	0	0	-	0	0	0	606	0	0	0	-
Delta Connection	Minneapolis	MSP	0	0	0	0	459	481	22	4.8%	0	0	0	0	34,882	36,567	1,684	4.8%
Delta Connection	Raleigh/Durham	RDU	0	0	0	0	0	100	100	-	0	0	0	0	0	6,136	6,136	-
Delta Connection	Indianapolis	IND	0	0	0	0	78	0	-78	-100.0%	0	0	0	0	3,897	0	-3,897	-100.0%
Independence Air	Washington Dulles	IAD	1,966	0	0	0	0	0	0	-	98,307	0	0	0	0	0	0	-
FrontierExpress	Milwaukee	MKE	0	0	0	0	0	140	140	-	0	0	0	0	0	6,313	6,313	-
Midwest Connect	Milwaukee	MKE	0	940	827	528	0	0	0	-	0	30,068	35,272	26,413	0	0	0	-
Northwest Airlink	Detroit	DTW	0	95	329	520	0	152	152	-	0	4,763	16,454	30,708	0	7,586	7,586	-
Northwest Airlink	Minneapolis	MSP	31	0	0	56	0	110	110	-	1,522	0	0	4,278	0	8,327	8,327	-
Northwest Airlink	Indianapolis	IND	640	624	606	606	0	0	0	-	31,973	31,176	30,310	30,310	0	0	0	-
Northwest Airlink	Memphis	MEM	0	0	0	52	0	0	0	-	0	0	0	2,598	0	0	0	-
Pan Am Clipper Connection	Fort Lauderdale/Hollywood	FLL	13	0	0	0	0	0	0	-	1,993	0	0	0	0	0	0	-
United Express	Chicago O'Hare	ORD	693	688	688	498	381	548	167	43.8%	48,416	48,106	47,258	34,025	26,292	36,797	10,506	40.0%
United Express	Washington Dulles	IAD	1,526	1,013	792	688	706	494	-211	-29.9%	84,651	63,218	48,955	47,084	46,634	30,270	-16,364	-35.1%
US Airways Express	Buffalo	BUF	841	827	810	95	0	0	0	-	28,627	28,119	27,530	3,239	0	0	0	-
US Airways Express	Charlotte	CLT	0	104	286	966	1,031	537	-493	-47.8%	0	6,686	24,317	82,530	86,254	45,043	-41,211	-47.8%
US Airways Express	New York La Guardia	LGA	0	0	0	0	0	139	139	-	0	0	0	0	0	5,159	5,159	-
US Airways Express	Philadelphia	PHL	440	1,936	2,464	2,382	2,009	2,404	394	19.6%	27,675	119,257	176,785	181,228	147,991	183,838	35,847	24.2%
US Airways Express	Pittsburgh	PIT	1,652	1,628	1,576	970	935	939	3	0.4%	84,729	88,358	79,949	48,496	46,764	46,929	165	0.4%
US Airways Express	Rochester	ROC	576	567	611	524	572	478	-94	-16.4%	19,570	19,286	20,758	17,814	19,433	16,242	-3,191	-16.4%
US Airways Express	Syracuse	SYR	480	0	0	0	0	0	0	-	9,091	0	0	0	0	0	0	-
US Airways Express	Washington National	DCA	554	896	862	914	901	1,334	434	48.1%	34,513	58,884	51,181	62,724	59,867	89,629	29,763	49.7%
Subtotal			18,244	18,872	21,208	18,900	16,779	16,956	176	1.1%	843,514	905,333	1,039,468	1,021,075	919,640	917,195	-2,445	-0.3%
Total			48,867	45,336	45,114	40,511	35,112	35,651	538	1.5%	5,304,692	4,677,097	4,380,345	4,053,850	3,408,139	3,539,281	131,142	3.8%

Source: OAG Schedules.

Note: All Northwest operations included in Delta from 2009 onwards

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F. Green Airport

Carrier	Market	Code	Departures 2005	Departures 2006	Departures 2007	Departures 2008	Departures 2009	Departures 2010	Departures '09-'10 Change	Departures '09-'10 Pct. Change	Departing Seats 2005	Departing Seats 2006	Departing Seats 2007	Departing Seats 2008	Departing Seats 2009	Departing Seats 2010	Departing Seats '09-'10 Change	Departing Seats '09-'10 Pct. Change
Jet Carriers																		
American	Chicago O'Hare	ORD	1,116	260					-	-	143,654	33,514					-	-
American	Dallas/Fort Worth	DFW	366	91					-	-	47,137	11,730					-	-
Continental	Cleveland	CLE	13	4					-	-	1,618	446					-	-
Continental	New York Newark	EWR	283	282	247	39			-	-	34,878	29,298	27,140	4,443			-	-
Delta	Atlanta	ATL	1,984	827	255	26	43	510	467	1078.5%	291,407	108,527	36,524	3,689	6,149	72,461	66,312	1078.5%
Delta	Cincinnati	CVG	698	238					-	-	89,332	23,815					-	-
Delta	Detroit	DTW					1,000	414	-587	-58.6%					104,080	50,065	-54,015	-51.9%
Delta	Minneapolis	MSP						74	74	-						9,211	9,211	-
Northwest	Detroit	DTW	1,557	1,390	1,273	1,113			-	-	202,545	191,057	162,531	143,081			-	-
Northwest	Minneapolis	MSP	541	303	281				-	-	68,974	41,949	34,900				-	-
SATA	Ponta Delgada	PDL		17	13	13			-	-		3,464	2,598	2,598			-	-
Southwest	Baltimore	BWI	4,194	4,235	4,243	3,971	3,416	3,260	-156	-4.6%	573,304	580,159	579,181	543,844	467,263	442,637	-24,626	-5.3%
Southwest	Chicago Midway	MDW	1,352	1,368	1,394	1,381	1,225	1,135	-90	-7.4%	184,745	187,454	190,724	189,234	166,969	153,121	-13,848	-8.3%
Southwest	Fort Lauderdale	FLL			221	424	654	594	-60	-9.2%			30,254	58,135	89,575	81,378	-8,197	-9.2%
Southwest	Kansas City	MCI	366	30					-	-	50,060	4,152					-	-
Southwest	Las Vegas	LAS	31	364	364	364	364	365	1	0.4%	4,172	49,830	49,830	49,830	49,830	50,005	175	0.4%
Southwest	Nashville	BNA	724	394	364	364	364	296	-68	-18.7%	98,928	53,982	49,830	49,830	48,985	39,578	-9,407	-19.2%
Southwest	Orlando	MCO	1,827	1,832	2,022	2,148	1,836	1,799	-37	-2.0%	249,703	250,928	277,029	294,232	251,131	245,156	-5,976	-2.4%
Southwest	Philadelphia	PHL	1,779	1,910	1,979	1,710	1,663	1,402	-261	-15.7%	238,645	261,216	271,097	228,537	227,793	192,054	-35,738	-15.7%
Southwest	Phoenix	PHX	728	727	637	364	364	361	-3	-0.9%	99,523	99,659	87,202	49,830	49,830	49,398	-431	-0.9%
Southwest	Tampa	TPA	1,090	1,087	1,091	987	823	813	-10	-1.2%	148,987	148,896	149,489	135,252	111,801	111,231	-570	-0.5%
Spirit Airlines	Detroit	DTW	122						-	-	18,270						-	-
Spirit Airlines	Fort Lauderdale	FLL	571	398	152				-	-	84,381	57,208	21,174				-	-
Spirit Airlines	Fort Myers	RSW	366	182	186				-	-	54,810	29,825	32,969				-	-
United	Chicago O'Hare	ORD	1,465	1,485	1,485	996	727	644	-83	-11.4%	200,813	188,468	178,725	123,500	97,815	82,802	-15,013	-15.3%
US Airways	Charlotte	CLT	1,866	1,429	1,251	1,290	1,650	1,643	-7	-0.4%	274,911	223,415	180,448	174,949	207,372	233,886	26,513	12.8%
US Airways	Fort Lauderdale	FLL	17						-	-	2,218						-	-
US Airways	Orlando	MCO	44	13	13	9			-	-	5,831	1,831	1,831	1,062			-	-
US Airways	Philadelphia	PHL	2,193	1,126	1,048	359	922	1,299	377	40.8%	313,648	148,874	134,901	45,902	96,862	130,008	33,146	34.2%
US Airways	Pittsburgh	PIT	31						-	-	4,367						-	-
US Airways	Washington National	DCA	1,273	1,329	758	576	463	365	-98	-21.2%	170,102	176,014	96,585	71,887	57,987	49,501	-8,487	-14.6%
Subtotal			26,597	21,321	19,277	16,134	15,514	14,974	-541	-3.5%	3,656,963	2,905,711	2,594,960	2,169,833	2,033,442	1,992,492	-40,950	-2.0%
Regional/Commuter Carriers																		
Air Canada Express	Toronto	YYZ	737	697	697	654	637	625	-11	-1.8%	13,794	13,245	13,245	12,423	12,094	11,880	-213	-1.8%
American Eagle	Chicago O'Hare	ORD	0	836	1,091	779	0	0	0	-	0	36,822	48,219	34,294	0	0	0	-
American Eagle	Raleigh/Durham	RDU	349	0	0	0	0	0	0	-	13,276	0	0	0	0	0	0	-
Cape Air	Hyannis	HYA	0	26	0	0	0	0	0	-	0	234	0	0	0	0	0	-
Cape Air	Martha's Vineyard	MVY	1,012	1,273	1,005	961	788	747	-41	-5.2%	9,083	11,457	9,041	8,651	7,093	6,722	-371	-5.2%
Cape Air	Nantucket	ACK	1,195	1,035	1,173	875	727	681	-47	-6.4%	10,727	9,314	10,561	7,872	6,547	6,128	-419	-6.4%
Continental Connection	Albany	ALB	51	0	0	0	0	0	0	-	961	0	0	0	0	0	0	-
Continental Connection	New York Newark	EWR	0	0	0	619	1,039	427	-612	-58.9%	0	0	0	45,820	76,901	31,630	-45,271	-58.9%
Continental Express	Cleveland	CLE	1,243	1,286	1,321	1,282	1,260	1,217	-43	-3.4%	61,988	64,307	65,976	64,084	63,002	60,836	-2,166	-3.4%
Continental Express	New York Newark	EWR	1,461	1,438	1,477	1,074	416	1,028	612	147.3%	71,279	70,697	71,969	53,017	20,784	51,407	30,623	147.3%
Delta Connection	Atlanta	ATL	31	701	1,286	1,364	1,130	724	-406	-35.9%	1,522	37,065	70,363	84,219	78,503	52,959	-25,544	-32.5%
Delta Connection	Cincinnati	CVG	375	745	974	987	814	43	-771	-94.7%	19,140	43,231	53,043	51,354	41,481	2,150	-39,331	-94.8%
Delta Connection	Detroit	DTW	0	0	0	0	372	1,324	952	255.7%	0	0	0	0	25,772	78,701	52,929	205.4%
Delta Connection	Minneapolis	MSP	0	0	0	0	260	347	88	33.7%	0	0	0	0	19,745	26,192	6,447	32.7%
Delta Connection	New York J F Kennedy	JFK	0	537	1,234	667	91	0	-91	-100.0%	0	19,866	49,938	33,341	4,547	0	-4,547	-100.0%
Independence Air	Washington Dulles	IAD	1,509	0	0	0	0	0	0	-	75,429	0	0	0	0	0	0	-
Northwest Airlink	Detroit	DTW	0	0	0	113	0	0	0	-	0	0	0	8,556	0	0	0	-
Northwest Airlink	Minneapolis	MSP	31	0	0	268	0	0	0	-	1,522	0	0	20,403	0	0	0	-
United Express	Chicago O'Hare	ORD	261	334	217	212	368	455	87	23.6%	18,270	23,339	14,843	14,003	24,291	29,820	5,528	22.8%
United Express	Washington Dulles	IAD	1,722	1,650	1,585	1,455	1,455	1,569	114	7.8%	85,912	84,825	89,995	88,332	90,341	99,719	9,377	10.4%
US Airways Express	Charlotte	CLT	17	338	490	472	91	126	35	38.4%	870	26,569	38,805	39,576	5,949	10,047	4,098	68.9%
US Airways Express	New York La Guardia	LGA	1,674	1,810	1,849	1,580	1,702	1,222	-479	-28.2%	55,132	59,460	57,277	53,398	62,963	45,225	-17,738	-28.2%
US Airways Express	Philadelphia	PHL	715	1,680	1,728	2,286	1,784	1,526	-258	-14.5%	45,048	105,137	123,046	178,279	123,487	107,790	-15,698	-12.7%
US Airways Express	Pittsburgh	PIT	1,365	1,390	979	303	0	0	0	-	72,862	76,641	51,311	15,155	0	0	0	-
US Airways Express	Washington National	DCA	484	624	1,251	1,468	1,251	1,373	122	9.7%	31,129	31,271	78,572	92,835	79,178	92,151	12,973	16.4%
Subtotal			14,231	16,399	18,355	17,420	14,185	13,436	-750	-5.3%	587,943	713,480	846,204	905,611	742,677	713,356	-29,322	-3.9%
Total			40,828	37,720	37,632	33,553	29,699	28,409	-3,854	-11.5%	4,244,907	3,619,191	3,441,163	3,075,444	2,776,119	2,705,848	-299,355	-9.7%

Source: OAG Schedules.

Note: All Northwest operations included in Delta from 2009 onwards

Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester Airport

Carrier	Market	Code	Departures 2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change	Departing Seats 2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change
Jet Carriers																		
Continental	Cleveland	CLE					9	0	-9	-100.0%					1,031	0	-1,031	-100.0%
Continental	New York Newark	EWR	288	260	4				-	-	31,076	27,019	450				-	-
Delta	Atlanta	ATL	671			13		275	-	-	95,126			1,845		39,050	-	-
Delta	Cincinnati	CVG	667						-	-	86,834						-	-
Delta	Detroit	DTW					775	796	21	2.7%					93,086	89,289	-3,797	-4.1%
Northwest	Detroit	DTW	1,404	1,295	1,195	827			-	-	181,073	180,284	148,805	101,170			-	-
Northwest	Minneapolis	MSP	366	238	152				-	-	46,980	30,258	18,792				-	-
Southwest	Baltimore	BWI	3,863	3,845	3,884	3,616	3,299	2,891	-408	-12.4%	527,946	523,458	528,637	493,317	448,908	393,093	-55,815	-12.4%
Southwest	Chicago Midway	MDW	1,360	1,399	1,624	1,641	1,247	1,144	-103	-8.3%	185,741	191,722	221,908	224,762	168,961	155,466	-13,495	-8.0%
Southwest	Fort Lauderdale	FLL				251	121	9	-113	-92.8%				34,341	16,610	1,194	-15,416	-92.8%
Southwest	Las Vegas	LAS	366	364	364	364	364	365	1	0.4%	50,060	49,830	49,830	49,830	49,830	50,005	175	0.4%
Southwest	Nashville	BNA	732	61					-	-	99,989	8,305					-	-
Southwest	Orlando	MCO	1,474	1,451	1,767	1,593	1,199	1,125	-74	-6.2%	201,431	198,725	241,965	218,171	164,059	154,145	-9,915	-6.0%
Southwest	Philadelphia	PHL	1,792	1,749	1,996	2,013	1,888	1,411	-477	-25.3%	244,609	239,657	273,097	268,179	258,380	192,456	-65,923	-25.5%
Southwest	Phoenix	PHX			121	364	364	322	-42	-11.5%			16,610	49,830	49,830	44,114	-5,716	-11.5%
Southwest	Tampa	TPA	1,103	1,091	1,026	736	671	782	111	16.6%	150,319	149,489	140,591	100,651	91,948	107,173	15,226	16.6%
United	Chicago O'Hare	ORD	1,343	1,091	1,061	818	606	0	-606	-100.0%	179,246	137,460	128,359	106,180	85,691	0	-85,691	-100.0%
US Airways	Charlotte	CLT	1,312	658	606	528	377	365	-12	-3.1%	179,003	90,887	83,630	72,484	53,467	52,560	-907	-1.7%
US Airways	Philadelphia	PHL	2,032	680	329	333	394	365	-29	-7.4%	275,085	94,901	45,517	45,439	56,039	33,132	-22,907	-40.9%
US Airways	Washington National	DCA	576	537	303	294			-	-	77,334	77,316	43,568	40,451			-	-
Subtotal			19,349	14,719	14,432	13,393	11,314	9,850	-1,464	-12.9%	2,611,852	1,999,311	1,941,758	1,806,649	1,537,838	1,311,677	-226,162	-14.7%
Regional/Commuter Carriers																		
Air Canada Express	Toronto	YYZ	933	905	914	905	905	707	-198	-21.8%	17,461	17,194	17,359	17,194	17,194	13,441	-3,753	-21.8%
Continental Connection	Albany	ALB	314	0	0	0	0	0	0	-	5,951	0	0	0	0	0	0	-
Continental Connection	New York Newark	EWR	0	0	0	61	338	141	-196	-58.1%	0	0	0	4,486	24,993	9,483	-15,510	-62.1%
Continental Express	Cleveland	CLE	1,190	1,208	1,230	1,204	1,173	1,178	5	0.4%	59,095	60,009	60,079	60,074	58,672	58,921	250	0.4%
Continental Express	New York Newark	EWR	1,168	1,191	1,446	1,373	1,065	1,267	202	18.9%	58,177	59,538	71,804	68,236	53,259	63,336	10,077	18.9%
Delta Connection	Atlanta	ATL	484	1,615	1,173	688	364	90	-274	-75.3%	26,492	106,821	82,140	48,193	25,460	6,300	-19,160	-75.3%
Delta Connection	Cincinnati	CVG	737	983	979	771	0	0	0	-	38,410	54,515	55,337	39,403	0	0	0	-
Delta Connection	Detroit	DTW	0	0	0	0	355	499	144	40.6%	0	0	1,645	0	25,296	32,795	7,500	29.6%
Delta Connection	New York La Guardia	LGA	488	0	0	0	0	0	0	-	24,360	0	0	0	0	0	0	-
Delta Connection	New York J F Kennedy	JFK	0	450	1,057	0	0	0	0	-	0	16,662	41,681	0	0	0	0	-
Delta Connection	Minneapolis	MSP	0	0	0	0	91	0	-91	-100.0%	0	0	0	0	6,911	0	-6,911	-100.0%
Independence Air	Washington Dulles	IAD	1,568	0	0	0	0	0	0	-	78,379	0	0	0	0	0	0	-
Northwest Airlink	Detroit	DTW	0	91	48	394	0	0	0	-	0	4,547	2,944	30,007	0	0	0	-
Northwest Airlink	Minneapolis	MSP	235	91	152	268	0	0	0	-	11,745	4,547	9,275	20,403	0	0	0	-
United Express	Chicago O'Hare	ORD	31	333	364	320	385	1,040	655	169.9%	2,132	23,339	24,975	21,078	25,227	67,675	42,449	168.3%
United Express	Washington Dulles	IAD	1,765	1,311	1,425	1,091	1,156	1,104	-52	-4.5%	90,523	65,687	75,593	61,140	62,309	55,951	-6,357	-10.2%
US Airways Express	Boston	BOS	0	0	0	74	0	0	0	-	0	0	0	1,399	0	0	0	-
US Airways Express	Charlotte	CLT	307	396	416	196	225	153	-72	-32.1%	21,863	29,701	33,671	16,017	19,364	13,146	-6,218	-32.1%
US Airways Express	New York La Guardia	LGA	2,507	2,446	2,446	2,143	1,459	1,381	-78	-5.3%	86,552	83,790	83,010	72,848	49,613	49,420	-193	-0.4%
US Airways Express	Philadelphia	PHL	562	2,113	2,018	1,897	1,923	2,116	194	10.1%	30,202	115,559	134,767	129,324	118,339	140,277	21,938	18.5%
US Airways Express	Pittsburgh	PIT	1,024	0	0	0	0	0	0	-	51,113	0	0	0	0	0	0	-
US Airways Express	Washington National	DCA	510	546	779	840	1,005	1,039	34	3.4%	25,448	35,186	55,259	57,909	75,922	81,095	5,172	6.8%
Subtotal			13,823	13,679	14,445	12,225	10,444	10,716	272	2.6%	627,903	677,094	749,541	647,712	562,558	591,840	29,282	5.2%
Total			33,172	28,398	28,877	25,618	21,758	20,566	-1,192	-5.5%	3,239,755	2,676,405	2,691,299	2,454,361	2,100,396	1,903,517	-196,879	-9.4%

Source: OAG Schedules.

Note: All Northwest operations included in Delta from 2009 onwards

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport

Carrier	Market	Code	Departures 2005	Departures 2006	Departures 2007	Departures 2008	Departures 2009	Departures 2010	Departures '09-'10 Change	Departures '09-'10 Pct. Change	Departing Seats 2005	Departing Seats 2006	Departing Seats 2007	Departing Seats 2008	Departing Seats 2009	Departing Seats 2010	Departing Seats '09-'10 Change	Departing Seats '09-'10 Pct. Change
Jet Carriers																		
AirTran	Atlanta	ATL					152	92	-60	-39.3%					18,013	10,764	-7,249	-40.2%
AirTran	Baltimore	BWI			585	1,005	944	944	0	0.0%			68,392	117,534	110,497	112,951	2,454	2.2%
AirTran	Orlando	MCO			91	156	91	52	-39	-43.1%			10,639	18,351	11,089	6,503	-4,586	-41.4%
Continental	Cleveland	CLE					9	0	-9	-100.0%					1,342	0	-1,342	-100.0%
Delta	Atlanta	ATL	488			117	113	424	311	276.4%	61,387			16,601	15,986	60,167	44,181	276.4%
Delta	Cincinnati	CVG	488	91					-	-	69,182	9,093					-	-
JetBlue	New York JFK	JFK		849	1,498	1,559	1,520	1,201	-319	-21.0%		118,815	181,340	181,098	177,097	128,936	-48,161	-27.2%
JetBlue	Orlando	MCO				294	286	212	-74	-25.8%				29,444	28,578	21,214	-7,364	-25.8%
Northwest	Detroit	DTW	427	610	303				-	-	42,630	61,053	30,310				-	-
US Airways	Charlotte	CLT					121	395	274	225.8%					10,669	48,688	38,019	356.3%
US Airways	Philadelphia	PHL	152						-	-	19,183						-	-
US Airways	Washington National	DCA	52						-	-	6,656						-	-
Subtotal			1,607	1,550	2,477	3,131	3,235	3,320	85	2.6%	199,038	188,961	290,682	363,027	373,272	389,224	15,952	4.3%
Regional/Commuter Carriers																		
Air Canada Express	Toronto	YYZ	0	0	0	0	0	481	481	-	0	0	0	0	0	9,142	9,142	-
Continental Connection	Albany	ALB	296	0	0	0	0	0	0	-	5,620	0	0	0	0	0	0	-
Continental Connection	Boston	BOS	241	0	0	0	0	0	0	-	4,576	0	0	0	0	0	0	-
Continental Connection	New York Newark	EWR	0	0	0	710	1,407	1,426	18	1.3%	0	0	0	52,549	104,137	105,503	1,366	1.3%
Continental Express	Cleveland	CLE	222	208	234	320	273	188	-85	-31.1%	10,979	10,392	11,072	16,021	13,640	9,400	-4,240	-31.1%
Continental Express	New York Newark	EWR	1,400	1,416	1,433	745	13	4	-9	-69.2%	69,704	70,796	71,662	36,788	650	200	-450	-69.2%
Delta Connection	Atlanta	ATL	702	1,364	1,052	779	740	350	-390	-52.7%	48,416	95,477	73,653	54,385	51,830	25,532	-26,298	-50.7%
Delta Connection	Boston	BOS	1,160	0	0	0	0	0	0	-	57,855	0	0	0	0	0	0	-
Delta Connection	Cincinnati	CVG	602	940	1,009	701	0	0	0	-	31,146	49,752	47,630	35,246	0	0	0	-
Delta Connection	Detroit	DTW	0	0	0	0	992	1,217	226	22.8%	0	0	0	0	60,992	53,691	-7,301	-12.0%
Delta Connection	Minneapolis	MSP	0	0	0	0	30	0	-30	-100.0%	0	0	0	0	1,516	0	-1,516	-100.0%
Delta Connection	New York J F Kennedy	JFK	0	443	1,386	1,264	1,282	270	-1,012	-78.9%	0	16,021	64,664	65,123	64,084	13,500	-50,584	-78.9%
Delta Connection	New York La Guardia	LGA	1,099	996	585	0	0	786	786	-	54,810	49,795	29,228	0	0	41,440	41,440	-
Independence Air	Washington Dulles	IAD	1,691	0	0	0	0	0	0	-	109,710	0	0	0	0	0	0	-
Northwest Airlink	Detroit	DTW	920	324	585	840	0	0	0	-	53,248	16,813	30,578	60,802	0	8,629	8,629	-
Northwest Airlink	Minneapolis	MSP	405	91	121	121	0	0	0	-	20,227	4,547	6,062	6,062	0	0	0	-
Starlink Aviation	Yarmouth	YQI	0	0	0	0	390	521	132	33.8%	0	0	0	0	7,015	9,386	2,371	33.8%
United Express	Chicago O'Hare	ORD	1,099	1,247	1,260	1,247	1,251	1,249	-3	-0.2%	67,599	87,293	84,998	82,166	82,313	82,273	-40	0.0%
United Express	Washington Dulles	IAD	1,461	1,403	1,108	1,065	1,095	1,078	-17	-1.6%	83,738	92,575	70,683	67,600	67,591	64,767	-2,824	-4.2%
US Airways Express	Charlotte	CLT	366	429	364	537	381	88	-293	-76.9%	23,751	30,821	31,280	45,811	32,769	5,323	-27,447	-83.8%
US Airways Express	New York La Guardia	LGA	1,670	1,836	1,762	1,927	1,866	1,647	-220	-11.8%	77,987	89,432	84,063	93,796	92,692	78,477	-14,216	-15.3%
US Airways Express	Philadelphia	PHL	1,923	2,139	2,035	1,987	1,884	1,947	64	3.4%	100,607	112,571	120,911	123,851	134,230	133,521	-709	-0.5%
US Airways Express	Pittsburgh	PIT	218	0	0	0	0	0	0	-	10,874	0	0	0	0	0	0	-
US Airways Express	Washington National	DCA	1,151	1,169	1,373	1,563	1,108	1,043	-66	-5.9%	75,603	77,316	85,492	94,974	78,053	83,302	5,250	6.7%
Subtotal			16,626	14,004	14,306	13,808	12,713	12,296	-417	-3.3%	906,450	803,600	811,975	835,175	791,511	724,086	-67,425	-8.5%
Total			18,233	15,554	16,783	16,939	15,947	15,615	-332	-2.1%	1,105,488	992,561	1,102,656	1,198,202	1,164,783	1,113,310	-51,473	-4.4%

Source: OAG Schedules.

Note: All Northwest operations included in Delta from 2009 onwards

Table F-7 Scheduled Passenger Operations by Market and Carrier for Burlington Airport

			Departures								Departing Seats							
Carrier	Market	Code	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change
Jet Carriers																		
AirTran	Baltimore	BWI				507	606	0	-606	-100.0%				59,273	70,925	0	-70,925	-100.0%
JetBlue	New York J F Kennedy	JFK	1,129	1,455	1,490	1,468	1,494	1,434	-60	-4.0%	174,052	220,899	231,395	224,623	218,882	180,286	-38,596	-17.6%
JetBlue	Orlando	MCO				359	316	330	14	4.4%				41,516	37,671	33,014	-4,657	-12.4%
United	Chicago O'Hare	ORD	366	424	650	628	91	0	-91	-100.0%	42,404	54,558	78,988	77,135	11,145	0	-11,145	-100.0%
Northwest	Detroit	DTW	174						-	-	17,400						-	-
US Airways	Philadelphia	PHL	366	364	182				-	-	46,223	43,932	21,823				-	-
US Airways	Washington National	DCA	4						-	-	548						-	-
Subtotal			2,039	2,243	2,321	2,962	2,507	1,764	-743	-29.6%	280,627	319,389	332,206	402,547	338,623	213,300	-125,323	-37.0%
Regional/Commuter Carriers																		
Continental Connection	Boston	BOS	632	979	208	0	0	0	0	-	11,984	18,593	3,949	0	0	0	0	-
Continental Connection	New York Newark	EWR	0	0	0	567	970	405	-564	-58.2%	0	0	0	41,975	71,774	30,002	-41,772	-58.2%
Continental Connection	Plattsburgh	PLB	366	580	178	0	0	0	0	-	6,942	11,024	3,373	0	0	0	0	-
Continental Connection	Plattsburgh AFB	PBG	0	0	30	0	0	0	0	-	0	0	576	0	0	0	0	-
Continental Express	Cleveland	CLE	510	537	611	611	368	366	-2	-0.6%	25,334	26,846	28,331	29,457	18,403	18,286	-117	-0.6%
Continental Express	New York Newark	EWR	1,461	1,442	1,446	879	455	1,020	565	124.3%	72,806	72,095	71,129	43,443	22,733	51,000	28,268	124.3%
Delta Connection	Atlanta	ATL	61	697	615	502	303	0	-303	-100.0%	3,044	34,857	33,514	35,160	21,217	0	-21,217	-100.0%
Delta Connection	Boston	BOS	1,007	0	242	121	0	0	0	-	50,242	0	4,607	2,304	0	0	0	-
Delta Connection	Cincinnati	CVG	1,064	650	364	152	0	0	0	-	53,070	31,479	18,186	7,578	0	0	0	-
Delta Connection	Detroit	DTW	0	0	0	0	879	1,227	348	39.5%	0	0	0	0	43,950	61,417	17,468	39.7%
Delta Connection	New York J F Kennedy	JFK	0	576	1,360	1,243	1,178	1,336	158	13.4%	0	23,897	62,633	62,136	59,494	67,071	7,577	12.7%
Independence Air	Washington Dulles	IAD	1,903	0	0	0	0		0	-	95,136	0	0	0	0		0	-
Northwest Airlink	Detroit	DTW	1,164	1,083	862	818	0	0	0	-	62,122	63,257	43,084	40,919	0	0	0	-
Northwest Airlink	Minneapolis	MSP	61	61	91	91	0	0	0	-	3,044	3,031	4,547	4,547	0	0	0	-
United Express	Chicago O'Hare	ORD	1,007	961	727	615	1,091	1,353	262	24.0%	59,987	67,288	49,120	40,304	70,215	84,431	14,216	20.2%
United Express	Washington Dulles	IAD	1,461	1,451	1,399	1,303	1,191	1,130	-61	-5.1%	72,862	72,528	71,662	66,621	62,932	61,988	-945	-1.5%
US Airways Express	Charlotte	CLT	0	4	0	13	0	0	0	-	0	217	0	650	0	0	0	-
US Airways Express	New York La Guardia	LGA	2,184	2,373	2,269	2,169	2,148	1,680	-468	-21.8%	80,636	87,795	83,950	80,265	79,464	62,144	-17,320	-21.8%
US Airways Express	Philadelphia	PHL	1,988	1,680	1,741	2,074	1,888	1,903	15	0.8%	97,453	87,808	95,373	121,833	116,854	128,140	11,287	9.7%
US Airways Express	Washington National	DCA	994	996	1,091	1,217	1,074	1,043	-31	-2.9%	61,457	57,970	69,973	79,932	65,513	77,625	12,112	18.5%
Subtotal			15,863	14,070	13,233	12,375	11,544	11,461	-83	-0.7%	756,119	658,685	644,005	657,121	632,548	642,104	9,556	1.5%
Total			17,902	16,313	15,554	15,337	14,051	13,225	-826	-5.9%	1,036,746	978,074	976,211	1,059,668	971,171	855,404	-115,768	-11.9%

Source: OAG Schedules.

Note: All Northwest operations included in Delta from 2009 onwards

Table F-8 Scheduled Passenger Operations by Market and Carrier for Bangor Airport

			Departures								Departing Seats							
Carrier	Market	Code	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change
Jet Carriers																		
Allegiant Air	Sanford	SFB			17	108	160	181	21	13.1%			2,598	16,238	24,000	27,150	3,150	13.1%
Allegiant Air	St. Petersburg/Clearwater	PIE					12	107	95	791.7%					1,800	16,050	14,250	791.7%
Subtotal			0	0	17	108	172	288	116	67.4%	0	0	2,598	16,238	25,800	43,200	17,400	67.4%
Regional/Commuter Carriers																		
American Eagle	Boston	BOS	1,535	1,485	1,044	0	0	0	0	-	56,654	55,983	38,611	0	0	0	0	-
American Eagle	New York La Guardia	LGA	519	407	338	0	0	0	0	-	19,153	15,060	12,496	0	0	0	0	-
Continental Connection	Albany	ALB	192	0	0	0	0	0	0	-	3,637	0	0	0	0	0	0	-
Continental Express	New York Newark	EWR	480	559	437	546	407	0	-407	-100.0%	22,568	23,707	17,420	25,421	20,351	0	-20,351	-100.0%
Delta Connection	Atlanta	ATL	0	212	507	273	0	0	0	-	0	14,852	35,463	19,095	0	0	0	-
Delta Connection	Boston	BOS	1,421	1,035	1,394	1,091	554	0	-554	-100.0%	70,905	51,180	34,276	43,954	27,712	0	-27,712	-100.0%
Delta Connection	Cincinnati	CVG	1,400	675	693	126	0	0	0	-	82,607	35,160	34,640	6,279	0	0	0	-
Delta Connection	Detroit	DTW	0	0	0	0	727	975	248	34.0%	0	0	0	0	36,372	50,540	14,168	39.0%
Delta Connection	Minneapolis	MSP	0	0	0	0	13	0	-13	-100.0%	0	0	0	0	875	0	-875	-100.0%
Delta Connection	New York J F Kennedy	JFK	0	0	0	338	940	180	-760	-80.8%	0	0	0	16,887	46,981	9,000	-37,981	-80.8%
Delta Connection	New York La Guardia	LGA	0	0	0	0	0	537	537	-	0	0	0	0	0	26,958	26,958	-
Northwest Airlink	Detroit	DTW	1,016	818	818	814	0	0	0	-	55,306	42,646	40,919	40,702	0	0	0	-
Northwest Airlink	Minneapolis	MSP	61	13	13	13	0	0	0	-	3,045	650	650	650	0	0	0	-
US Airways Express	New York La Guardia	LGA	160	135	126	268	706	1,017	311	44.1%	7,830	6,757	6,279	13,423	27,465	44,051	16,586	60.4%
US Airways Express	Philadelphia	PHL	1,182	1,121	1,074	1,078	1,121	1,156	35	3.1%	58,943	56,076	60,594	59,243	58,481	68,510	10,029	17.1%
US Airways Express	Washington National	DCA	0	0	0	13	22	31	9	41.2%	0	0	0	650	1,083	1,529	446	41.2%
Subtotal			7,966	6,460	6,443	4,559	4,490	3,896	-594	-13.2%	380,648	302,071	281,347	226,303	219,319	200,587	-18,732	-8.5%
Total			7,966	6,460	6,461	4,668	4,662	4,184	-478	-10.3%	380,648	302,071	283,945	242,541	245,119	243,787	-1,332	-0.5%

Source: OAG Schedules; U.S. DOT, T100 Database.

Note: Flyglobespan scheduled technical stops (on route to Sanford) in 2007 and 2008 not included

Note: Allegiant stopped reporting to the OAG in 2009, so Allegiant 2009 and 2010 statistics from the T100 database.

Note: All Northwest operations included in Delta from 2009 onwards

Table F-9 Scheduled Passenger Operations by Market and Carrier for Tweed-New Haven Airport

			Departures								Departing Seats							
Carrier	Market	Code	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change
Regional/Commuter Carriers																		
Pan Am Clipper Connection	Baltimore	BWI			277				-	-			4,988				-	-
Pan Am Clipper Connection	Bedford	BED			113				-	-			2,026				-	-
Pan Am Clipper Connection	Elmira/Corning	ELM			152				-	-			2,728				-	-
Pan Am Clipper Connection	Portsmouth	PSM			56				-	-			1,013				-	-
Delta Connection/Comair	Cincinnati	CVG	1,029						-	-	51,330						-	-
US Airways Express	Philadelphia	PHL	1,910	2,071	1,697	1,624	1,580	1,608	28	1.7%	76,255	77,477	62,971	60,360	58,814	59,491	676	1.1%
Total			1,910	2,071	1,697	1,624	1,580	1,608	28	1.7%	76,255	77,477	62,971	60,360	58,814	59,491	676	1.1%

Source: OAG Schedules.

Table F-10 **Scheduled Passenger Operations by Market and Carrier for Worcester Regional Airport**

			Departures								Departing Seats							
Carrier	Market	Code	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change
Regional/Commuter Carriers																		
Allegiant Air	Orlando/Sanford	SFB		181	17				-	-		27,279	2,598				-	-
Direct Air	Myrtle Beach	MYR					63	61	-2	-3.2%					8,743	8,101	-642	-7.3%
Direct Air	Orlando/Sanford	SFB				17	139	127	-12	-8.6%				2,533	19,641	19,101	-540	-2.7%
Direct Air	Punta Gorda	PGD				17	66	78	12	18.2%				2,533	9,421	11,853	2,432	25.8%
Direct Air	West Palm Beach	PBI						13	13	-						1,872	1,872	-
Total			0	181	17	34	268	279	11	4.1%	0	27,279	2,598	5,066	37,805	40,927	3,122	8.3%

Sources: OAG Schedules; U.S. DOT, T100 Database.

Note: As Direct Air schedule not published in the OAG, all Direct Air statistics from the T100 database. Direct Air flights operated by Virgin America, Xtra Airways, USA Jet, and Falcon Air Express.

Table F-11 Scheduled Passenger Operations by Market and Carrier for Hanscom Field

			Departures								Departing Seats							
Carrier	Market	Code	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change
Regional/Commuter Carriers																		
Pan Am Clipper Connection	Elmira/Coming	ELM		131	390				-	-		2,366	7,015				-	-
Pan Am Clipper Connection	New Haven	HVN			113				-	-			2,026				-	-
Pan Am Clipper Connection	New London/Groton	GON	9						-	-	157						-	-
Pan Am Clipper Connection	Portsmouth	PSM	192	251	221	26			-	-	3,445	4,520	3,975	468			-	-
Pan Am Clipper Connection	Trenton	TTN	863	982	1,048	26			-	-	15,503	17,692	18,861	468			-	-
Total			1,064	1,364	1,772	52	0	0	-	-	19,105	24,578	31,877	935	0	0	-	-

Source: OAG Schedules.

Table F-12 Scheduled Passenger Operations by Market and Carrier for Pease International Tradeport

				Departures								Departing Seats							
Carrier	Code	Market	Code	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change	2005	2006	2007	2008	2009	2010	'09-'10 Change	'09-'10 Pct. Change
Jet Carriers																			
Alliegiant Airways	G4	Orlando/Sanford	SFB	35	191	34				-	-	5,220	28,578	5,100				-	-
Skybus	SX	Columbus	CMH			409	108			-	-			58,896	15,552			-	-
Skybus	SX	Greensboro	GSO				83			-	-				11,952			-	-
Skybus	SX	Punta Gorda	PGD			15	59			-	-			2,160	8,496			-	-
Skybus	SX	Saint Augustine	UST			14	56			-	-			2,016	8,064			-	-
Subtotal				35	191	472	306	0	0	-	-	5,220	28,578	68,172	44,064	0	0	-	-
Regional/Commuter Carriers																			
Pan Am Clipper Connection	E9	Bedford	BED	170	221	196	9			-	-	3,053	3,975	3,724	156			-	-
Pan Am Clipper Connection	E9	Fort Lauderdale	FLL	13						-	-	1,957						-	-
Pan Am Clipper Connection	E9	Hartford	BDL	13						-	-	1,957						-	-
Pan Am Clipper Connection	E9	Newburgh	SWF	48						-	-	7,178						-	-
Pan Am Clipper Connection	E9	New Haven	HVN			57				-	-			1,021				-	-
Pan Am Clipper Connection	E9	Sanford	SFB	57						-	-	8,483						-	-
Pan Am Clipper Connection	E9	Trenton	TTN	22						-	-	391						-	-
Subtotal				323	221	253	9	0	0	-	-	23,019	3,975	4,745	156	0	0	-	-
Total				358	412	725	315	0	0	-	-	28,239	32,553	72,917	44,220	0	0	-	-

Sources: OAG Schedules; U.S. DOT, T100 Database.

Note: Skybus did not report to the OAG, so all 2007 and 2008 Skybus statistics from the T100 database.

G

Ground Access

This appendix provides information in support of *Chapter 5, Ground Access to and from Logan Airport*:

- Table G-1 Logan Express Bus Service Ridership
- Table G-2 Water Transportation Services Ridership
- Table G-3 Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers
- Table G-4 Annual Taxi Dispatches (Tickets Sold)
- Table G-5 Logan Airport Employee Parking Supply
- Table G-6 2010 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment, and Vehicle Miles Traveled (VMT) Summary
- 2010 Traffic Roadway Network
- March 2010 Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection
- September 2010 Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection

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Table G-1 Logan Express Bus Service Ridership

	Ridership			Percent Change		
Service Year	Air Passengers	Employees	Total	Air Passengers	Employees	Total
Framingham						
1992	207,847	7,573	215,420	4.3%	21.3%	4.8%
1993	229,064	12,307	241,371	10.2%	62.5%	12.0%
1994	250,342	17,352	267,694	9.3%	41.0%	10.9%
1995	274,754	21,129	295,883	9.8%	21.8%	10.5%
1996	325,665	22,932	348,597	18.5%	8.5%	17.8%
1997	316,306	29,871	346,175	(2.9)%	30.3%	(0.7)%
1999	345,715	31,946	380,661	3.5%	(6.0)%	2.6%
2000	371,560	34,508	406,068	6.6%	8.0%	6.7%
2001	354,521	38,740	393,261	(4.6)%	12.3%	(3.2)%
2002	342,746	42,441	385,187	(3.3)%	8.7%	(2.1)%
2003	310,024	55,979	366,003	(9.5)%	31.9%	(5.0)%
2004	323,931	54,763	378,694	4.5%	(2.2%)	3.5%
2005	318,125	57,569	375,694	(1.8%)	5.1%	(0.8%)
2006	349,022	60,764	409,789	9.7%	5.5%	9.1%
2007	311,299	57,252	368,551	(2.1%)[5]	(0.6%)[5]	(1.9%)[5]
2008	276,112	57,797	333,909	(11.3%)	1.0%	(9.4%)
2009	264,233	59,840	324,073	(4.3%)	3.5%	(2.9%)
2010	**272,190**	**62,226**	**334,416**	**3.0%**	**4.0%**	**3.2%**
Braintree[1]						
1992	186,217	9,694	195,911	10.6%	16.6%	10.8%
1993	205,209	22,768	227,977	10.2%	134.9%	16.4%
1994	247,636	37,489	285,125	20.7%	64.7%	25.1%
1995	264,579	70,723	335,302	6.8%	88.7%	17.6%
1996	335,232	103,519	438,751	26.7%	46.4%	30.1%
1997	300,006	135,340	435,346	(10.5)%	30.7%	(0.8)%
1999	328,818	125,286	454,105	9.6%	(19.7)%	(0.5)%
2000	355,932	149,687	505,619	8.2%	19.5%	11.3%
2001	345,249	156,240	501,489	(3.0)%	4.4%	(0.8)%
2002	323,115	190,360	513,475	(6.4)%	21.8%	2.4%
2003	301,013	216,765	517,778	(6.8)%	13.9%	0.8%
2004	318,100	208,566	526,666	5.7%	(3.8%)	1.7%
2005	307,659	189,531	497,190	(3.2%)	(9.1%)	(5.5%)
2006	333,413	202,983	536,396	8.4%	7.1%	7.9%
2007	300,715	196,955	497,670	(2.3%)[5]	3.9%[5]	0.1%[5]
2008	252,289	221,591	473,880	(16.1%)	12.5%	(4.8%)
2009	231,151	234,908	466,059	(8.4%)	6.0%	(1.7%)
2010	**231,422**	**251,443**	**482,865**	**0.1%**	**7.0%**	**3.6%**
Woburn[2]						
1992[3]	3,052	91	3,143	NA	NA	-
1993	59,635	5,027	64,662	NA	NA	-
1994	119,567	9,082	128,649	100.5%	80.7%	99.0%
1995	150,147	13,376	163,523	25.6%	47.3%	27.1%
1996	190,566	17,322	207,888	26.9%	29.5%	27.1%
1997	199,715	20,018	219,733	4.8%	15.6%	5.7%
1998	208,286	22,876	231,162	4.3%	14.3%	5.2%
1999	191,454	23,495	214,949	(8.1)%	2.7%	(7.0)%
2000	195,744	27,522	223,266	2.2%	17.1%	3.9%

Table G-1	Logan Express Bus Service Ridership (Continued)					
	Ridership			Percent Change		
Service Year	Air Passengers	Employees	Total	Air Passengers	Employees	Total
Woburn (cont.)						
2001	177,375	38,318	215,530	(9.4)%	39.2%	(3.4)%
2002	161,145	73,277	234,422	(9.2)%	91.0%	8.7%
2003	164,980	103,963	268,943	(2.4)%	41.9%	14.7%
2004	172,110	111,326	283,436	4.3%	7.1%	5.4%
2005	163,227	110,961	274,188	(5.1%)	(0.3%)	(3.2%)
2006	167,341	121,672	289,013	2.5%	9.7%	5.4%
2007	149,149	123,066	272,215	(8.6%)[5]	10.9%[5]	(0.7%)[5]
2008	129,385	122,777	252,162	(13.3%)	(0.2%)	(7.4%)
2009	113,607	121,633	235,240	(12.2%)	(0.9%)	(6.7%)
2010	**115,257**	**127,120**	**242,377**	**1.5%**	**4.5%**	**3.0%**
Peabody						
2001[4]	8,151	3,097	11,248	NA	NA	NA
2002	28,626	20,629	49,255	NA	NA	NA
2003	32,318	23,425	55,743	21.4%	13.6%	13.2%
2004	43,389	33,642	77,031	34.3%	43.6%	38.2%
2005	51,023	39,599	87,622	17.6%	17.7%	13.7%
2006	42,142	32,632	74,774	(17.4%)	(17.6%)	(14.7%)
2007	36,367	26,949	63,316	(28.7%)[5]	(31.9%)[5]	(27.7%)[5]
2008	30,887	30,596	61,483	(15.1%)	13.5%	(2.9%)
2009	27,856	32,220	60,076	(9.8%)	5.3%	(2.3%)
2010	**25,543**	**26,231**	**51,744**	**(8.3%)**	**(18.6%)**	**(13.8%)**
Total System Ridership						
1992	397,116	17,358	414,474	8.0%	19.2%	8.5%
1993	493,908	39,832	533,740	24.4%	129.5%	28.8%
1994	617,545	63,923	681,468	25.0%	60.5%	27.7%
1995	689,480	105,228	794,708	11.6%	64.6%	16.6%
1996	851,463	143,773	995,236	23.4%	36.6%	25.2%
1997	816,015	185,229	1,001,254	(4.2)%	28.8%	0.6%
1998	845,598	212,952	1,058,550	3.6%	15.0%	5.7%
1999	868,987	180,727	1,049,714	2.7%	(15.2)%	(0.8)%
2000	923,236	211,717	1,134,953	6.2%	17.1%	8.1%
2001	885,296	236,395	1,121,691	(4.1)%	11.7%	(1.2)%
2002	855,632	326,707	1,182,339	(3.4)%	38.2%	5.4%
2003	808,335	400,132	1,208,467	(5.5%)	22.5%	2.2%
2004	857,530	408,297	1,265,827	6.1%	2.0%	2.2%
2005	837,034	397,660	1,234,694	(2.4%)	(2.6%)	(2.4%)
2006	891,918	418,051	1,309,969	6.6%	5.1%	6.1%
2007	797,530	404,222	1,201,752	(4.7%)[5]	1.7%[5]	(2.7%)[5]
2008	688,673	432,761	1,121,434	(13.6%)	7.1%	(6.7%)
2009	636,847	448,601	1,085,448	(7.5%)	3.7%	(3.2%)
2010	**644,412**	**467,020**	**1,111,432**	**1.2%**	**4.1%**	**2.4%**

NA Not applicable.
1 Service originally based from the Quincy-Adams Massachusetts Bay Transportation Authority (MBTA) Station.
2 Woburn Express moved from Mishawum Station to the Anderson Regional Transportation Center (ARTC) in Woburn in May 2001.
3 Reflects a partial year of operation; Woburn Logan Express service was implemented in November 1992.
4 Reflects a partial year of operation. The Peabody Logan Express service commenced in September 2001.
5 Percent comparison between 2007 and 2005. 2006 numbers elevated due to Ted Williams Tunnel closures in Fall 2006.

Table G-2	Water Transportation Services Ridership to and from Logan Airport				
	Rowes Wharf/Fan Pier Water Shuttle	Private Water Taxi (on-demand)[2]	Harbor Express (Long Wharf/Quincy/Hull)	Boston-Logan Water Shuttle (Long Wharf)	Total
1990	181,530	NS	NS	NS	181,530
1991	142,500	NS	NS	NS	142,500
1992	133,297	NS	NS	NS	133,297
1993	159,525	NS	NS	NS	159,525
1994	209,057	NS	NS	NS	209,057
1995	203,829	NS	NS	NS	203,829
1996	159,992	3,364	11,781	NS	175,137
1997	132,542	6,299	71,309	NS	210,150
1998	124,836	9,243	101,174	NS	235,253
1999	122,211	17,252	98,539	NS	238,002
2000	128,097	26,335	83,243	NS	237,675
2001	107,400	29,642	82,704	NS	219,746
2002	75,304	36,736	66,471	NS	178,511
2003	26,480[1]	35,724[3]	61,849	5,722[4]	129,775
2004	NS	54,540	58,788	3,202[5]	116,530
2005	NS	44,975	51,960	NS	96,935
2006	NS	63,639	70,998	NS	134,637
2007	NS	50,737	59,460	NS	110,197
2008	NS	48,630	48,003	NS	96,633
2009	NS	50,734	37,861	NS	88,595
2010	**NS**	**54,382**	**34,794**	**NS**	**89,176**

Source: Massport.
Note: Figures from 2003 – 2007 have been revised from previous documents.
1 Rowes Wharf Water Shuttle operated from January to June only in 2003.
2 Operates April-October only.
3 Operated from May to October only in 2003.
4 Long Wharf Boston-Logan Water Shuttle operated from August to December in 2003.
5 Joint operation with City Water Taxi began on August 16, 2003.
NA Not available.
NS Not in service.

Table G-3	Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers			
Year	**Entrances**	**Exits**	**Total Turnstile Count[1]**	**Percent Change**
1990	NA	NA	2,854,317	-
1991	NA	NA	2,515,293	(11.9)%
1992	NA	NA	2,626,572	4.2%
1993	NA	NA	2,604,980	(0.8)%
1994	NA	NA	3,108,734	19.3%
1995	NA	NA	3,040,868	(2.2)%
1996	NA	NA	2,974,850	(2.2)%
1997[2]	NA	NA	2,774,268	(6.7)%
1998	NA	NA	2,850,367	2.7%
1999	NA	NA	2,974,045	4.3%
2000	NA	NA	3,019,086	1.5%
2001	NA	NA	2,896,638	(4.1)%
2002	NA	NA	2,670,594	(7.8)%
2003[3]	1,300,272	1,275,627	2,575,899	(3.6)%
2004	1,373,861	1,366,511	2,740,372	6.4%
2005	NA	NA	NA	NA
2006	NA	NA	NA	NA
2007[4]	1,412,055	1,112,024	2,524,079	--
2008[4]	2,212,111	1,435,283	3,647,394	56.7%
2009	2,329,370	1,421,179	3,750,549	5.3%
2010	2,270,241	1,358,952	**3,629,193**	**(2.5%)**

Source: MBTA.

Note: Turnstile counts include both Logan Airport bound (turnstile exits) and non-Logan Airport bound (turnstile entrances) passengers.

1 As stated in the *Logan Airport 1999 ESPR*, Massport believes that ridership estimates through 2005 from the old Airport Station were actually understated because many travelers that were destined for the Airport with baggage had been observed to avoid the turnstiles and exit the old Airport Station via the wide gate (designed for handicapped access) that did not have the capability to count passengers.

2 Airport Station was closed on six weekends during September and October 1997 due to construction.

3 Airport Station was closed on eight weekend days during 2003.

4 Automated fare collection and new fare gates implemented beginning January 2007. Station access to Bremen Street Park opened June 2007. Exits are undercounted.

5 Exits are undercounted.

NA Not available.

Table G-4 Annual Taxi Dispatches (Tickets Sold)

Year	Total[1]	Percent Change
1990	1,330,418	
1991	1,208,611	(9.2)%
1992	1,266,033	4.8%
1993	1,336,603	5.6%
1994	1,409,505	5.5%
1995	1,499,869	6.4%
1996	1,721,093	14.7%
1997	1,827,244	6.2%
1998	1,888,281	3.3%
1999	1,955,895	3.6%
2000	2,140,724	9.4%
2001	1,789,736	(16.4)%
2002	1,679,508	(6.2)%
2003	1,562,076	(7.0)%
2004	1,713,696	9.7%
2005	1,769,876	3.3%
2006	1,857,609	5.0%
2007	1,925,817	3.7%
2008	1,749,730	(9.1)%
2009	1,630,333	(6.8)%
2010	**1,829,961**	**12.1%**

Source: Previous EDR/ESPR Documentation
1 Represents yearly total of tickets sold

Table G-5 Logan Airport Employee Parking Supply (2010)

Location	Number of Spaces March 2009	September 2009	**March 2010**	**September 2010**
Terminal Area	843	884	**884**	**779**
North Service Area	770	773	**777**	**815**
Southwest Service Area	10	10	**10**	**10**
South Service Area	1,169	1,181	**1,181**	**884**
Airside (Fire/Rescue)	5	5	**5**	**5**
Total spaces in service	2,797	2,853	**2,857**	**2,493**
Total spaces out of service	576	520	**511**	**880**
Total employee spaces	3,373	3,373	**3,373**	**3,373**

Source: Logan Airport Parking Space Inventory submitted to Massachusetts Department of Environmental Protection (MassDEP), March and September 2010.
Note: Logan Airport Parking Freeze sets a limit of 17,319 commercial and 3,373 employee spaces at the Airport beginning in 2007.

Table G-6 2010 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME AM Peak	VOLUME PM Peak	VOLUME High 8-Hour	VOLUME AWDT	VMT AM Peak	VMT PM Peak	VMT High 8-Hour	VMT AWDT
1	750	35	850	621	5,420	11,292	120.72	88.27	769.91	1,603.98
2	1535	35	996	1,115	7,134	14,862	289.46	324.02	2,073.92	4,320.68
3	1080	35	1,849	1,728	12,554	26,154	378.22	353.35	2,567.85	5,349.68
4	361	35	424	320	2,291	4,772	28.98	21.86	156.61	326.27
5	721	30	1,357	1,404	10,263	21,382	185.29	191.75	1,401.49	2,919.77
6	1110	35	485	607	4,527	9,431	101.99	127.58	951.68	1,982.66
7	1035	35	896	800	5,736	11,951	175.66	156.83	1,124.47	2,342.65
8	992	30	1,266	1,979	14,978	31,205	237.94	371.86	2,814.13	5,862.76
9	851	30	1,609	1,469	11,017	22,953	259.35	236.83	1,775.72	3,699.42
10	366	30	946	1,603	12,082	25,170	65.56	111.14	837.49	1,744.76
11	189	20	321	376	2,897	6,035	11.48	13.46	103.69	216.01
12	892	30	1,368	1,290	9,663	20,131	231.17	217.92	1,632.46	3,400.96
13	209	20	241	179	1,354	2,822	9.53	7.10	53.61	111.69
14	169	20	241	179	1,354	2,822	7.71	5.74	43.35	90.31
15	50	15	11	4	36	75	0.11	0.04	0.34	0.71
16	226	20	229	176	1,319	2,747	9.82	7.52	56.44	117.58
17	168	20	354	413	3,209	6,686	11.25	13.16	102.12	212.74
18	472	20	360	425	3,209	6,686	32.23	37.97	286.90	597.70
19	225	20	252	154	1,319	2,747	10.74	6.56	56.19	117.06
20	50	15	2	12	36	75	0.02	0.12	0.34	0.71
21	580	25	50	129	902	1,880	5.53	14.22	99.12	206.49
22	620	25	169	98	935	1,947	19.85	11.53	109.75	228.65
23	315	20	85	68	420	874	5.07	4.06	25.04	52.17
24	1050	30	582	488	4,056	8,449	115.78	97.06	806.52	1,680.25
25	568	30	526	1,085	8,026	16,721	56.55	116.67	863.42	1,798.79
26	315	20	254	166	1,354	2,822	15.15	9.92	80.80	168.34
27	475	20	147	342	2,493	5,194	13.23	30.80	224.28	467.25
28	590	25	377	743	5,533	11,527	42.15	82.98	618.28	1,288.09
29	315	20	310	295	2,307	4,806	18.50	17.62	137.64	286.74
30	437	20	440	640	4,800	10,000	36.45	52.96	397.28	827.66
31	432	20	734	613	4,588	9,559	60.05	50.14	375.41	782.11
32	387	30	664	677	5,075	10,572	48.66	49.64	371.95	774.89
33	168	35	19	35	240	500	0.60	1.10	7.64	15.91
34	295	35	576	431	3,323	6,922	32.19	24.06	185.64	386.75
35	605	20	480	823	5,547	11,556	55.03	94.35	635.57	1,324.10
37	450	20	49	40	294	612	0.00	0.00	0.00	0.00
38	488	30	810	440	4,152	8,651	69.07	37.51	353.89	737.27

Table G-6 2010 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME AM Peak	VOLUME PM Peak	VOLUME High 8-Hour	VOLUME AWDT	VMT AM Peak	VMT PM Peak	VMT High 8-Hour	VMT AWDT
39	98	30	193	550	3,415	7,115	3.58	10.21	63.39	132.06
40	470	20	287	273	2,131	4,441	25.56	24.33	189.73	395.28
41	96	30	575	1,281	8,948	18,643	10.46	23.29	162.70	338.95
42	64	15	15	55	258	538	0.18	0.67	3.13	6.53
43	67	30	557	1,261	8,690	18,104	7.07	16.00	110.27	229.73
44	64	30	57	25	258	538	0.69	0.30	3.13	6.53
45	154	30	534	1,311	8,948	18,643	15.56	38.25	261.00	543.74
46	351	30	405	1,009	6,731	14,022	26.94	67.07	447.44	932.16
47	222	20	128	303	2,218	4,620	5.39	12.72	93.24	194.26
48	327	20	505	382	2,966	6,179	31.29	23.65	183.69	382.69
49	366	30	798	666	5,482	11,422	55.31	46.14	380.03	791.74
50	58	20	404	577	4,349	9,061	4.44	6.34	47.78	99.53
51	0	-	823	684	5,008	10,434	0.00	0.00	0.00	0.00
52	168	20	422	606	4,349	9,061	13.41	19.28	138.38	288.30
53	0	-	730	377	3,323	6,922	0.00	0.00	0.00	0.00
54	176	20	578	314	2,966	6,179	19.28	10.47	98.87	205.98
56	181	30	405	1,009	6,731	14,022	13.89	34.59	230.73	480.69
58	383	30	794	673	5,482	11,422	57.57	48.82	397.69	828.51
59	443	30	821	1,617	11,080	23,083	68.85	135.63	929.62	1,936.71
60	438	30	1,361	991	8,449	17,601	112.91	82.20	700.84	1,460.09
61	313	35	162	287	2,119	4,416	9.62	17.00	125.64	261.75
62	125	30	1,199	704	6,329	13,186	28.38	16.67	149.84	312.16
63	185	30	537	1,177	7,816	16,283	18.83	41.25	273.85	570.52
64	315	25	283	439	3,264	6,800	16.90	26.21	194.73	405.69
65	173	25	215	229	1,837	3,827	7.03	7.51	60.19	125.39
65	440	25	215	229	1,837	3,827	17.89	19.09	153.08	318.92
66	150	20	279	209	1,817	3,785	7.93	5.95	51.62	107.54
67	200	25	468	510	4,076	8,491	17.73	19.33	154.38	321.62
197	476	25	47	58	2,414	5,199	4.20	5.27	217.62	453.38
68	1000	25	13	17	689	5,029	2.52	3.16	130.54	271.96
69	980	25	70	68	689	1,436	12.97	12.58	127.93	266.52
69	307	25	70	68	689	1,436	4.06	3.94	40.08	83.49
70	567	15	64	229	1,736	3,616	6.88	24.60	186.39	388.31
71	295	30	379	432	5,882	12,253	21.19	24.12	328.61	684.61
72	162	30	949	1,841	13,697	28,536	29.11	56.48	420.26	875.55
72	348	20	927	1,799	13,697	28,536	61.11	118.56	902.79	1,880.80
73	609	30	1,212	940	8,065	16,802	139.77	108.44	930.19	1,937.91
74	295	30	711	505	4,313	8,986	39.71	28.22	240.99	502.05

Table G-6	**2010 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)**									
			VOLUME				**VMT**			
Link Name	**Link Distance (ft)**	**Link Speed (mph)**	**AM Peak**	**PM Peak**	**High 8-Hour**	**AWDT**	**AM Peak**	**PM Peak**	**High 8-Hour**	**AWDT**
75	555	30	501	435	3,751	7,816	52.66	45.74	394.33	821.53
76	443	30	530	1,174	8,445	17,594	44.46	98.46	708.57	1,476.19
77	425	30	406	611	5,252	10,942	32.71	49.20	422.76	880.75
78	272	25	151	186	1,868	3,892	7.76	9.60	96.24	200.49
79	579	30	256	425	3,384	7,050	28.05	46.59	371.09	773.11
80	230	25	215	255	2,557	5,328	9.35	11.09	111.40	232.09
81	402	30	81	80	632	1,316	6.18	6.12	48.09	100.19
82	650	30	434	321	3,120	6,500	53.47	39.57	384.07	800.15
83	236	30	397	507	4,016	8,366	17.75	22.68	179.49	373.93
83	98	30	397	507	4,016	8,366	7.37	9.42	74.53	155.28
84	629	30	706	1,561	11,734	24,446	84.15	186.01	1,397.85	2,912.19
85	463	30	411	898	7,044	14,674	36.05	78.71	617.64	1,286.75
86	251	30	300	678	4,690	9,772	14.26	32.22	222.97	464.53
87	1852	35	684	1,027	7,810	16,271	240.06	360.08	2,739.52	5,707.33
88	630	30	210	188	1,506	3,138	25.11	22.42	179.72	374.42
88	307	25	210	188	1,506	3,138	12.23	10.93	87.58	182.46
89	628	35	497	318	2,807	5,848	59.11	37.85	333.86	695.55
90	395	35	609	925	4,038	8,412	45.53	69.16	302.07	629.31
91	808	35	1,013	1,817	11,081	23,086	155.06	278.03	1,695.77	3,532.86
92	716	35	329	685	4,452	9,276	44.59	92.95	603.78	1,257.88
93	582	35	681	1,129	6,629	13,810	75.05	124.48	730.67	1,522.24
93	151	35	681	1,129	6,629	13,810	19.47	32.30	189.57	394.95
93	1075	35	681	1,129	6,629	13,810	138.62	229.93	1,349.61	2,811.70
94	768	50	329	685	4,452	9,276	47.83	99.70	647.63	1,349.24
95	1722	30	151	155	1,194	2,487	49.20	50.65	389.34	811.13
96	1615	30	219	348	2,822	5,879	67.11	106.55	863.13	1,798.19
97	1558	35	256	326	2,668	5,557	75.46	96.24	787.14	1,639.87
98	1449	35	590	520	4,087	8,515	162.05	142.61	1,121.59	2,336.65
99	1114	35	829	844	6,755	14,072	174.88	178.09	1,425.11	2,968.98
100	458	35	1,450	1,290	10,508	21,891	125.76	111.89	911.46	1,898.88
101	1255	30	635	444	3,753	7,819	150.99	105.46	892.08	1,858.50
102	369	25	973	850	6,789	14,143	67.99	59.37	474.45	988.44
103	391	25	963	843	6,735	14,031	71.33	62.43	498.74	1,039.03
106	249	25	105	404	1,408	2,933	4.97	19.04	66.39	138.32
107	77	25	77	360	1,211	2,524	1.12	5.24	17.67	36.81
108	185	15	37	37	196	409	1.29	1.29	6.88	14.33
109	263	25	70	71	472	984	3.50	3.56	23.52	49.00
111	200	20	60	61	388	808	2.25	2.30	14.70	30.62

Table G-6 2010 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME AM Peak	VOLUME PM Peak	VOLUME High 8-Hour	VOLUME AWDT	VMT AM Peak	VMT PM Peak	VMT High 8-Hour	VMT AWDT
112	200	20	40	52	388	808	1.52	1.97	14.70	30.62
113	20	15	11	11	84	175	0.04	0.04	0.32	0.66
115	327	20	51	63	472	984	3.15	3.89	29.24	60.92
116	148	20	34	35	276	575	0.94	0.97	7.73	16.11
117	369	25	100	407	1,462	3,046	7.01	28.48	102.16	212.84
118	216	25	32	37	313	651	1.33	1.51	12.79	26.65
118	151	25	32	37	313	651	0.93	1.05	8.94	18.63
120	372	25	890	772	6,150	12,813	62.70	54.42	433.31	902.73
121	372	25	87	319	1,136	2,367	6.15	22.47	80.03	166.73
122	2801	25	185	374	2,115	4,407	98.22	198.48	1,122.08	2,337.66
123	2801	25	351	299	2,115	4,407	185.98	158.79	1,122.08	2,337.66
124	1150	25	292	378	1,659	3,456	63.51	82.36	361.28	752.66
125	1150	25	901	957	6,673	13,902	196.19	208.49	1,453.41	3,027.94
126	850	25	25	8	148	309	4.00	1.33	23.88	49.74
127	850	25	7	44	240	500	1.19	7.13	38.64	80.49
128	939	25	309	552	2,765	5,760	54.90	98.13	491.68	1,024.34
129	939	25	736	671	5,144	10,717	130.83	119.33	914.82	1,905.88
130	580	35	127	429	2,543	5,299	13.99	47.07	279.38	582.04
131	660	35	788	1,478	10,354	21,570	98.55	184.77	1,294.20	2,696.25
134	65	25	44	67	516	1,075	0.54	0.83	6.35	13.24
135	155	25	270	899	5,736	11,950	7.92	26.38	168.39	350.80
136	151	25	871	676	5,736	11,950	24.92	19.33	164.04	341.75
137	227	25	323	711	5,078	10,579	13.88	30.58	218.31	454.82
138	608	25	315	695	4,962	10,338	36.32	80.03	571.41	1,190.44
139	369	35	569	1,023	7,630	15,895	39.75	71.46	533.22	1,110.88
141	583	30	787	1,373	10,452	21,774	86.95	151.59	1,154.02	2,404.21
142	450	30	726	677	5,281	11,002	61.91	57.73	450.08	937.67
143	2325	25	53	70	408	850	23.16	31.01	179.66	374.29
144	2050	25	76	103	816	1,700	29.44	39.81	316.82	660.04
145	372	25	76	103	816	1,700	5.34	7.22	57.49	119.77
145	275	25	76	103	816	1,700	3.95	5.34	42.50	88.54
146	1317	25	317	734	5,248	10,933	79.04	183.13	1,308.95	2,726.97
147	1317	25	531	627	5,780	12,041	132.56	156.49	1,441.60	3,003.34
148	575	25	507	390	3,264	6,801	55.19	42.50	355.50	740.62
149	575	25	248	572	3,264	6,801	27.01	62.26	355.50	740.62
150	1119	25	93	79	1,044	2,175	19.75	16.83	221.26	460.95
151	1819	25	68	160	1,576	3,283	23.45	54.97	542.89	1,131.02
152	1358	25	602	644	5,780	12,041	154.89	165.65	1,486.48	3,096.84

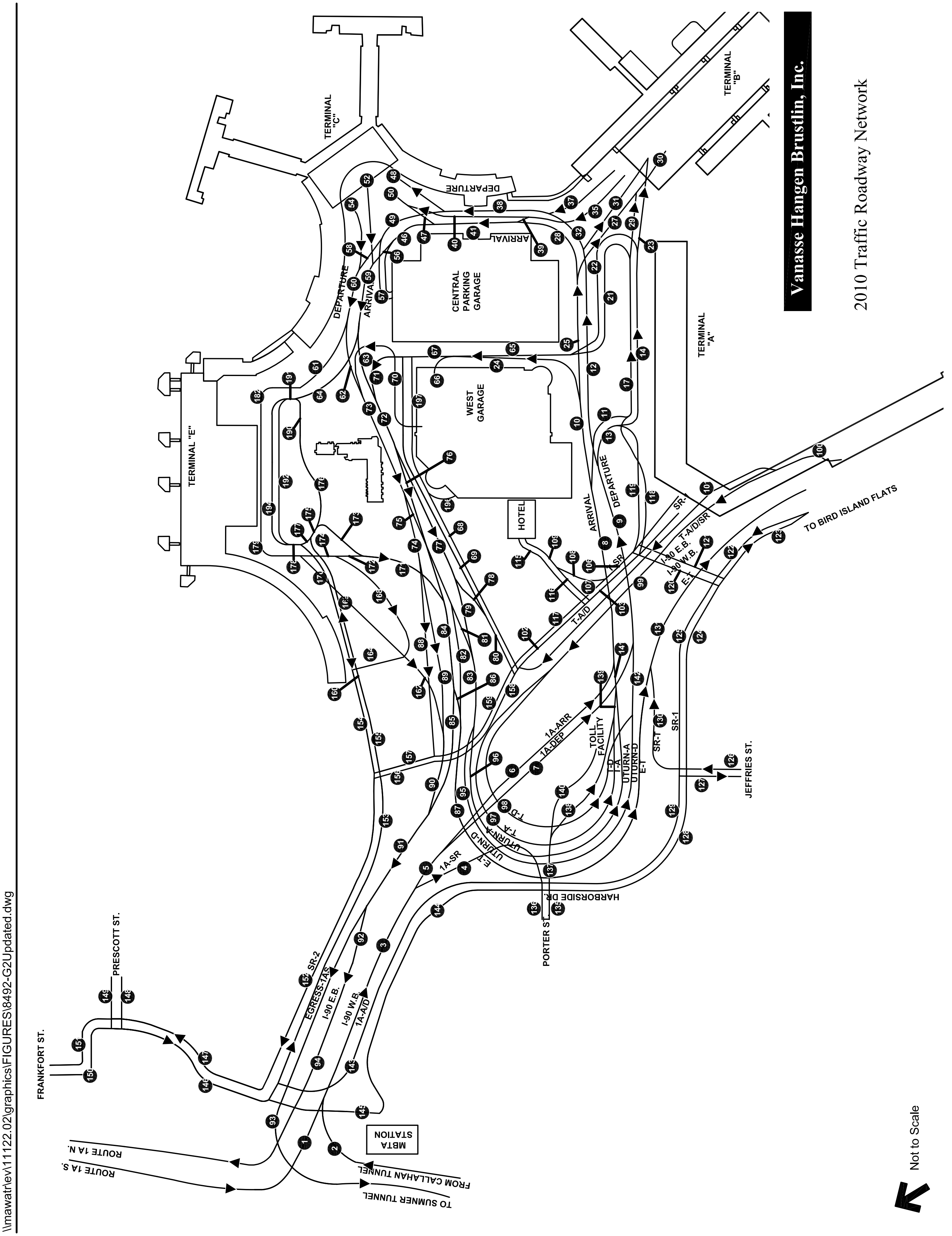
Table G-6 2010 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME AM Peak	VOLUME PM Peak	VOLUME High 8-Hour	VOLUME AWDT	VMT AM Peak	VMT PM Peak	VMT High 8-Hour	VMT AWDT
152	431	25	602	644	5,780	12,041	49.16	52.57	471.78	982.87
153	986	25	364	1,121	4,840	10,083	67.99	209.33	903.78	1,882.87
153	431	25	364	1,121	4,840	10,083	29.72	91.50	395.06	823.04
153	372	25	364	1,121	4,840	10,083	25.65	78.98	340.98	710.37
154	610	25	329	376	3,022	6,295	38.06	43.41	349.09	727.27
155	240	25	356	1,390	2,158	4,495	16.20	63.19	98.07	204.31
156	253	25	789	822	7,329	15,268	37.83	39.38	351.16	731.58
157	254	25	980	1,556	7,404	15,426	47.13	74.86	356.19	742.07
158	626	25	776	805	7,183	14,965	91.97	95.45	851.66	1,774.30
159	626	25	728	1,447	5,753	11,985	86.34	171.61	682.06	1,420.97
160	610	25	96	124	2,158	4,495	11.15	14.31	249.26	519.30
162	1050	25		483	1,231	2,564	19.34	95.98	244.76	509.91
164	990	25	97	72	516	1,075	9.43	13.48	96.76	201.58
165	50	15	50	8	46	95	0.00	0.08	0.43	0.90
166	50	35	0	59	470	980	0.41	0.56	4.45	9.28
167	50	15	44	6	46	95	0.01	0.06	0.43	0.90
168	420	35	1	66	516	1,075	3.55	5.24	41.05	85.52
169	310	25	45	100	1,420	2,959	3.66	5.85	83.38	173.72
170	310	25	62	209	1,768	3,684	11.18	12.26	103.82	216.28
171	295	25	190	399	3,289	6,851	10.12	22.27	183.74	382.79
172	108	25	181	37	373	776	0.54	0.77	7.62	15.88
173	115	25	26	370	2,916	6,075	3.22	8.06	63.51	132.32
174	302	25	148	103	889	1,851	4.06	5.91	50.83	105.89
175	165	25	71	438	3,481	7,252	5.47	13.68	108.78	226.62
176	365	25	175	67	565	1,177	1.86	4.65	39.05	81.36
177	105	25	27	324	2,061	4,293	2.21	6.45	40.98	85.38
178	45	25	111	533	3,829	7,977	2.57	4.54	32.63	67.99
179	464	20	301	246	2,119	4,416	14.87	21.66	186.25	388.03
180	50	15	169	120	1,386	2,888	0.67	1.13	13.13	27.35
181	50	15	70	142	1,386	2,888	0.49	1.35	13.13	27.35
182	602	20	52	287	2,119	4,416	18.50	32.70	241.65	503.43
183	50	15	162	57	369	769	0.15	0.54	3.50	7.28
184	50	25	16	10	196	408	0.10	0.10	1.85	3.86
185	50	15	11	59	369	769	0.08	0.56	3.50	7.28
186	50	25	9	70	565	1,177	0.19	0.66	5.35	11.14
187	50	15	9	4	75	156	0.09	0.04	0.71	1.48

Table G-6 2010 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
188	40	25	10	66	490	1,021	0.08	0.50	3.71	7.73
189	50	15	2	10	75	156	0.01	0.10	0.71	1.48
190	50	15	12	76	565	1,177	0.11	0.72	5.35	11.14
191	85	25	298	515	3,829	7,977	4.79	8.30	61.64	128.42
192	450	20	267	256	2,003	4,173	22.74	21.80	170.73	355.69
193	520	20	31	260	1,826	3,804	3.04	25.56	179.81	374.60
194	450	20	37	275	1,826	3,804	3.13	23.43	155.60	324.17
195	405	20	265	258	2,003	4,173	20.30	19.79	153.66	320.12
196	200	15	6	13	81	170	0.23	0.47	3.08	6.42
				LOGAN AIRPORT ITM VMT ANALYSIS:			**8,451**	**10,887**	**78,185**	**162,885**

AWDT = Average annual weekday daily traffic



Vanasse Hangen Brustlin, Inc.
2010 Traffic Roadway Network
TERMINAL "A"
TERMINAL "B"
TERMINAL "C"
TERMINAL "E"
CENTRAL PARKING GARAGE
WEST GARAGE
HOTEL
DEPARTURE
ARRIVAL
TOLL FACILITY
MBTA STATION
TO BIRD ISLAND FLATS
JEFFRIES ST.
HARBORSIDE DR.
PORTER ST.
PRESCOTT ST.
FRANKFORT ST.
ROUTE 1A N.
ROUTE 1A S.
FROM CALLAHAN TUNNEL
TO SUMNER TUNNEL
SR-2
EGRESS-TAS
I-90 E.B.
I-90 W.B.
1A-A/D
1A-SR
1A-ARR
1A-DEP
T-A/D
T-A/D/SR
UTURN-A
UTURN-D
SR-1
SR-T
Not to Scale
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Massachusetts Port Authority
One Harborside Drive, Suite 200S
East Boston, MA 02128-2909
Telephone (617) 428-2800
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March 1st, 2010

Ms. Barbara Kwetz
Department of Environmental Protection
Division of Air Quality Control
One Winter Street
Boston, MA 02108

Re: March 1st, 2010 Logan Airport Parking Space Inventory

Dear Ms. Kwetz:

In compliance with the reporting requirements of 310 CMR 7.30 (3)(d), enclosed are the following March 1st, 2010 Massachusetts Port Authority submissions:

- Commercial Parking Space Inventory
- Employee Parking Space Inventory

We also continue to provide information on rental car spaces as a courtesy.

The attachments provide the quantity, physical distribution and allocation of commercial and employee parking spaces as defined by 310 CMR 7.30, as amended. These inventory tables are based on information provided to me by the Aviation Department's Ground Transportation Unit, as supplemented by field checks, and represent the most up to date information on parking at Logan International Airport as of March 1st, 2010.

The Commercial Parking Space Inventory now totals 17,319 parking spaces (15,422 in service and 1,897 designated). The Employee Parking Space Inventory totals 3,373 employee parking spaces (2,853 in service and 520 designated). Designated spaces reflect parking spaces that are temporarily out of service. The total inventory of spaces at Logan Airport remains unchanged at 20,692.

Massport's parking program remains in compliance with the Aviation and Transportation Security Act of 2001 (ATSA) and supplemental FAA security directives, and our top priority continues to be the safe and secure operation of our transportation and parking facilities. The Authority has also recently designated priority parking spaces for qualified alternative fuel vehicles. The Central and West Garages have a total of 80 such spaces and the Terminal B Garage has another 10 spaces.

The Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended. If you have any questions, please call me at (617) 568-3570.

Sincerely,

Craig Leiner
Economic Planning & Development Department

cc: C. Kirby
L. Dantas
S. Dalzell
I. Wallach
B. Desrosiers
D. Cook

Commercial Parking Space Inventory
Logan International Airport
March 1, 2010 Submission

In-Service Commercial Parking Spaces

Map ID#	Location of Commercial Parking Areas	Number of Spaces
C1a	Central Garage	7,227
C1b	West Garage	3,148
C2	Terminal B Garage	2,235
C3	Lot 3 (former USPS site)	416
C4	Logan Airport Hilton	235
C5	Signature (General Aviation Terminal)	35
C6	Economy Lot 2 / Satellite II Parking	932
C7a	Harborside Hyatt Conference Center	258
C8a	Terminal E Lot 1	269
C8b	Terminal E Lot 2	257
C9	"Gulf Station" Lot	150
C10	"Sky Chef" Lot	260
Total In-Service Commercial Parking Spaces		**15,422**
Total Designated Commercial Parking Spaces		**1,897**
Total Commercial Parking Spaces		**17,319**
Total Employee Parking Spaces *(see table on next page)*		**3,373**
TOTAL PARKING FREEZE SPACES		**20,692**

Employee Parking Space Inventory
Logan International Airport
March 1, 2010 Submission

In-Service Employee Parking Spaces

Map ID#	Location of Employee Parking Areas	Number of Spaces
E1	Central Parking / West Garage	83
E2	Massport Tower	526
E3	Old Terminal D (former State Police)	151
E4	Massport Facilities 1 (Heating Plant)	94
E5a	North Cargo Building 11, TSA lot	81
E5b	North Cargo Building 11, State Police lot	158
E6	North Gate & EMS Trailer	31
E8	North Cargo Building 8	89
E9	US Airways Administration	74
E10	Massport Facilities 2	35
E11	Massport Facilities 3	87
E12	LSG Sky Chefs	112
E13	Massport Taxi Pool	10
E14	Gate Gourmet	85
E15	Bird Island Flats (BIF) / LOC Garage	504
E16	Lot B	297
E17	South Cargo Building 63	16
E18	South Cargo Building 62	51
E19	South Cargo Building 58	23
E20	South Cargo Building 57	44
E21	South Cargo Building 56	72
E22	Amelia Earhart Building (old RJ/GA Terminal)	89
E25	Hilton Hotel	30
E26	UPS	44
E94	Building 94 (United)	66
N/A	*ARFF Satellite Station* [1]	5

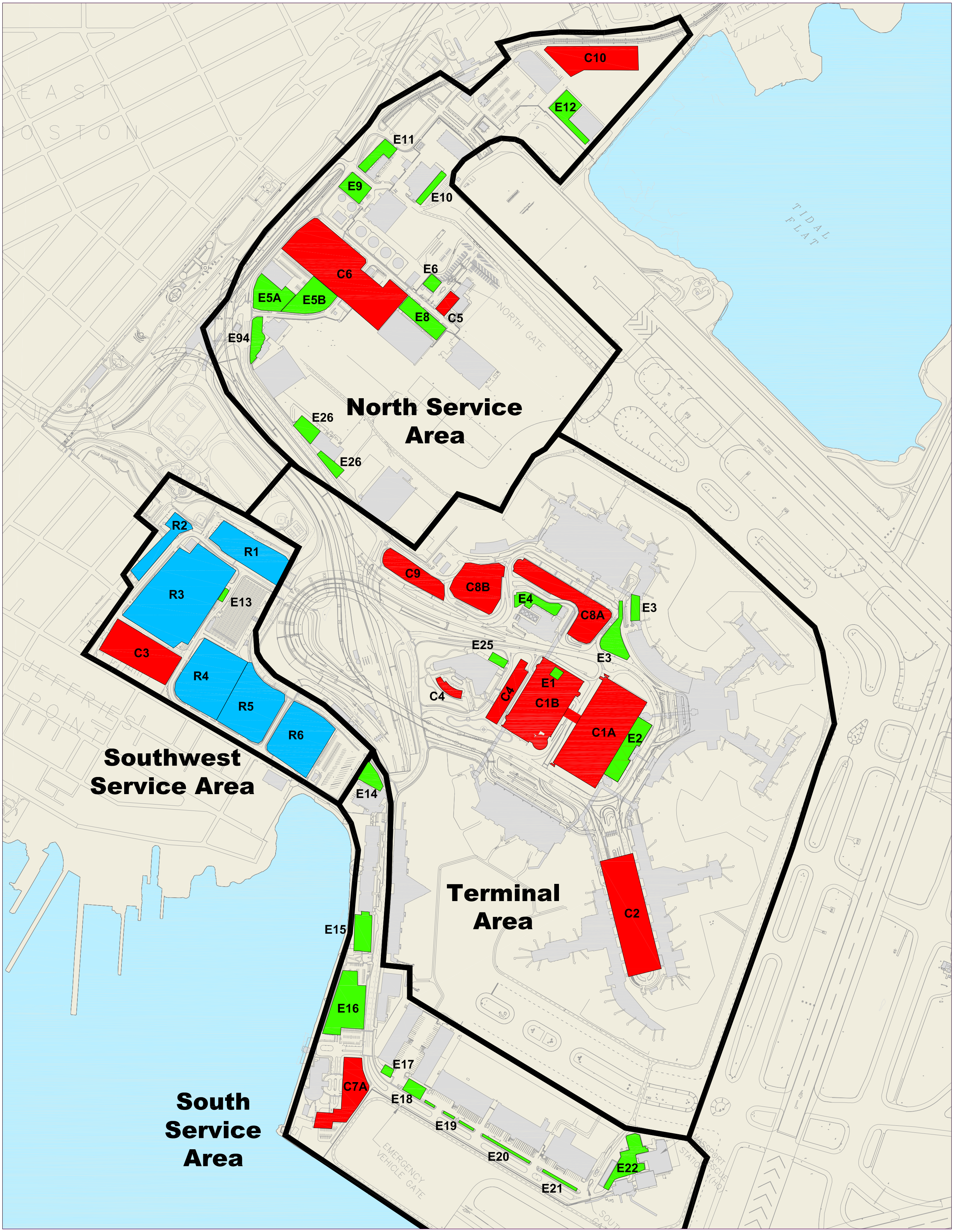
[1] This facility is located on the airfield and is not shown in the map.

Total In-Service Employee Parking Spaces	**2,857**
Total Designated Employee Parking Spaces	**516**
Total Employee Parking Spaces	**3,373**
Total Commercial Parking Spaces *(see table on previous page)*	**17,319**
TOTAL PARKING FREEZE SPACES	**20,692**

Supplemental Information: Rental Car Spaces Inventory
Logan International Airport
March 1, 2010 Submission

Rental Car Company Parking Spaces

Map ID#	Number of Spaces
R1	1,027
R2	130
R3	1,016
R4	1,550
R5	960
R6	337
Total Rental Car Spaces	**5,020**



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Logan Airport Parking Space Inventory

Logan International Airport
East Boston, MA

Massachusetts Port Authority

March 1, 2010

Legend:

- Logan Parking Service Area Zones
- Commercial Parking Space Locations
- Employee Parking Space Locations
- Rental Car Parking Space Locations

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in feet

Notes:

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September 1st, 2010

Ms. Barbara Kwetz
Department of Environmental Protection
Division of Air Quality Control
One Winter Street
Boston, MA 02108

Re: September 1st, 2010 Logan Airport Parking Space Inventory

Dear Ms. Kwetz:

In compliance with the reporting requirements of 310 CMR 7.30 (3)(d), enclosed are the following September 1st, 2010 Massachusetts Port Authority submissions:

- Commercial Parking Space Inventory
- Employee Parking Space Inventory
- Location Map

Massport's parking program remains in compliance with the Aviation and Transportation Security Act of 2001 (ATSA) and supplemental FAA security directives, and our top priority continues to be the safe and secure operation of our transportation and parking facilities. We continue to provide information on rental car spaces as a courtesy.

The attachments provide the quantity, physical distribution and allocation of commercial and employee parking spaces as defined by 310 CMR 7.30, as amended. These inventory tables are based on information provided by the Aviation Department's Ground Transportation Unit, as supplemented by field checks, and represent the most up to date information on parking at Logan International Airport as of September 1st, 2010.

The Commercial Parking Space Inventory now totals 17,319 parking spaces (14,592 in service and 2,727 designated). The Employee Parking Space Inventory totals 3,373 employee parking spaces (2,493 in service and 880 designated). Designated spaces reflect parking spaces that are temporarily out of service. The total inventory of spaces at Logan Airport remains unchanged at 20,692.

There are several changes of note since the March 1st, 2010 filing. First, to improve efficiency and customer service and to meet the growing demand for economy parking, the Authority is working to consolidate economy parking spaces in the North Cargo Area. The Authority is currently constructing two decks over the existing economy parking lot on Prescott Street. Second, the enabling projects necessary to advance the construction of the new rental car facility started in August. This has resulted in relocation of employee spaces and will require relocation of commercial spaces; in some cases, commercial spaces may be temporarily removed from service.

The attached Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended. If you have any questions, please call me at (617) 568-3570.

Sincerely,

Craig Leiner

Craig Leiner
Economic Planning & Development Department

cc: C. Kirby
L. Dantas
S. Dalzell
I. Wallach
B. Desrosiers
D. Cook

Commercial Parking Space Inventory
Logan International Airport
September 1, 2010 Submission

In-Service Commercial Parking Spaces

Map ID#	Location of Commercial Parking Areas	Number of Spaces
C1a	Central Garage	7,227
C1b	West Garage	3,148
C2	Terminal B Garage	1,880
C3	Lot 3 (former USPS site)	416
C4	Logan Airport Hilton	235
C5	Signature (General Aviation Terminal)	35
C6	Economy Lot 2 / Satellite II Parking *(closed)*	0
C7a	Harborside Hyatt Conference Center	251
C8a	Terminal E Lot 1	269
C8b	Terminal E Lot 2	257
C9	"Gulf Station" Lot	229
C10	"Sky Chefs"/Purple Lot	408
C11	Orange Lot (aka Wood Is. Station lot)	237

Total In-Service Commercial Parking Spaces	**14,592**
Total Designated Commercial Parking Spaces	**2,727**
Total Commercial Parking Spaces	**17,319**
Total Employee Parking Spaces *(see table on next page)*	**3,373**
TOTAL PARKING FREEZE SPACES	**20,692**

Employee Parking Space Inventory
Logan International Airport
September 1, 2010 Submission

In-Service Employee Parking Spaces

Map ID#	Location of Employee Parking Areas	Number of Spaces
E1	Central Parking / West Garage	93
E2	Massport Tower	517
E3	Terminal C Pier A (Old Terminal D) (two lots)	45
E4	Massport Facilities 1 (Heating Plant)	94
E5a	North Cargo Building 11, TSA lot	81
E5b	North Cargo Building 11, State Police lot	158
E6	North Gate & EMS Trailer	31
E8	North Cargo Building 8	70
E9	US Airways Administration	81
E10	Massport Facilities 2	35
E11	Massport Facilities 3	87
E12a	LSG Sky Chefs, main lot	112
E12b	LSG Sky Chefs, overflow 1	28
E12c	LSG Sky Chefs, overflow 2	22
E13	Massport Taxi Pool	10
E14	Gate Gourmet	85
E15	Bird Island Flats (BIF) / LOC Garage	504
E16	Lot B (aka Economy Lot 4) *(closed)*	0
E17	South Cargo Building 63	16
E18	South Cargo Building 62	51
E19	South Cargo Building 58	23
E20	South Cargo Building 57	44
E21	South Cargo Building 56	72
E22	Fire-Rescue HQ & Amelia Earhart Building	89
E25	Hilton Hotel	30
E26	UPS (Cargo Building 13)	44
E94	United Aircraft Maint. (Buildings 93 & 94)	66
N/A	*ARFF Satellite Station* [1]	5

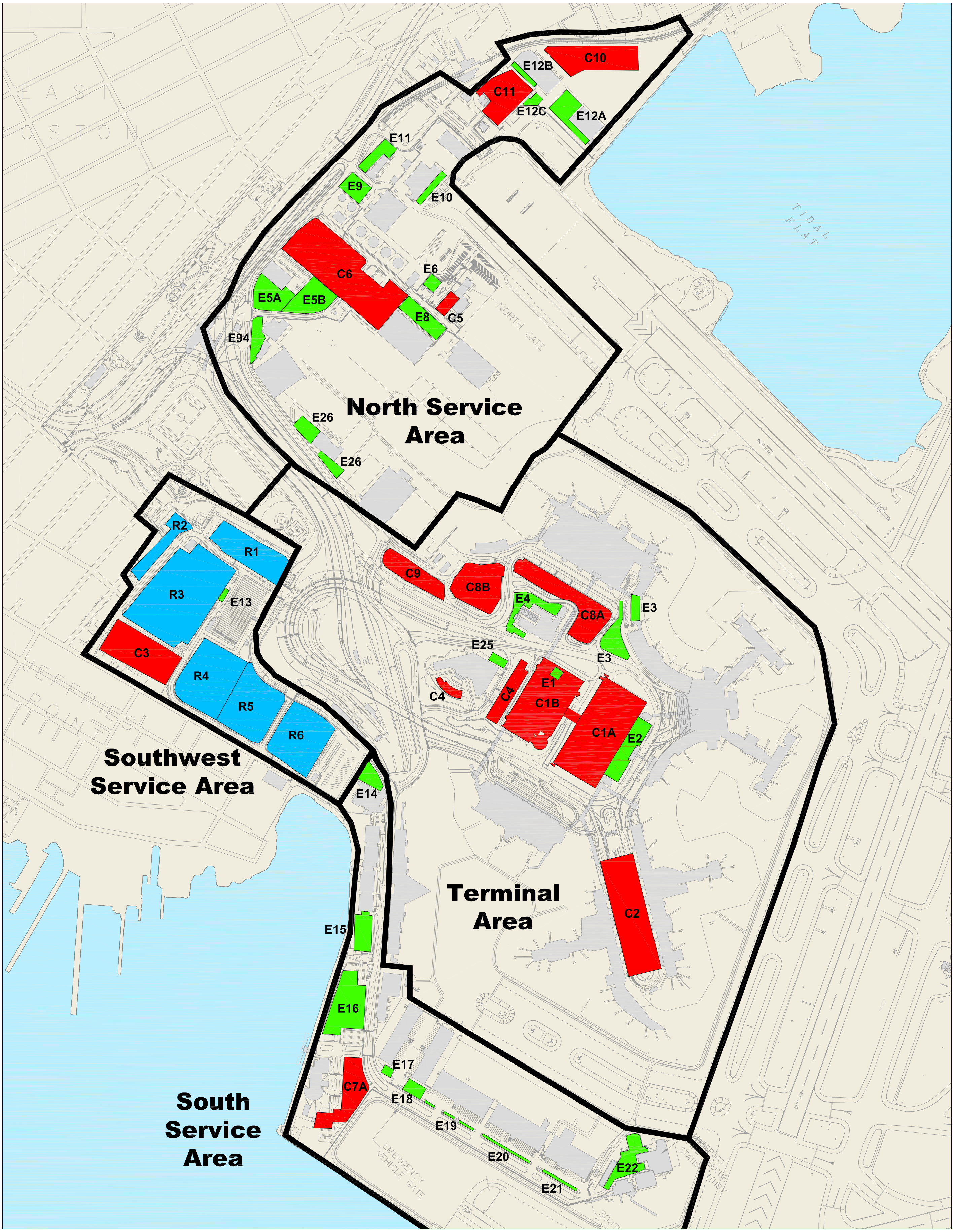
[1] This facility is located on the airfield and is not shown in the map.

Total In-Service Employee Parking Spaces	**2,493**
Total Designated Employee Parking Spaces	**880**
Total Employee Parking Spaces	**3,373**
Total Commercial Parking Spaces *(see table on previous page)*	**17,319**
TOTAL PARKING FREEZE SPACES	**20,692**

Supplemental Information: Rental Car Spaces Inventory
Logan International Airport
September 1, 2010 Submission

Rental Car Company Parking Spaces

Map ID#	Number of Spaces
R1	1,027
R2	130
R3	1,016
R4	1,550
R5	960
R6	337
Total Rental Car Spaces	**5,020**



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Logan Airport
Parking Space Inventory

Logan International Airport
East Boston, MA

Massachusetts Port Authority
August 30, 2010

Legend:

- Logan Parking Service Area Zones
- Commercial Parking Space Locations
- Employee Parking Space Locations
- Rental Car Parking Space Locations

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in feet

Notes:

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H

Noise Abatement

This appendix provides detailed information, tables, and figures in support of *Chapter 6, Noise Abatement*:

- Logan Airport RealContours™ Data Inputs
  - Figure H-1 Schematic Noise Modeling Process (Standard INM vs. RealContoursTM)
  - Table H-1 2010 Annual Modeled Operations
  - Table H-2 2010 Modeled Runway Use by Aircraft Group
  - Table H-3 Summary of Jet and Non-Jet Aircraft Runway Use
  - Table H-4 Total Count of Flight Tracks Modeled in RealContours™ (2010)

- Residential Sound Insulation Program
  - Table H-5 Residential Sound Insulation Program Status (1986-2010)
  - Table H-6 Schools Treated Under Massport Sound Insulation Program

- Noise Exposed Population
  - Table H-7 Noise-Exposed Population by Community
  - Table H-8 Noise Complaint Line Summary
  - Figure H-2 Number of Callers and Complaints between 2005 and 2010

- History of Operations, Runway Use and Cumulative Noise Index (CNI)
  - Table H-9 Modeled Daily Operations by Commercial and General Aviation Aircraft – 1990 to 2010
  - Table H-10 Percentage of Commercial Jet Operations by Part 36 Stage Category – 1990 to 2010
  - Table H-11 Modeled Nighttime Operations at Logan Airport – 1990 to 2010
  - Table H-12 Summary of Jet Aircraft Runway Use – 1990 to 2010
  - Table H-13 Cumulative Noise Index (EPNdB) – 1990 to 2010

- Flight Track Monitoring Report
  - Figure H-3 Logan Airport Gates
  - Table H-14 Runways 4R/4L Nahant Gate Summary for 2010
  - Table H-15 Runways 4R/4L Shoreline Crossings Above 6,000 Feet for 2010
  - Table H-16 Runway 9 Gate Summary – Winthrop Gates 1 and 2 for 2010
  - Table H-17 Runway 9 Shoreline Crossings Above 6,000 Feet for 2010
  - Table H-18 Runway 15R Shoreline Crossings Above 6,000 Feet for 2010
  - Table H-19 Runways 22R/22L Squantum 2 Gate Summary for 2010
  - Table H-20 Runways 15R/22R/22L Gate Summary – North of Hull Peninsula for 2010
  - Table H-21 Runways 22R/22L Shoreline Crossings Above 6,000 Feet for 2010
  - Table H-22 Runway 27 Corridor Percent of Tracks Through Each Gate for 2010
  - Table H-23 Runway 33L Gates – Passages Below 3,000 Feet for 2010

Logan Airport RealContours™ Data Inputs

For this *2010 Environmental Data Report* (*2010 EDR)*, Massport has produced a set of noise contours, time above (TA) noise metrics, and population counts for 2010 using the pair of software packages RealProfiles™ and RealContours™. This software incorporates the latest version of the Federal Aviation Administration (FAA) Integrated Noise Model (INM) Version 7.0b as the computational "engine" for calculating noise, but uses individual flight tracks taken directly from the Massport Noise and Operations Management System (NOMS) rather than relying on consolidated data summaries. For 2010, the NOMS retained suitable data for 349,397 flights; all of these were used in the noise model directly.

Introduction

Standard INM methodology involves development of operational inputs and calculation of the Day-Night Sound Level (DNL) for a prototypical average annual day. This approach requires manually collecting, refining, and entering the enormous amount of data related to a full year of activity at an airport. For example, the model inputs may include an aircraft fleet mix with several dozen representative aircraft types, numerous representative flight tracks (on the order of 100 to 300 is common for an airport comparable to Logan Airport), and runway use and flight track use percentages for three or four categories of aircraft types with similar performance characteristics.

This approach meets accepted professional standards, and reduces the effort and cost that would be associated with manually entering the parameters for every actual operation. However, it represents a significant simplification of the extraordinary diversity of actual aircraft operations over a year. It also does not take full advantage of the investment that Massport has made in installing and maintaining a state-of-the-art radar system[1], which automatically collects flight track data and flight identification data for all operations at the Airport and feeds the new NOMS.

For this report, Massport has selected an INM pre-processor, named RealContours™, which takes maximum possible advantage of both the INM's capabilities and the investment that Massport has made in operations monitoring. RealContours™ automates the process of preparing the INM inputs directly from the actual flight operations, and permits airports to model the full diversity of activity as precisely as possible, at a cost equivalent to the more simplified manual approach. RealContours™ improves the precision of modeling by utilizing operations monitoring results in five key areas:

- Directly converts the flight track for every identified aircraft operation to an INM track, rather than assigning all operations to a limited number of prototypical tracks.
- Models each operation on the specific runway that it actually used, rather than applying a generalized distribution to broad ranges of aircraft types.
- Models each operation in the modeling time frame that it occurred which takes in account delays at the airport during the year.
- Selects the specific airframe and engine combination to model, on an operation-by-operation basis, based on the registration data for each flight wherever possible, otherwise the published compositions of the fleets of the specific airlines operating at Logan Airport are used.
- Uses each aircraft's actual performance and altitude profile to develop inputs to the model which define the actual arrival or departure profile.

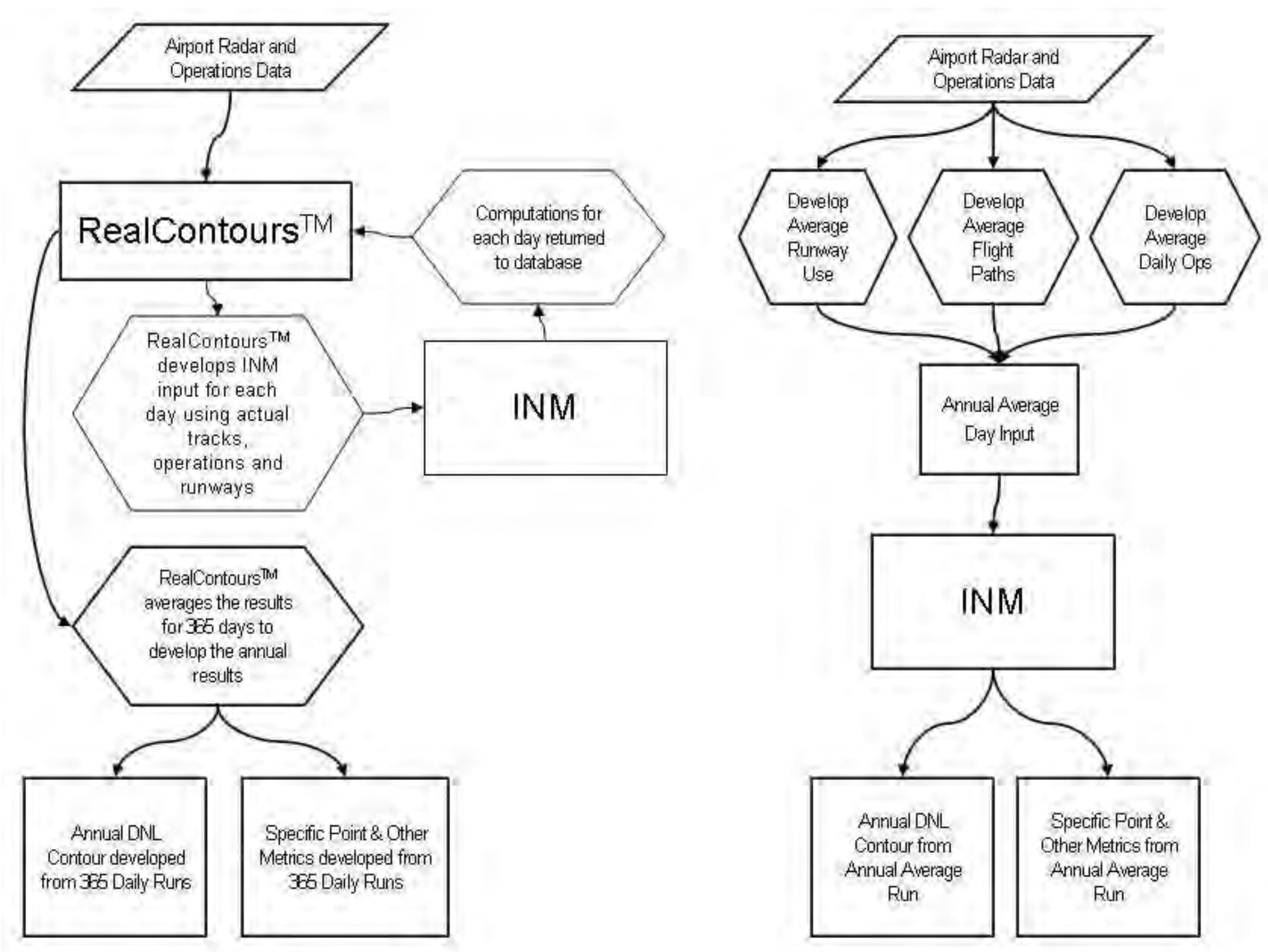
As defined in the INM 7.0 User's Guide, the annual day-night average sound level (YDNL) is used for quantifying airport noise. The YDNL is the 365-day average, day-night average sound level. To use this

1 For 2010, the Massport system utilizes the Airscene.com product of Era Corporation. During 2010 Era Corporations was acquired by ITT Corporation.

definition to model noise in INM, one would have to run 365 cases of the model and average the results. Since this is time consuming and impractical, the current practice is to average the 365 days of data before the run and design one input file.[2] However, RealContours™ accomplishes this task by using the actual radar data to develop INM input files for each day of the year and then averaging the results to obtain the annual contour.

Figure H-1 provides a schematic representation of the RealContours™ noise modeling process compared to the standard INM process.

Figure H-1 Schematic Noise Modeling Process (Standard INM vs. RealContours™)



2 Federal Aviation Administration Integrated Noise Model (INM) Version 7.0 User's Guide, April 2007, p. 12.

2010 Radar Data

Logan Airport's radar data provide the key to the RealContours™ system. Since February 2004, Massport has collected Passive Surveillance Radar System (PASSUR) radar data which supplies information to the Airport's web-based Airport Monitor software. This dataset has been used for the *2004 ESPR* through the *2008 EDR*. Beginning with the 2009 *EDR*, Massport is utilizing the radar data from its NOMS system. This radar data is called multilateration radar since it collects data from multiple ground stations (Massport has eight sensors) deployed around the Airport. The positioning data from all of these sensors is correlated to provide better coverage in areas where the traditional FAA radar has limitations and provides a more complete set of points to define each track. Traditional radar provides points every four to five seconds where the multilateration provides data every second. The new system was able to collect 365 complete days of data for 2010 with approximately 97 percent of these tracks usable for the development of the noise exposure contours.

Fleet Mix

The 2010 radar data first were processed to establish a baseline set of operations. After processing 365 days of radar data, 349,397 flight tracks with sufficient data were identified to use as the baseline for the 2010 contour. The operations from these tracks were then scaled upwards by airline and aircraft type to match the reported totals for 2010. Table H-1 provides the scaled annual operations, as modeled, by aircraft type. The INM aircraft types modeled by RealContours™ match the types listed in Table H-1.

Runway Use

RealContours™ obtains its runway use information directly from the radar data based on the actual runways which were used each day throughout the modeled year. The runway use presented here is broken into six representative aircraft groups listed below: (see Table H-2).

- Heavy Jet A – B747s, A340s, DC-8s
- Heavy Jet B – B767s, B777s, A300s, A310s, A330s, DC-10s, L1011s, MD-11s
- Light Jet A – B717s, B727s, DC-9s, F100s, MD-90s
- Light Jet B – B737s, B757s, A319s, A320s, B-146s, MD-80s, E190, CRJ9
- Regional Jet – E135, E145, E170, CRJ2, CRJ7, J328 and Corporate Jets
- Turboprops and Piston Aircraft (Non-Jets)

The runway use has been grouped in this format to allow comparison with prior years. However, the definition of regional jet used in the Environmental Data Report (EDR) was changed to represent aircraft with less than 80 seats which shifted two aircraft types E190 and the CRJ9 to the Light Jet B category.

Table H-2 shows the runway use that was used to model the 2010 noise conditions. As described above, turbojet aircraft in the table were grouped into different categories for reporting purposes. Because the 2010 contour developed using RealContours™ reflects the individual use of the runways by each INM aircraft type, it accurately represents Logan Airport's noisiest aircraft by modeling them on the actual runways that they used during the year. The modeled runway use for each particular aircraft type may be different than the overall group runway use presented in Table H-2.

Table H-1 2010 Annual Modeled Operations

INM Type	Runway Use Group	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total
Commercial Jet Operations						
747400	HJA	916	11	766	161	1853
A340-211	HJA	1172	6	928	251	2357
A340-642	HJA	487	3	472	18	980
DC870	HJA	148	115	6	257	526
767300	HJB	822	39	785	77	1723
767400	HJB	5	1	5	1	12
767CF6	HJB	8	0	7	1	17
777200	HJB	564	78	617	25	1284
777300	HJB	2	0	2	0	4
A300-622R	HJB	193	636	326	502	1658
A310-304	HJB	204	9	22	191	427
A330-301	HJB	1239	7	1201	42	2490
A330-343	HJB	75	0	52	26	153
DC1010	HJB	576	399	325	651	1951
DC1030	HJB	13	7	13	6	39
MD11GE	HJB	3	1	1	3	8
MD11PW	HJB	2	0	1	1	4
717200	LJA	4618	478	4533	563	10191
727EM2	LJA	326	163	254	235	978
DC93LW	LJA	49	10	48	12	119
DC95HW	LJA	909	84	885	108	1985
MD9025	LJA	0	1	0	1	2
MD9028	LJA	47	165	140	72	423
7373B2	LJB	453	46	456	43	998
737400	LJB	791	32	797	26	1646
737500	LJB	1813	53	1698	168	3733
737700	LJB	7513	1435	7807	1141	17897
737800	LJB	7671	1881	8659	894	19104
737N17	LJB	3	0	3	0	6
757300	LJB	90	3	87	6	186
757PW	LJB	5569	1694	6210	1053	14526
757RR	LJB	4536	1189	4776	949	11450
A319-131	LJB	11447	2035	11394	2089	26966
A320-211	LJB	2711	777	3002	490	6980
A320-232	LJB	13272	4426	15507	2188	35393

Note: Some totals may not match due to rounding.

Table H-1 2010 Annual Modeled Operations (Continued)

INM Type	Runway Use Group	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total
Commercial Jet Operations (Continued)						
A321-232	LJB	245	393	297	341	1276
CRJ9-ER	LJB	130	29	126	23	309
CRJ9-LR	LJB	1598	169	1473	305	3544
EMB19D**	LJB	19499	2366	19732	2134	43730
MD81	LJB	4	0	4	0	8
MD82	LJB	717	61	754	23	1556
MD83	LJB	4432	600	4687	345	10064
CL600	RJ	52	6	54	4	116
CL601	RJ	10122	480	10138	475	21213
CRJ9-ER	RJ	1104	83	1106	69	2362
EMB145	RJ	8348	576	7878	1044	17847
EMB14L	RJ	1214	5	1201	19	2440
EMB17D**	RJ	5638	751	5360	1030	12779
GIV	RJ	3	2	5	0	10
GV	RJ	3	1	4	0	8
LEAR25	RJ	2	2	2	1	6
LEAR35	RJ	70	10	72	8	161
Commercial Jets Subtotal		**121428**	**21321**	**124679**	**18071**	**285498**
Commercial Non-Jet Operations						
BEC58P	NJ	17453	512	17852	112	35929
CNA208	NJ	35	0	35	0	69
DHC6	NJ	8	1	8	1	18
DHC8	NJ	778	2	775	5	1561
DHC830	NJ	2068	332	2059	341	4799
PA31	NJ	172	249	171	249	841
SF340	NJ	4562	61	4587	37	9247
Commercial Non-Jet Operations Subtotal		**25076**	**1157**	**25487**	**745**	**52464**
Commercial Aircraft Total		**146503**	**22478**	**150165**	**18815**	**337962**
General Aviation (GA) Operations						
747400	HJA	2	0	1	1	4
A340-211	HJA	0	0	1	0	1
A340-642	HJA	1	0	1	0	2
A380-841	HJA	1	0	1	0	2
DC870	HJA	1	0	1	0	2
767300	HJB	1	1	1	1	4
767CF6	HJB	0	1	1	0	2

Notes: BEC58P is the INM substitution for the Cessna 402.
The CRJ9-ER in the RJ category is the CRJ700 aircraft.
Some totals may not match due to rounding.

Table H-1 2010 Annual Modeled Operations (Continued)

INM Type	Runway Use Group	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total
General Aviation Operations (Continued)						
777200	HJB	1	0	0	1	2
A300-622R	HJB	1	0	0	1	2
A330-301	HJB	2	0	2	0	4
MD11GE	HJB	1	0	1	0	2
717200	LJA	0	1	0	1	2
727EM2	LJA	3	0	2	1	5
DC93LW	LJA	1	0	1	0	2
F10062	LJA	13	1	13	1	28
737400	LJB	2	2	2	2	7
737700	LJB	8	1	7	1	16
737800	LJB	2	1	2	0	4
757PW	LJB	2	1	3	1	6
757RR	LJB	2	1	1	2	6
A319-131	LJB	2	0	2	0	4
EMB19D**	LJB	3	1	3	0	7
MD83	LJB	1	1	1	1	4
CIT3	RJ	44	1	44	1	90
CL600	RJ	600	61	614	47	1322
CL601	RJ	238	18	238	18	513
CNA500	RJ	129	6	124	11	270
CNA510	RJ	20	0	16	4	40
CNA55B	RJ	499	34	488	41	1061
CNA750	RJ	279	38	299	19	634
ECLIPSE500	RJ	7	1	6	2	16
EMB145	RJ	28	6	32	2	69
EMB14L	RJ	747	41	610	178	1576
FAL20	RJ	2	0	2	1	4
FAL50**	RJ	100	7	96	11	214
FAL900**	RJ	97	11	98	10	216
GII	RJ	3	0	2	1	6
GIIB	RJ	37	8	42	3	90
GIV	RJ	301	36	302	35	674
GV	RJ	200	32	205	27	463
IA1125	RJ	62	11	68	5	146
LEAR25	RJ	5	1	4	0	11
LEAR35	RJ	1060	124	1062	122	2368
MU3001	RJ	672	92	670	99	1533

Note: Some totals may not match due to rounding.

Table H-1 2010 Annual Modeled Operations (Continued)

INM Type	Runway Use Group	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total
General Aviation Operations (Continued)						
1900D	NJ	1	1	2	0	3
BEC58P	NJ	252	46	248	50	597
CNA172	NJ	11	0	11	0	23
CNA206	NJ	71	1	69	2	144
CNA208	NJ	551	42	551	42	1185
CNA20T	NJ	16	0	16	1	33
CNA441	NJ	66	7	63	10	145
CVR580	NJ	1	0	1	0	1
DHC6	NJ	289	14	280	24	608
DHC830	NJ	2	0	2	0	4
EMB120	NJ	1	1	2	1	4
GASEPF	NJ	14	0	14	0	29
GASEPV	NJ	169	10	174	6	359
HS748A	NJ	2	0	2	0	3
J328**	NJ	0	1	1	0	2
PA28	NJ	11	0	11	0	23
PA30	NJ	4	0	4	0	9
PA31	NJ	23	2	21	4	49
PA42	NJ	1	0	1	0	2
SD330	NJ	5	0	5	1	11
SF340	NJ	10	0	9	1	20
General Aviation Total		**6680**	**661**	**6554**	**787**	**14682**
Grand Total		**153183**	**23139**	**156719**	**19602**	**352643**

Source: HMMH, 2011.
Notes: Annual operations modeled in the 2010 Annual contour.
** User Defined Aircraft.
Some totals may not match due to rounding.
HJA, HJB Heavy Jets A and B
LJA, LJB Light Jets A and B
RJ Regional Jets
NJ Non-jets

Comparing Table H-2 with the similar Table H-2 in the *2009 EDR*, departure use of Runway 33L increased during the day and decreased at night for all jet groups except Heavy Jets-Group A and Group B which saw an increase in both day and night departures. For departures, the largest increase for Heavy Jet Group A was on Runway 15R during the night (52.62 percent in 2010 compared to 38.66 percent in 2009) and decreases on Runway 22R during the night (7.51 percent in 2010 compared to 16.10 percent in 2009). For Heavy Jet-Group B departures, the largest increase was on Runway 15R during the night (42.37 percent in 2010 compared to 25.26 percent in 2009) with decreases on Runway 22R both day and night (14.23 percent in 2010 compared to 28.80 percent in 2009).

Table H-2 2010 Modeled Runway Use by Aircraft Group

ARRIVALS

	Heavy Jets - Group A		Heavy Jets - Group B		Light Jets - Group A		Light Jets - Group B		Regional Jets		Turboprops (Non-jets)	
Runway	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
04L	0.11%	0.00%	0.30%	0.08%	3.30%	0.23%	3.94%	0.40%	11.65%	2.09%	24.04%	5.47%
04R	36.29%	20.62%	34.66%	21.96%	31.33%	24.95%	31.46%	20.96%	23.35%	23.42%	11.52%	17.13%
09	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
14	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
15L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%
15R	1.70%	2.28%	1.53%	1.28%	1.21%	1.26%	1.31%	1.13%	1.18%	1.05%	1.20%	0.54%
22L	24.08%	32.11%	12.98%	28.03%	7.28%	30.47%	11.57%	26.89%	17.27%	26.74%	17.82%	37.01%
22R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.17%	0.86%
27	19.74%	16.79%	35.05%	5.72%	43.07%	17.59%	39.11%	11.22%	28.20%	12.68%	20.46%	12.29%
32	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.10%	0.01%	6.22%	0.56%	11.40%	0.71%
33L	18.07%	28.21%	15.48%	42.93%	13.79%	25.51%	12.51%	39.39%	12.13%	33.47%	7.91%	24.00%
33R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.39%	1.98%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

DEPARTURES

	Heavy Jets - Group A		Heavy Jets - Group B		Light Jets - Group A		Light Jets - Group B		Regional Jets		Turboprops (Non-jets)	
Runway	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
04L	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	18.36%	10.94%
04R	36.29%	5.37%	12.93%	2.11%	4.90%	3.02%	4.95%	3.23%	1.31%	1.96%	5.11%	2.35%
09	0.00%	3.92%	17.06%	10.99%	28.84%	13.66%	29.66%	13.67%	34.81%	17.09%	15.28%	5.58%
14	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.16%	0.13%
15L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.00%
15R	1.70%	52.62%	6.41%	42.37%	2.81%	39.44%	3.32%	38.26%	1.66%	34.74%	2.84%	36.84%
22L	24.08%	4.02%	5.47%	1.18%	2.29%	0.21%	1.75%	0.59%	0.51%	0.23%	0.68%	0.82%
22R	0.00%	7.51%	30.63%	14.23%	32.73%	16.83%	33.34%	18.22%	34.86%	19.33%	37.06%	18.62%
27	19.74%	3.48%	4.30%	7.75%	9.11%	12.42%	9.71%	13.63%	10.39%	16.92%	4.71%	5.78%
32	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
33L	18.07%	23.08%	23.19%	21.38%	19.33%	14.42%	17.27%	12.40%	16.45%	9.72%	15.56%	18.95%
33R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: Massport, HMMH.2011

Notes: Night for noise modeling is defined as 10 PM to 7AM.
Nighttime runway restrictions are from 11PM to 6 AM.
Values may not add to 100 percent due to rounding.

For Light Jets –Group A departures, the largest increase is on Runway 15R during the night (39.44 percent in 2010 compared to 11.65 percent in 2009) with the largest decrease on Runway 9 during the night (13.66 percent in 2010 compared to 28.24 percent in 2009). For Light Jets – Group B departures, the largest increase was on Runway 15R during the night (38.26 percent in 2010 compared to 9.21 percent in 2009) with the largest decrease on Runway 9 during the night (13.67 percent in 2010 compared to 26.84 percent in 2009). For Regional Jet departures use on Runway 27 and Runway 15R increased between 2009 and 2010 for both day and night.

While Table H-2 presents runway use by aircraft groups, Table H-3 presents the total runway use by runway and time of day. The first section of the table displays the operations by runway and time of day for an average day. The second section displays the same information for the year and the last section displays the percent that each runway is used by operation type and time of day. Table H-3 shows that on an average day Runway 22R has the most departures (146.2 per day) and Runway 27 has the most arrivals (139.9 per day). At night, Runway 15R has the most departures (20.7 per day) but Runway 33L has the most arrivals (23.8 per day).

Table H-3 Summary of Jet and Non-Jet Aircraft Runway Use

	Runway												
	4L	4R	9	14[2]	15L	15R	22L	22R	27	32	33L	33R	Total
2010 Daily Operations													
Departures Day	13.6	19.7	118.4	0.1	0.2	13.5	6.6	146.2	37.4	--	73.7	<0.1	429.4
Departures Night	0.3	1.6	7.2	<0.1	0	20.7	0.4	9.5	7.0	--	7.2	0	53.7
Arrivals Day	37.1	111.1	--	--	<0.1	5.3	58.4	1.6	139.9	13.9	49.7	2.5	419.7
Arrivals Night	0.5	13.4	--	--	0	0.7	17.5	<0.1	7.2	<0.1	23.8	<0.1	63.4
Total Daily Operations	51.4	145.8	125.6	0.1	0.2	40.2	83.0	157.3	191.5	13.9	154.4	2.5	966.1
2010 Annual Operations													
Departures Day	4,951	7,175	43,233	49	55	4,913	2,426	53,366	13,660	--	26,883	8	156,719
Departures Night	97	580	2,612	1	0	7,545	134	3,463	2,539	--	2,631	0	19,602
Arrivals Day	13,537	40,566	0	0	25	1,946	21,332	576	51,058	5,087	18,157	900	153,183
Arrivals Night	194	4,909	0	0	0	256	6,400	11	2,646	24	8,674	25	23,139
Total Annual Operations	18,778	53,229	45,845	50	80	14,659	30,292	57,417	69,903	5,111	56,345	934	352,644
2010 Operations Percentage													
Percentage Departures Day	3%	5%	28%	< 1%	< 1%	3%	2%	34%	9%	--	17%	< 1%	100%
Percentage Departures Night	< 1%	3%	13%	< 1%	0%	38%	1%	18%	13%	--	13%	0%	100%
Percentage Arrivals Day	9%	26%	--	--	< 1%	1%	14%	0%	33%	3%	12%	< 1%	100%
Percentage Arrivals Night	1%	21%	--	--	0%	1%	28%	0%	11%	< 1%	37%	< 1%	100%

Source: Massport Noise Office and HMMH 2011.

Notes: The data reflect actual percentages of 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.
Runway 14-32 is unidirectional
Values may not add to 100 percent due to rounding.

Overall, the Airport continued to favor a north-south operating flow in 2010 as shown with the percentage of jet departures by operating direction in Figure 6-5 of *Chapter 6, Noise Abatement.*

Flight Tracks

RealContours™ converts each radar track to an INM model track and then models the scaled aircraft operation on that track. This method keeps the lateral and vertical dispersion of the aircraft types consistent with the radar data, and ensures that anomalies in the departure paths are captured in the RealContours™ system. Table H-4 lists the number of flight tracks used in the RealContours™ modeling system for 2010. Flight tracks from May of 2010 are displayed in Figures 6-6 through 6-11 in *Chapter 6, Noise Abatement.*

Table H-4 Total Count of Flight Tracks Modeled in RealContours™ (2010)

	Runway											
	4L	4R	9	14	15L	15R	22L	22R	27	32	33L	33R
Departures	5,064	7,585	45,435	47	50	12,302	2,496	56,223	15,950	0	29,318	8
Arrivals	13,846	44,875	0	0	23	2,173	27,317	614	53,274	5,302	26,640	855

Source: HMMH 2011, ITT NOMS data

Flight Profiles

To further enhance the results from RealContours™, Massport elected to use the companion RealProfiles™ software. By using the actual radar information along with the equations developed for the INM, RealProfiles™ develops an altitude profile for each aircraft operation. This profile is then modeled in the RealContours™ system. As a result, the modeled aircraft follows both the actual radar track on the ground and the actual radar altitude profile in the sky.

RealProfiles™ provides several advantages over the standard INM profile modeling. The standard INM modeling uses a "Stagelength" to identify an aircraft's departure weight and then models a standard departure profile for that Stagelength. Using Realprofiles™, the RealContours™ system selects a weight similar to the standard modeling but then develops a profile to allow the INM aircraft to follow the actual path flown for that route. For example, if aircraft departing from a particular runway are required to remain level at 3,000 feet for a certain distance, RealProfiles™ will develop a profile that remains level for that distance along the track. In contrast, the standard modeling would use the standard INM profile and would not model the level segment.

RealProfiles™ was able to compute profiles based on the actual radar data for 98.7 percent of the available departure tracks and 90.7 percent of the available arrivals. RealProfiles™ uses the INM supplied aircraft performance database to develop its unique profiles; however, for several aircraft in the INM database the aircraft performance data is not available. For those profiles the INM database contains fixed profiles which are not modified and are used as supplied with the INM data.

Residential Sound Insulation Program

In 2010, Massport completed sound insulation of 56 residential buildings containing 83 dwelling units, resulting in a total of 5,312 residential buildings and 11,219 dwelling units that have been sound-insulated since 1986 when the program was first implemented. Table H-5 lists the yearly progress of this mitigation effort.

Table H-5 Residential Sound Insulation Program Status (1986-2010)

Construction Year	Residential Buildings[1]	Dwelling Units[2]
1986	4	8
1987	43	51
1988	102	159
1989	94	133
1990	121	200
1991	175	360
1992	197	354
1993	318	654
1994	310	542
1995	372	753
1996	323	577
1997	364	808
1998	328	806
1999	330	718
2000	195	601
2001	260	278
2002	205	354
2003	230	468
2004	320	791
2005	314	471
2006	286	827
2007	160	548
2008	94	388
2009	111	287
2010	**56**	**83**
Total	**5312**	**11219**

Source: Massport, 2011.
1 Includes multiple units.
2 Individual units.

Following the FAA's approval of model adjustments based on the effects of terrain (discussed in the *1999 ESPR*), Massport submitted, and the New England Region of the FAA approved, a new sound insulation program. The revised contour, approved for a two-year period beginning in 1999, included dwelling units in East Boston, South Boston, and Winthrop that previously had not been eligible for insulation. Massport received notice of FAA funding in the amount of $5 million. Subsequently, Massport updated its program contour, first with the *2001 EDR* contour and more recently with the Logan Airside Improvements Project approved contour.

These updates have allowed Massport to continue the program with additional funds every year since 1999. This latest update takes into account runway use changes due to the new Runway 14-32 which opened in late November 2006. This update expands the focus of the sound insulation program into Chelsea to satisfy the mitigation commitments made in the Airside Improvements Program Record of Decision. Massport has also utilized a program where they have contacted properties that are still eligible within the RSIP boundaries that had previously declined to participate. They have been offered a second chance to participate in the program.

Table H-6 provides a list of all schools that have been treated under Massport's sound insulation program. To date, Massport has provided sound insulation to 36 schools at a cost of over $8 million.

Table H-6 Schools Treated Under Massport Sound Insulation Program

Boston:	
East Boston	
East Boston High	$381,948
St. Mary's Star of the Sea	$80,901
St. Dominic Savio High	$127,879
St. Lazurus	$46,092
James Otis	$46,092
Samuel Adams	$120,650
Curtis Guild	$180,572
Dante Alighieri	$97,750
P.J. Kennedy	$127,637
Donald McKay	$231,754
Hugh Roe O'Donnell	$113,564
E Boston Central Catholic	$391,768
Manassah Bradley	$237,500
13 East Boston Schools	**$2,184,107**
South Boston:	
St. Augustine	$92,855
Cardinal Cushing	$47,276
Patrick Gavin	$217,077
St. Bridgid's	$112,100
Oliver Hazard Perry	$337,538
Condon School	$294,481
6 South Boston Schools	**$1,101,327**
Roxbury & Dorchester:	
Samuel Mason	$192,401
Dearborn Middle	$248,238
Ralph Waldo Emerson	$155,851
Lewis Middle	$202,092
Nathan Hale Elem.	$92,302
Phillis Wheatley Elem.	$290,794
Davis Ellis Elem.	$253,663
Henry L. Higginson	$119,543
8 Roxbury & Dorchester Schools	**$1,554,884**
27 Total Boston Schools	**$4,840,318**
Winthrop	
Winthrop Jr. High School	$63,756
E. B. Newton	$184,674
A. T. Cummings (Ctr.) School	$800,000
3 Total Winthrop Schools	**$1,048,430**
Revere	
Beachmont School	$854,864
1 Total Revere School	**$854,864**
Chelsea	
Shurtleff School	$292,207
Williams School	$486,258
St. Rose Elementary	$46,396
St. Stanislaus	$66,298
Chelsea High School	$524,249
5 Total Chelsea Schools	**$1,415,408**
36 Total Schools	**$8,159,020**

Source: Massport, 2011

Noise Exposed Population

Table H-7 presents the noise exposed population by community for 2010. This table includes population within the 60-65 dB DNL contours, although a DNL of 65 dB is the federally-defined noise criterion used as a guideline to identify when residential land use is considered incompatible with aircraft noise. The 2010 results using both Census 2000 data and Census 2010 data are presented in the table.

Table H-7 Noise-Exposed Population by Community

Year	Census Data	80+ dB DNL	75+ dB DNL	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
BOSTON[2]							
1990	1980	0	0	1,778	28,970	30,748	NA
1992	1980	0	0	800	4,316	5,116	NA
1993	1980	0	0	264	2,820	3,084	NA
1994	1990	0	106	265	7,698	8,069	30,895
1995	1990	0	106	851	8,815	9,772	33,765
1996	1990	0	106	374	8,775	9,255	40,992
1997	1990	0	106	719	13,857	14,682	54,804
1998	1990	0	58	580	10,877	11,515	52,201
1999[3]	1990	0	58	364	11,632	12,054	45,948
2000[3]	1990	0	58	183	7,880	8,121	32,474
2000[3]	2000	0	0	234	9,014	9,248	35,785
2001[3]	2000	0	0	315	6,515	6,700	27,778
2002[3]	2000	0	0	132	2,625	2,757	23,225
2003[3]	2000	0	0	164	1,730	1,894	21,763
2004[3,4]	2000	0	65	192	4,142	4,399	24,473
2005[3,4]	2000	0	65	104	2,020	2,189	17,661
2006[4]	2000	0	65	99	1,054	1,218	14,866
2007 (INMv7.0a)[4]	**2000**	**0**	**0**	**169**	**4,094**	**4,263**	**21,446**
2008 (INMv7.0b)[4]	**2000**	**0**	**5**	**0**	**3,487**	**3,492**	**18,890**
2009 (INMv7.0b)[4]	**2000**	**0**	**5**	**67**	**937**	**1,009**	**12,284**
2010 (INMv7.0b)[4]	**2000**	**0**	**0**	**67**	**644**	**711**	**14,900**
2010 (INMv7.0b)[4]	**2010**	**0**	**0**	**0**	**689**	**689**	**17,646**
CHELSEA							
1990	1980	0	0	0	4,813	4,813	NA
1992	1980	0	0	0	3,952	3,952	NA
1993	1980	0	0	0	0	0	NA
1994	1990	0	0	0	0	0	8,510
1995	1990	0	0	0	95	95	9,750
1996	1990	0	0	0	0	0	8,744
1997	1990	0	0	0	0	0	10,001
1998	1990	0	0	0	0	0	9,222
1999	1990	0	0	0	95	95	9,249
2000	1990	0	0	0	0	0	5,622
2000	2000	0	0	0	0	0	7,361
2001	2000	0	0	0	0	0	4,508
2002	2000	0	0	0	0	0	3,995
2003	2000	0	0	0	0	0	3,591
2004[4]	2000	0	0	0	0	0	7,756
2005[4]	2000	0	0	0	0	0	5,772
2006[4]	2000	0	0	0	0	0	2,477
2007 (INMv7.0a)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**9,774**
2008 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**7,793**
2009 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**5,462**
2010 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**4,880**
2010 (INMv7.0b)[4]	**2010**	**0**	**0**	**0**	**0**	**0**	**4,897**

Table H-7 Noise-Exposed Population by Community (Continued)							
Year	Census Data	80+ dB DNL	75-80 dB DNL	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
EVERETT							
1990	1980	0	0	0	0	0	NA
1992	1980	0	0	0	0	0	NA
1993	1980	0	0	0	0	0	NA
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999[3]	1990	0	0	0	0	0	0
2000[3]	1990	0	0	0	0	0	0
2000[3]	2000	0	0	0	0	0	0
2001[3]	2000	0	0	0	0	0	0
2002[3]	2000	0	0	0	0	0	0
2003[3]	2000	0	0	0	0	0	0
2004[3,4]	2000	0	0	0	0	0	0
2005[3,4]	2000	0	0	0	0	0	0
2006[4]	2000	0	0	0	0	0	0
2007 (INMv7.0a) [4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2008 (INMv7.0b) [4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2009 (INMv7.0b) [4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2010 (INMv7.0b) [4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2010 (INMv7.0b) [4]	**2010**	**0**	**0**	**0**	**0**	**0**	**0**
MEDFORD							
1990	1980	0	0	0	0	0	NA
1992	1980	0	0	0	0	0	NA
1993	1980	0	0	0	0	0	NA
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999	1990	0	0	0	0	0	0
2000	1990	0	0	0	0	0	0
2000	2000	0	0	0	0	0	0
2001	2000	0	0	0	0	0	0
2002	2000	0	0	0	0	0	0
2003	2000	0	0	0	0	0	0
2004[4]	2000	0	0	0	0	0	0
2005[4]	2000	0	0	0	0	0	0
2006[4]	2000	0	0	0	0	0	0
2007 (INMv7.0a)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2008 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2009 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2010 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2010 (INMv7.0b)[4]	**2010**	**0**	**0**	**0**	**0**	**0**	**0**

Table H-7 Noise-Exposed Population by Community (Continued)

Year	Census Data	80+ dB DNL	75-80 dB DNL	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
QUINCY							
1990	1980	0	0	0	0	0	NA
1992	1980	0	0	0	0	0	NA
1993	1980	0	0	0	0	0	NA
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999	1990	0	0	0	0	0	0
2000	1990	0	0	0	0	0	0
2000	2000	0	0	0	0	0	636
2001	2000	0	0	0	0	0	610
2002	2000	0	0	0	0	0	610
2003	2000	0	0	0	0	0	610
2004[4]	2000	0	0	0	0	0	610
2005[4]	2000	0	0	0	0	0	610
2006[4]	2000	0	0	0	0	0	610
2007 (INMv7.0a)[4]	2000	0	0	0	0	0	0
2008 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2009 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2010 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**0**	**0**	**0**
2010 (INMv7.0b)[4]	**2010**	**0**	**0**	**0**	**0**	**0**	**0**
REVERE							
1990	1980	0	0	0	4,274	4,274	NA
1992	1980	0	0	0	3,848	3,848	NA
1993	1980	0	0	0	4,617	4,617	NA
1994	1990	0	0	0	3,569	3,569	2,099
1995	1990	0	0	0	3,364	3,364	2,304
1996	1990	0	0	172	3,292	3,464	2,505
1997	1990	0	0	0	3,293	3,293	2,047
1998	1990	0	0	0	3,168	3,168	2,132
1999	1990	0	0	128	3,165	3,293	2,047
2000	1990	0	0	0	2,552	2,552	2,386
2000	2000	0	0	0	2,496	2,496	3,100
2001	2000	0	0	0	2,496	2,496	3,100
2002	2000	0	0	0	2,822	2,822	2,399
2003	2000	0	0	0	2,994	2,994	2,227
2004[4]	2000	0	0	82	2,969	3,051	2,678
2005[4]	2000	0	0	82	2,540	2,622	2,731
2006[4]	2000	0	0	82	2,540	2,622	2,698
2007 (INMv7.0a)[4]	**2000**	**0**	0	**0**	**2,450**	**2,450**	**2,853**
2008 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**2,434**	**2,434**	**1,802**
2009 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**2,512**	**2,512**	**1,452**
2010 (INMv7.0b)[4]	**2000**	**0**	**0**	**0**	**2,505**	**2,505**	**1,385**
2010 (INMv7.0b)[4]	**2010**	**0**	**0**	**0**	**2,413**	**2,413**	**2,473**

Table H-7 Noise-Exposed Population by Community (Continued)

Year	Census Data	80+ dB DNL	75-80 dB DNL	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
WINTHROP							
1990	1980	0	676	1,211	2,420	4,307	NA
1992	1980	0	626	1,146	2,488	4,262	NA
1993	1980	0	648	1,211	1,773	3,632	NA
1994	1990	0	417	1,343	5,154	6,914	7,512
1995	1990	0	482	1,611	5,757	7,850	7,077
1996	1990	0	417	1,376	5,930	7,723	7,333
1997	1990	0	417	1,659	6,386	8,462	6,839
1998	1990	0	519	1,522	6,572	8,613	6,507
1999	1990	0	353	1,408	5,946	7,707	7,135
2000	1990	0	277	991	5,240	6,508	7,296
2000	2000	0	247	1,070	4,684	6,001	7,776
2001	2000	0	244	683	4,123	5,050	8,104
2002	2000	0	2	481	2,247	2,730	7,921
2003	2000	0	0	339	1,956	2,295	7,386
2004[4]	2000	0	2	337	1,649	1,988	6,508
2005[4]	2000	0	39	347	1,280	1,666	6,353
2006[4]	2000	0	39	416	1,288	1,743	6,845
2007 (INMv7.0a)[4]	**2000**	**0**	**0**	**247**	**1,139**	**1,386**	**6,749**
2008 (INMv7.0b)[4]	**2000**	**0**	**0**	**244**	**1,409**	**1,653**	**6,547**
2009 (INMv7.0b)[4]	**2000**	**0**	**0**	**171**	**643**	**814**	**4,221**
2010 (INMv7.0b)[4]	**2000**	**0**	**0**	**131**	**523**	**654**	**3,960**
2010 (INMv7.0b)[4]	**2010**	**0**	**0**	**130**	**598**	**728**	**3,720**
All Communities							
1990	1980	0	676	2,989	40,477	44,142	NA
1992	1980	0	628	2,352	14,604	17,584	NA
1993	1980	0	648	1,475	9,210	11,333	NA
1994	1990	0	523	1,608	16,421	18,552	49,016
1995	1990	0	588	2,462	18,031	21,081	52,896
1996	1990	0	523	1,922	17,997	20,442	59,574
1997	1990	0	523	2,378	23,536	26,437	73,691
1998	1990	0	577	2,102	20,617	23,296	70,062
1999	1990	0	411	1,900	20,838	23,149	64,379
2000	1990	0	335	1,174	15,672	17,181	47,778
2000	2000	0	247	1,304	16,194	17,745	54,190
2001	2000	0	244	998	13,004	14,246	43,616
2002	2000	0	2	613	7,694	8,309	38,150
2003	2000	0	0	503	6,680	7,183	35,577
2004[4]	2000	0	67	611	8,760	9,438	41,975
2005[4]	2000	0	104	533	5,840	6,477	33,127
2006[4]	2000	0	104	597	4,882	5,583	27,496
2007 (INMv7.0a)[4]	**2000**	**0**	**0**	**416**	**7,683**	**8,099**	**40,822**
2008(INMv7.0b)[4]	**2000**	**0**	**5**	**244**	**7,330**	**7,579**	**35,122**
2009 (INMv7.0b)[4]	**2000**	**0**	**5**	**238**	**4,092**	**4,335**	**23,419**
2010 (INMv7.0b)[4]	**2000**	**0**	**0**	**198**	**3,672**	**3,870**	**25,125**
2010 (INMv7.0b)[4]	**2010**	**0**	**0**	**130**	**3,700**	**3,830**	**28,736**

Source: Data prepared for Massport by HMMH 2011.
NA Not available.
1 65 dB DNL is the Federally-defined noise criterion.
2 Portions of Dorchester, East Boston, Roxbury, South Boston, and the South End are included in Boston totals.
3 Boston population by community changed in 1999 due to employment of more accurate hill effects methodology and reporting change.
4 All results since 2004 are from the RealContours™ modeling system.

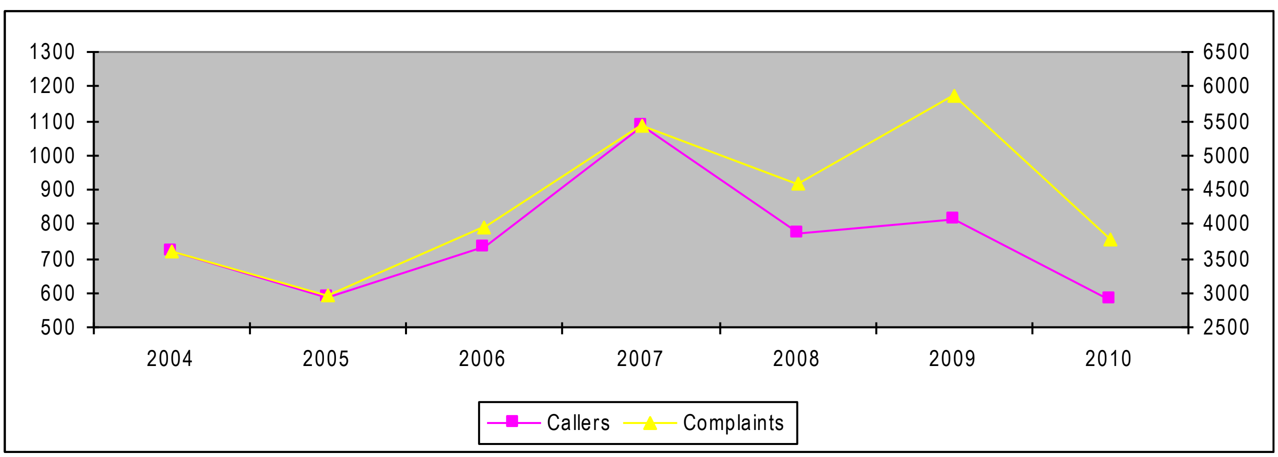
Noise Complaints

Table H-8 presents a summary by community of the total complaints made in 2010 to which can be filed either by Massport's Noise Complaint Line or through a form on Massport's website. The Noise Complaint Line provides individuals the ability to express their concerns about aviation noise (activities) or to ask questions regarding noise at Logan Airport. Callers ask a range of questions such as "Why is this runway in use?"; "What times do the planes stop flying?" and "Was that aircraft off-course?"

The Noise Abatement Office (NAO) staff documents noise line complaints by obtaining information from the caller about the nature of the complaint, time of the occurrence, location of caller's residence, and the activity that was disturbed. The NAO uses the collected information to determine the probable activity responsible for the complaint and writes a letter report to the complainant. The letter includes the original complaint, a response that identifies the activity responsible for the call (arrivals, departures, run-up, etc.), meteorological information at the time of the call (a major factor in aviation activities), runways in use at the time of the call, and a notice that the FAA will receive a copy of the report.

In 2010, Massport received a total of 3,761 noise complaints from 53 communities, a decrease of 35.9 percent from 2009, when the NAO received 5,869 complaints (Figure H-2). Four communities with more than 100 annual complaints had an increase in the number of calls from 2009 and six communities with more than 100 annual complaints had a decrease in the number of calls from 2009. As shown in Figure H-2, there are fewer complaints per caller in 2010 than there have been since 2005. Massport's website, www.massport.com, provides for additional general questions and answers regarding the Noise Complaint Line.

Figure H-2 Number of Callers and Complaints between 2004 and 2010



Source: Massport, HMMH 2011.

Table H-8 Noise Complaint Line Summary

Town	2009 Calls	2009 Callers	2010 Calls	2010 Callers	Change Calls	Town	2009 Calls	2009 Callers	2010 Calls	2010 Callers	Change Calls
Arlington	13	12	11	7	(2)	Nahant	400	111	204	48	(196)
Belmont	14	4	6	4	(8)	Needham	0	0	1	1	1
Beverly	0	0	2	2	2	Newton	1	1	19	3	18
Boston	67	18	30	19	(37)	Norton	1	1	0	0	(1)
Braintree	0	0	1	1	1	Newtown	0	0	1	1	1
Brighton	0	0	3	3	3	North Easton	0	0	1	1	1
Brockton	1	1	0	0	(1)	Norwell	15	1	13	1	(2)
Brookline	0	0	2	1	2	Peabody	5	3	3	2	(2)
Burlington	0	0	3	2	3	Quincy	34	10	8	5	(26)
Cambridge	471	29	323	37	(148)	Randolph	0	0	1	1	1
Canton	3	2	1	1	(2)	Reading	2	2	1	1	(1)
Charlestown	8	6	8	6	0	Revere	103	26	92	27	(11)
Chelsea	570	32	129	17	(441)	Roslindale	4	4	73	5	69
Cohasset	4	2	0	0	(4)	Roxbury	64	5	86	6	22
Dorchester	6	4	5	4	(1)	Salem	3	1	10	2	7
East Arlington	1	1	0	0	(1)	Scituate	8	4	2	1	(6)
East Boston	1,657	55	699	51	(958)	Somerville	325	87	385	74	60
Everett	121	26	40	15	(81)	South Boston	26	15	59	26	33
Framingham	0	0	3	1	3	South End	50	11	28	6	(22)
Hamilton	1	1	0	0	(1)	South Hamilton	0	0	1	1	1
Hingham	47	6	24	7	(23)	Stoneham	2	1	0	0	(2)
Hull	23	10	15	11	(8)	Stoughton	13	3	5	1	(8)
Hyde Park	0	0	2	1	2	Swampscott	10	4	0	0	(10)
Jamaica Plain	93	8	158	15	65	Wakefield	3	3	0	0	(3)
Lynn	154	7	339	3	185	Watertown	4	2	5	4	1
Malden	17	8	4	4	(13)	West Medford	1	1	0	0	(1)
Marblehead	1	1	1	1	0	West Newton	26	1	0	0	(26)
Marshfield	228	6	13	1	(215)	West Roxbury	0	0	1	1	1
Medford	504	67	444	53	(60)	Weymouth	184	4	193	4	9
Melrose	1	1	0	0	(1)	Winchester	9	8	8	5	(1)
Middleton	0	0	2	1	2	Winthrop	513	170	207	70	(306)
Milton	54	22	84	13	30	Woburn	3	3	2	2	(1)
						Worcester	1	1	0	0	(1)
						Total	**5,869**	**812**	**3761**	**580**	**(2108)**

Source: Massport, HMMH 2011.

Fleet Mix

As in the past, 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. 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 H-9 summarizes the numbers of operations by categories of aircraft operating at Logan Airport from 1990 through 2010. General aviation (GA) operations were not included in the noise modeling prior to 1998 and commercial jet operations were not separated until 1999.

Table H-9 Modeled Daily Operations by Commercial and General Aviation Aircraft[1] - 1990 to 2002

		1990	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Commercial Aircraft													
Stage 2 Jets[2]	Day	312.40	228.89	203.34	189.40	156.90	132.40	108.46	84.93	83.30	5.13	1.18	0.05
	Night	19.99	13.13	7.44	10.10	5.50	4.79	7.75	5.92	6.66	0.26	0.05	0.00
	Totals	**332.39**	**242.02**	**210.78**	**199.50**	**162.40**	**137.19**	**116.21**	**90.85**	**89.96**	**5.39**	**1.23**	**0.05**
Stage 3 Jets (All)	Day	288.89	384.49	418.99	425.70	429.40	439.81	505.08	541.43	597.28	727.09	756.24	740.75
	Night	57.25	58.29	65.47	62.80	69.00	80.16	85.06	95.54	98.59	103.66	109.77	97.04
	Totals	**346.14**	**442.78**	**484.46**	**488.50**	**498.40**	**519.97**	**590.14**	**636.97**	**695.87**	**830.75**	**866.01**	**837.79**
Air Carrier Jets	Day	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	569.18	648.95	569.99	500.70
	Night	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	96.21	99.79	101.30	83.52
	Totals	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	**665.39**	**748.74**	**671.29**	**584.22**
Regional Jets	Day	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	28.10	78.14	186.25	240.05
	Night	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	2.38	3.87	8.47	13.52
	Totals	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	**30.48**	**82.01**	**194.72**	**253.57**
Non-Jet Aircraft	Day	444.41	411.84	598.16	541.97	526.85	505.31	514.70	552.56	448.82	409.62	317.62	165.45
	Night	11.72	69.32	46.84	13.59	11.14	13.73	27.27	21.86	16.63	21.58	10.97	3.45
	Total	**456.13**	**481.16**	**645.00**	**555.56**	**537.99**	**519.04**	**541.97**	**574.42**	**465.45**	**431.20**	**328.58**	**168.89**
Total Commercial Operations	Day	1045.70	1025.22	1220.49	1157.07	1113.15	1077.52	1128.24	1178.92	1129.90	1141.84	1075.04	906.25
	Night	88.96	140.74	119.75	86.49	85.64	98.68	120.08	123.32	121.88	125.51	120.79	100.49
	Total	**1134.66**	**1165.96**	**1340.24**	**1243.56**	**1198.79**	**1176.20**	**1248.32**	**1302.24**	**1251.78**	**1267.35**	**1195.82**	**1006.73**
GA Aircraft													
Stage 2 Jets[2]	Day	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	5.25	9.89	7.29	5.15	3.65
	Night	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	0.40	0.74	0.64	0.50	0.41
	Total	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	**5.65**	**10.63**	**7.93**	**5.65**	**4.08**
Stage 3 Jets	Day	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	30.54	48.46	40.08	34.23	37.83
	Night	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	4.21	6.55	3.21	3.28	6.42
	Total	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	**34.75**	**55.01**	**43.29**	**37.51**	**44.25**
Non-Jets	Day	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	37.29	19.36	34.57	37.31	17.36
	Night	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	16.28	18.89	1.83	1.92	4.45
	Total	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	**53.57**	**38.25**	**36.40**	**39.23**	**21.81**
Total GA Operations	Day	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	73.08	77.71	81.94	76.68	58.84
	Night	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	20.89	26.17	5.68	5.71	11.29
	Total	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	**93.97**	**103.88**	**87.62**	**82.39**	**70.13**
Total	Day	1045.70	1025.22	1220.49	1157.07	1113.15	1077.52	1128.24	1252.00	1207.61	1223.78	1151.72	965.09
	Night	88.96	140.74	119.75	86.49	85.64	98.68	120.08	144.21	148.05	131.19	126.50	111.78
	Total[3]	**1134.66**	**1165.96**	**1340.24**	**1243.56**	**1198.79**	**1176.20**	**1248.32**	**1396.21**	**1355.66**	**1354.97**	**1278.21**	**1076.86**

Table H-9 Modeled Daily Operations by Commercial and General Aviation Aircraft[1] – 2003 to 2010 (continued)

		2003	2004	2005	2006	2007	2008	2009	2010
Commercial Aircraft									
Stage 2 Jets[2]	Day	0.08	0.03	0.05	0.03	0.03	0.01	0.00	0.01
	Night	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01
	Total	**0.08**	**0.05**	**0.06**	**0.03**	**0.04**	**0.02**	**0.00**	**0.02**
Stage 3 Jets (All)	Day	717.85	772.39	765.76	767.55	748.13	699.39	668..32	674.25
	Night	92.69	113.24	113.66	114.81	118.29	114.30	103.11	107.92
	Total	**810.54**	**885.63**	**879.42**	**882.36**	**866.42**	**813.69**	**771.43**	**782.17**
Air Carrier Jets[5]	Day	461.06	518.96	505.48	490.63	472.39	443.15	421.51	530.76
	Night	72.69	89.24	91.99	92.71	96.28	89.89	82.19	95.42
	Total	**533.75**	**608.20**	**597.47**	**583.34**	**568.66**	**533.04**	**503.70**	**626.18**
Regional Jets[5]	Day	256.80	253.43	260.34	276.95	275.77	256.24	246.81	143.49
	Night	19.99	24.00	21.68	22.11	22.03	24.40	20.93	12.5
	Total	**276.79**	**277.43**	**282.01**	**299.06**	**297.80**	**280.64**	**267.73**	**155.99**
Non-Jet Aircraft	Day	135.18	133.24	148.77	140.81	145.27	132.52	136.45	138.53
	Night	2.41	3.03	3.02	3.26	3.47	4.00	5.54	5.21
	Total	**137.59**	**136.28**	**151.79**	**144.07**	**148.73**	**136.52**	**141.99**	**143.74**
Total Commercial Operations	Day	853.10	905.66	914.59	908.41	893.43	831.92	804.77	812.78
	Night	95.10	116.29	116.68	118.09	121.77	118.31	108.65	113.13
	Total	**948.20**	**1021.95**	**1031.27**	**1026.51**	**1015.19**	**950.23**	**913.42**	**925.91**
GA Aircraft									
Stage 2 Jets[2]	Day	2.84	0.94	2.29	1.90	1.24	0.36	0.09	0.27
	Night	0.26	0.14	0.25	0.17	0.19	0.03	0.01	0.04
	Total	**3.10**	**1.08**	**2.54**	**2.07**	**1.43**	**0.38**	**0.10**	**0.30**
Stage 3 Jets	Day	46.21	53.72	58.84	61.08	54.82	43.98	22.31	27.80
	Night	6.98	8.37	9.33	6.57	6.39	4.52	2.28	3.21
	Total	**53.19**	**62.09**	**68.16**	**67.65**	**61.21**	**48.49**	**23.59**	**31.01**
Non-Jets	Day	17.81	16.95	14.00	15.05	11.98	15.13	8.19	8.19
	Night	4.40	5.20	4.75	1.39	3.61	1.08	0.74	0.72
	Total	**22.21**	**22.14**	**18.75**	**16.44**	**15.58**	**16.20**	**8.93**	**8.92**
Total GA Operations	Day	66.88	71.60	75.12	78.03	68.04	59.46	29.58	36.26
	Night	11.64	13.71	14.33	8.13	10.19	5.62	3.04	3.97
	Total	**78.52**	**85.31**	**89.46**	**86.15**	**78.22**	**65.05**	**32.62**	**40.22**
Total	Day	919.98	977.27	989.71	986.43	961.46	891.39	834.35	849.03
	Night	106.74	130.00	131.02	126.22	131.96	123.93	111.69	117.10
	Total[3]	**1026.72**	**1107.26**	**1120.73**	**1112.66**	**1093.42**	**1015.31**	**946.04**	**966.13**

Source: Massport's Noise Monitoring System and Revenue Office numbers, HMMH 2011.
Note: Data from 1991 not available.
GA General Aviation
1 Includes scheduled and unscheduled operations.
2 Stage 2 aircraft are exempt from meeting newer federal Stage 3 noise limits when their maximum gross takeoff weight is less than or equal to 75,000 pounds.
3 Regional Jet operations were not tracked separately prior to 1999.
4 Totals prior to 1998 do not include GA operations.
5 The definition of regional jet for the EDR changed between 2009 and 2010. A regional jet in 2010 is a jet in commercial service with less than 80 seats, prior to 2010, a regional jet was a jet in commercial service with 100 seats or less.

Commercial Jet Aircraft by Part 36 Stage Category

Jet aircraft currently operating at Logan Airport are categorized by the FAA into two groups: Stage 2 and Stage 3. As described in *Chapter 6, Noise Abatement*, the designation refers to a noise classification specified in Federal Aviation Regulation (FAR) Part 36 that sets noise emission standards at three measurement locations – takeoff, landing, and sideline – based on an aircraft's maximum certificated weight. The heavier the aircraft, the more noise it is permitted to make within limits. Because of the substantial differences in noise between Stage 2, recertificated Stage 3, and new Stage 3 aircraft, Massport tracks operations by these separate categories to follow their trends. Table H-10 shows the percentage of commercial jet operations by stage category from 1999 through 2010. One of the most significant changes occurring after the economic downturn in 2001 was the almost immediate retirement of the recertificated aircraft from airlines' fleets due to their high operating costs. This type of accelerated retirement is not as prevalent during the 2008/2009 economic downturn since it is no longer the major airlines which are operating these aircraft. However, these aircraft still suffer from high operating costs and are being replaced wherever possible.

Table H-10 Percentage of Commercial Jet Operations by Part 36 Stage Category – 1999 to 2010

	New Stage 3[1]	Recertificated Stage 3[2]	Stage 2	Total
1999	70.0%	21.0%	9.0%	100%
2000	75.0%	24.0%	1.0%	100%
2001	86.3%	13.6%	0.1%	100%
2002	92.8%	7.2%	0.0%	100%
2003	95.8%	4.1%	0.01%	100%
2004	97.8%	2.2%	0.0%	100%
2005	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	99.1%	0..9%	0.0%	100%
2010	98.9%	1.1%	0.0%	100%

Source: Massport and FAA radar data.
1 New Stage 3 aircraft are aircraft originally manufactured as a certified Stage 3 aircraft under Federal Regulation Part 36.
2 Recertificated Stage 3 aircraft are aircraft originally manufactured as a certified Stage 1 or 2 aircraft under Federal Regulation Part 36 which have been either treated with hushkits or have been re-engined to meet Stage 3 requirements.

Nighttime Operations

Massport tracks 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 H-11 shows this nighttime activity by different groups of aircraft. Nighttime flights by commercial jet operators have increased 4.72 percent at Logan Airport compared to 2009. Commercial non-jet operations decreased 5.99 percent from 2009 and general aviation traffic is up 28.5 percent at night. Overall, nighttime operations at Logan Airport increased 4.84 percent. The majority of nighttime operations (between 10:00 PM and 7:00 AM) occurred either before midnight or after 5:00 AM.

Table H-11 Modeled Nighttime Operations at Logan Airport – 1990 to 2010

	Commercial Jets	Commercial Non-Jets	General Aviation[1]	Total
1990	77.24	11.72	NA	88.96
1991	NA[2]	NA[2]	NA[2]	NA[2]
1992	71.42	69.32	NA	140.74
1993	72.91	46.84	NA	119.75
1994	72.90	13.59	NA	86.49
1995	74.50	11.14	NA	85.64
1996	84.95	13.73	NA	98.68
1997	92.81	27.27	NA	120.08
1998	101.46	21.86	NA	123.32
1999	105.25	16.63	26.17	148.05
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	13.71	130.00
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
Change (2009 to 2010)	**4.88**	**-0.35**	**0.89**	**5.40**
Percent Change	**4.7%**	**-6.3%**	**28.9%**	**4.8%**

Source: Massport, HMMH, 2010.
1 General aviation data not available prior to 1999.
2 1991 data not available.

Jet Runway Use

Table H-12 presents a summary of runway use by jets. Since 2001, the radar data have been analyzed with Massport's PreFlight™ software. PreFlight™ is an analysis package used to compile fleet, day/night splits, and runway use information from radar data. Data prior to 2001 were derived from Massport's original noise monitoring system, supplemented with field records. Note that Logan Noise Rules prevent arrivals to Runway 22R and departures from Runway 4L by jet aircraft.

Table H-12 Summary of Jet Aircraft Runway Use - 1990 to 2000

	Runway									
	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
1990										
Departures	0%[2]	3%	21%	NA	10%	2%	36%	20%	NA	7%
Arrivals	1%	25%	0%	NA	2%	14%	0%	28%	NA	29%
1992[2]										
Departures	0%	6%	31%	NA	7%	2%	38%	10%	NA	6%
Arrivals	1%	37%	0%	NA	3%	12%	0%	30%	NA	17%
1993										
Departures	0%	9%	33%	NA	7%	3%	40%	4%	NA	4%
Arrivals	2%	44%	0%	NA	1%	11%	0%	28%	NA	15%
1994										
Departures	0%	9%	33%	NA	4%	3%	32%	12%	NA	5%
Arrivals	3%	42%	0%	NA	1%	8%	0%	27%	NA	19%
1995										
Departures	0%	8%	36%	NA	5%	5%	29%	11%	NA	5%
Arrivals	3%	41%	0%	NA	2%	8%	0%	27%	NA	17%
1996										
Departures	0%	8%	32%	NA	5%	6%	33%	12%	NA	5%
Arrivals	2%	38%	0%	NA	2%	11%	0%	29%	NA	18%
1997										
Departures	0%	8%	30%	NA	5%	6%	31%	15%	NA	5%
Arrivals	2%	36%	0%	NA	2%	9%	0%	30%	NA	20%
1998										
Departures	0%	8%	35%	NA	6%	5%	28%	14%	NA	5%
Arrivals	2%	41%	0%	NA	2%	7%	0%	28%	NA	19%
1999										
Departures	0%	8%	31%	NA	5%	4%	30%	15%	NA	6%
Arrivals	3%	37%	0%	NA	2%	10%	0%	28%	NA	21%
2000										
Departures	0%	8%	35%	NA	4%	3%	30%	15%	NA	6%
Arrivals	4%	50%	0%	NA	1%	7%	0%	28%	NA	20%

Table H-12 Summary of Jet Aircraft Runway Use – 2001 to 2010 (Continued)

	Runway									
	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
2001										
Departures	0%	7%	34%	NA	4%	3%	35%	12%	NA	5%
Arrivals	5%	36%	0%	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%	0%	NA	1%	12%	0%	24%	NA	23%
2005										
Departures	0%	5%	36%	NA	7%	1%	31%	13%	NA	7%
Arrivals	8%	33%	0%	NA	1%	11%	0%	29%	0%	17%
2006										
Departures	0%	4%	33%	0%	3%	1%	40%	13%	-	6%
Arrivals	7%	29%	0%	-	1%	14%	0%	33%	0.2%	16%
2007										
Departures	0%	5%	31%	0%	4%	1%	33%	7%	-	19%
Arrivals	5%	31%	0%	-	1%	15%	0%	36%	2%	11%
2008										
Departures	0%	6%	33%	<1%	3%	<1%	36%	6%	-	16%
Arrivals	6%	30%	-	-	2%	17%	-	33%	2%	11%
2009										
Departures	0%	7%	32%	0%	3%	2%	34%	6%	-	16%
Arrivals	7%	31%	-	-	3%	17%	-	30%	1%	11%
2010										
Departures	0%	4%	28%	<1%	8%	2%	31%	10%	-	17%
Arrivals	5%	28%	-	-	1%	15%	0%	32%	1%	16%

Source: HMMH 2011, Massport Noise Office.

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 PRAS to derive recommendations for use of a particular runway. Effective runway percentages include a factor of 10 applied to nighttime operations so that use of a runway at night more closely reflects its effect on total noise exposure.

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 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).

2 1991 data are not available. The *1990 Final Generic Environmental Impact Report* was published and submitted to the Secretary of Environmental Affairs in July 1993. It included modeled operations and resulting noise contours for 1987, 1990, and a 1996 forecast year. The *1993 Annual Update* published in July 1994 included operations and contours for 1992 and 1993. 1991 data are not available.

NA Runway was not available. 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 Cumulative Noise Index (CNI). The CNI is a single number representing the sum of the entire set of single-event noise levels experienced at the 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 mathematically equivalent to multiplying the number of nighttime events by each aircraft by a factor of 10. The Logan Airport Noise Rules define CNI in terms of Effective Perceived Noise Level (EPNL) 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.

The Noise Rules, adopted by Massport following public hearings held in February 1986, established a CNI limit of 156.5 Effective Perceived Noise Decibels (EPNdB). The CNI generally has decreased since 1990, remaining below that cap, with changes from year to year on the order of a few tenths of a decibel. The 2010 CNI remains well below the cap of 156.5 EPNL.

Table H-13 Cumulative Noise Index (EPNL) – 1990 to 2002

	Logan Airport CNI Cap – 156.5 EPNL												
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Full CNI (Entire Commercial Jet Fleet)	**156.4**	**155.8**	**155.5**	**155.3**	**155.4**	**155.3**	**155.1**	**154.8**	**154.7**	**154.9**	**154.7**	**154.1**	**153.2**
Total Passenger Jets	155.2	154.8	154.6	154.4	154.4	154.2	154.1	153.9	153.7	153.9	153.6	152.9	151.8
Total Cargo Jets	150.1	148.9	148.0	147.9	148.3	148.8	148.6	147.5	147.9	148.0	148.2	147.8	147.4
Total Daytime	152.5	152.1	152.4	152.1	152.1	151.6	151.2	150.8	150.4	150.4	149.5	149.0	148.5
Total Nighttime	154.4	153.4	152.6	152.4	152.6	152.9	152.9	152.5	152.7	153.1	153.1	152.4	151.3
Total Stage 2 Jets	NA	NA	NA	NA	151.0	150.2	149.4	149.2	147.7	147.1	124.7	121.5	114.3
Total Stage 3 Jets	NA	NA	NA	NA	153.4	153.8	153.8	153.4	153.8	154.2	154.7	154.1	153.2
Daytime Stage 2	NA	NA	NA	NA	149.0	148.5	147.6	146.5	145.2	144.1	122.6	119.3	111.2
Nighttime Stage 2	NA	NA	NA	NA	146.7	145.1	144.8	145.8	144.1	144.0	120.5	117.3	111.4
Daytime Stage 3	NA	NA	NA	NA	149.1	148.8	148.7	148.8	148.9	149.2	149.5	149.0	148.5
Nighttime Stage 3	NA	NA	NA	NA	151.4	152.1	152.2	151.5	152.1	152.5	153.1	152.4	151.3
Passenger Jet Stage 2	NA	NA	NA	NA	150.5	149.9	149.2	148.9	147.5	146.8	124.2	116.3	NA
Passenger Jet Stage 3	NA	NA	NA	NA	152.2	152.3	152.3	152.2	152.6	153.0	153.6	152.9	151.8
Cargo Jet Stage 2	NA	NA	NA	NA	141.5	137.4	136.8	137.4	139.0	134.5	114.8	119.9	114.3
Cargo Jet Stage 3	NA	NA	NA	NA	147.3	148.5	148.3	147.0	147.3	147.9	148.2	147.8	147.4
Daytime Passenger	NA	152.0	152.2	152.0	152.0	151.5	151.1	150.6	150.1	150.1	149.3	148.7	148.2
Nighttime Passenger	NA	151.6	150.9	150.6	150.8	151.0	151.0	151.1	151.2	151.6	151.6	150.8	149.4
Daytime Cargo	137.1	137.1	137.6	135.2	136.1	138.0	136.7	136.2	138.0	138.2	137.5	137.1	137.0
Nighttime Cargo	149.9	148.6	147.6	147.6	148.0	148.4	148.3	147.1	147.5	147.6	147.8	147.4	147.0
Daytime Passenger Stage 2	NA	NA	NA	NA	148.9	148.4	147.6	146.5	145.0	143.9	122.3	115.0	NA
Daytime Passenger Stage 3	NA	NA	NA	NA	149.0	148.5	148.4	148.5	148.6	149.0	149.2	148.7	148.2
Nighttime Passenger Stage 2	NA	NA	NA	NA	149.0	148.5	148.4	148.5	142.8	143.7	119.8	110.2	NA
Nighttime Passenger Stage 3	NA	NA	NA	NA	149.4	149.9	150.1	149.8	150.5	150.8	151.6	150.8	149.4
Daytime Cargo Stage 2	NA	NA	NA	NA	128.3	126.7	124.6	126.4	131.6	131.5	111.1	117.3	111.2
Daytime Cargo Stage 3	NA	NA	NA	NA	135.3	137.7	136.4	135.7	136.9	137.1	137.5	137.0	137.0
Nighttime Cargo Stage 2	NA	NA	NA	NA	141.3	137.0	136.5	137.0	138.2	131.5	112.3	116.4	111.4
Nighttime Cargo Stage 3	NA	NA	NA	NA	147.0	148.1	148.0	146.6	146.9	147.5	147.8	147.4	147.0

Table H-13 Cumulative Noise Index (EPNL) – 2003 to 2010 (Continued)									
	Logan Airport CNI Cap – 156.5 EPNL								
Full CNI (Entire Commercial Jet Fleet)	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Change from 2009**
	152.7	**153.4**	**153.2**	**152.6**	**152.7**	**152.9**	**152.3**	**151.9**	**(0.4)**
Total Passenger Jets	151.3	152.2	152.1	151.4	151.5	151.9	151.1	150.9	(0.2)
Total Cargo Jets	147.1	147.0	146.6	146.5	146.4	146.1	145.9	145.1	(0.8)
Total Daytime	148.0	148.5	148.2	147.5	147.2	147.6	147.1	146.8	(0.3)
Total Nighttime	150.9	151.7	151.6	151.0	151.2	151.4	150.7	150.3	(0.4)
Total Stage 2 Jets	114.1	118.1	NA	NA	NA	NA	NA	113.6	NA
Total Stage 3 Jets	152.7	153.4	153.2	152.6	152.7	152.9	152.3	151.9	(0.4)
Daytime Stage 2	113.7	109.4	NA	NA	NA	NA	NA	103.6	NA
Nighttime Stage 2	103.2	117.5	NA	NA	NA	NA	NA	113.1	NA
Daytime Stage 3	148.0	148.5	148.2	147.5	147.2	147.6	147.1	146.8	(0.3)
Nighttime Stage 3	150.9	151.7	151.6	151.0	151.2	151.4	150.7	150.3	(0.4)
Passenger Jet Stage 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Passenger Jet Stage 3	151.3	152.2	152.1	151.4	151.5	151.9	151.1	150.9	(0.2)
Cargo Jet Stage 2	114.1	118.1	NA	NA	NA	NA	NA	113.6	NA
Cargo Jet Stage 3	147.1	147.0	146.6	146.5	146.4	146.1	145.9	145.1	(0.8)
Daytime Passenger	147.7	148.2	147.9	147.2	146.9	147.3	146.8	146.6	(0.2)
Nighttime Passenger	148.8	150.0	150.1	149.3	149.7	150.0	149.1	149.0	(0.1)
Daytime Cargo	136.2	135.7	135.8	135.5	135.8	135.8	135.2	134.5	(0.7)
Nighttime Cargo	146.8	146.7	146.2	146.1	146.0	145.6	145.5	144.7	(0.8)
Daytime Passenger Stage 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Daytime Passenger Stage 3	147.7	148.2	147.9	147.2	146.9	147.3	146.8	146.6	(0.2)
Nighttime Passenger Stage 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nighttime Passenger Stage 3	148.8	150.0	150.1	149.3	149.7	150.0	149.1	149.0	(0.1)
Daytime Cargo Stage 2	113.7	109.4	NA	NA	NA	NA	NA	103.6	NA
Daytime Cargo Stage 3	136.1	135.7	135.8	135.5	135.8	135.8	135.2	134.4	(0.8)
Nighttime Cargo Stage 2	103.2	117.5	NA	NA	NA	NA	NA	113.1	NA
Nighttime Cargo Stage 3	146.8	146.7	146.2	146.1	146.0	145.6	145.5	144.7	(0.8)

Source: HMMH 2011
Notes: General aviation and non-jet aircraft are not included in the calculation.
NA - No operations by this aircraft type in the commercial fleet.
A few Stage 2 cargo Lear 25's were in this years fleet.

Flight Track Monitoring Report

Introduction

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

This is the ninth annual report for flight track monitoring; prior to 2002 Massport had issued semi-annual reports, an outgrowth of the Flight Track Monitoring Program study. That study was contained in the *Generic Environmental Impact Report* filed with Massachusetts Environmental Policy Act (MEPA) in July of 1996, and was the subject of two Community Working Group (CWG) workshops in September and October of 1996. The time period covered by this *2010 EDR* is January 1 through December 31, 2010.

The purpose of the ongoing monitoring program is to identify any systematic changes in flight tracks that may occur and to reduce flight track dispersion, where appropriate. The next report will cover the period January 1, 2011 through December 31, 2011, and will be included in the *2011 EDR*.

FAA Air Traffic Control Procedures

FAA Tower Order BOS TWR 7040.1 entitled "Noise Abatement" describes the series of noise abatement policies, rules, regulations, and the procedures to be followed by the FAA air traffic controllers in meeting their designated responsibilities to be "a good neighbor, while meeting our operational objectives/responsibilities to the National Airspace System (NAS)." Section 7.3 of the Order, subtitled "Turbojet Departure Noise Abatement Procedures" lists that all turbojet departures shall be issued the Standard Instrument Departure (SID) procedure appropriate for the departure runway. They are paraphrased from the Logan Four SID below.

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

On February 14, 2008, several of the conventional-only or radar vector procedures from the Boston Logan Airport Noise Study (BLANS) CATEX[3] were implemented. These procedures primarily affected departures flying over the North and South shores and were designed to increase the amount of jet traffic crossing back over land above 6,000 feet to minimize noise impacts to communities.

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

- For departures from Runway 4R, the noise abatement procedure in the Tower Order is:
  - Fly heading 036 degrees until the BOS 4 DME, then turn right to a heading of 090 degrees, then expect radar vectors to assigned Route/Navaid/Fix. Aircraft that are vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 9, the procedure is: Fly heading 093 degrees, then expect radar vectors to assigned Route/Navaid/Fix. Aircraft that are vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 14, the procedure is: Fly heading 142 degrees until the BOS 1 DME, then turn left to heading 120 degrees, then expect radar vectors to assigned Route/Navaid/Fix. Aircraft that are vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 15R, the procedure is: Fly heading 151 degrees until the BOS 1 DME then turn left to 120 degrees, then expect radar vectors to assigned Route/Navaid/Fix. Aircraft that are vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 22R and 22L: Turn left to a heading of 140 degrees, then expect radar vectors to assigned Route/Navaid/Fix. Aircraft that are vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
- For Runway 27:
  - LOGAN FOUR SID: Fly heading 273 until the BOS 2.2 DME, then turn left heading 235 degrees then expect radar vectors to assigned Route/Navaid/Fix. Note that this procedure was replaced by the LOGAN FIVE effective November 18, 2010, but the initial Runway 27 departure described here did not change.
  - WYLLY SEVEN RNAV (for turbojet aircraft only). Climb heading 273 degrees to 760 MSL, then climbing turn on 235 degrees course to WYLYY waypoint. Cross WYLYY at or above 2300 feet. This procedure keeps most jet traffic in a well defined flight corridor. Note that this procedure was replaced by the WYLLY EIGHT RNAV effective March 10, 2011.
- For Runway 33L: Fly heading 331 degrees until the BOS 2 DME then turn left to 316 degrees, then expect radar vectors to assigned Route/Navaid/Fix.

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

Figure H-3 presents the gates used in the analysis for the Flight Track Monitoring Report. These gates are virtual vertical planes, which are used in the analysis to capture the Airport flight paths. The gates are defined using a geographic coordinate for each end of the gate along with a floor and a ceiling altitude. The gates also capture direction of flights (in or out). The edges of each gate in Figure H-3 point in the direction that the aircraft is coming from. This information is used to evaluate the performance of the flight procedures off each runway end and is presented below.

Figure H-3 Logan Airport Gates

Statistical Analyses of Flight Tracks - Runway 4R

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

Table H-14 shows the dispersion of the jet departures on Runway 4R as they pass through the Nahant Gate. Table H-14 shows that Runway 4R departures were concentrated, with 88.7 percent "over the Causeway," and about 0.3 percent over the south end of the gate compared to 89.7 percent over the Causeway in 2009 and 0.3 percent over the south end of the gate. Departures through the north end of the gate increased from 10.0 percent in 2009 to 11.0 percent in 2010.

Table H-14 Runways 4R/4L Nahant Gate Summary for 2010

	Number of Tracks Through Gate Segment	Total Number of Tracks Through Gate	Percentage of Tracks Through Gate Segment
North End of Gate	682	6,186	11.0%
Over Causeway	5,487	6,186	88.7%
South End of Gate	17	6,186	0.3%
Total	6,186	6,186	100.0%

Source: Massport, HMMH 2011.

Table H-15 shows how many of the shoreline crossings from Runway 4R were above 6,000 feet. For 2010, 97.0 percent of the flights were above 6,000 feet compared to 97.1 percent in 2009. The Swampscott gate had 40.0 percent of flights above 6,000 feet compared to 60.3 percent in 2009. The number of flights through the Swampscott gate decreased in 2010 (126 in 2009, down to 80 in 2010). The crossing percentage for this gate is historically lower than most gates due to its proximity to the Nahant gate itself. As seen in Figure H-3, the Swampscott gate is adjacent to the Nahant gate and aircraft would have to climb very quickly in order to be above 6,000 feet when crossing the Swampscott gate.

Table H-15 Runways 4R/4L Shoreline Crossings Above 6,000 Feet for 2010

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	80	32	40.0%
Marblehead Gate	1,690	1,659	98.2%
Hull 2 Gate	465	462	99.4%
Hull 3 Gate	695	686	98.7%
Cohasset Gate	530	517	97.5%
Total	3,460	3,356	97.0%

Source: Massport, HMMH 2011.

Statistical Analyses of Flight Tracks - Runway 9

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

Table H-16 shows how many tracks turned prior to the BOS 2 DME. Northbound turns before BOS 2 DME pass through the Winthrop 1 Gate. Southbound traffic would pass through the Winthrop 2 Gate. In 2010, between both gates there were a total of 51 such turns, or about 0.1 percent. This is a decline from 2009 when about (66 or) 0.1 percent of the departures passed through one of the two gates.

Table H-16 Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2010

	Number of Departure Tracks	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	42,282	21	< 0.1%
Winthrop 2 Gate	42,282	30	0.1%
Total	42,282	51	0.1%

Source: Massport, HMMH 2011

Table H-17 indicates that 97.3 percent of Runway 9 departures were above 6,000 feet when crossing the shoreline, as compared with 97.1 percent in 2009. The Revere gate increased slightly from 80.0 percent in 2009 to 84.5 percent in 2010 and the Swampscott gate dropped slightly from 93.1 percent in 2009 to 90.2 percent in 2010. The Marblehead gate had an increase in crossings (from 9,651 in 2009 to 9,897 in 2010), and an increase in the percent above 6,000 feet (from 97.5 percent in 2009 to 97.7 percent in 2010). Overall, the Hull gates also declined in percent above 6,000 feet, from approximately 97(96.6 for Hull 3) to 98(98.4 for Hull 2) percent in 2009 to approximately 95(95.0 for Hull 3) to 99(98.5 for Hull 2) percent in 2010. The Cohasset gate increased significantly in crossings (from 8,147 in 2009 to 21,444 in 2010) and the percent above 6,000 feet increased slightly from 97.6 percent in 2009 to 97.7 percent in 2010.

Table H-17 Runway 9 Shoreline Crossings Above 6,000 Feet for 2010

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	58	49	84.5%
Swampscott Gate	235	212	90.2%
Marblehead Gate	9,897	9,670	97.7%
Hull 2 Gate	1,876	1,848	98.5%
Hull 3 Gate	5,046	4,793	95.0%
Cohasset Gate	21,444	20,945	97.7%
Total	**38,556**	**37,517**	**97.3%**

Source: Massport, HMMH 2011.

Statistical Analyses of Flight Tracks - Runway 15R

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

Table H-18 indicates that 96.2 percent of Runway 15R departures were above 6,000 feet when crossing the shoreline, as compared with 97.0 percent in 2009. At 98.1 percent, the percent above 6,000 feet for the Swampscott increased in 2010 as it was 97.9 in 2009. The Marblehead gate had an increase in crossings (from 832 in 2009 to 2,180 in 2010) and a slight decline in the percent above 6,000 feet (from 99.6 percent in 2010 to 99.8 percent in 2009). The Hull 2 gate decreased its percentage from 97.7 percent in 2009 to 95.9 percent in 2010, and the Hull 3 gate decreased from 94.1 percent in 2009 to 92.2 percent in 2010). The Cohasset gate had an increase in crossings (from 927 in 2009 to 3,050 in 2010) and the percent above 6,000 feet decreased slightly from 97.7 percent to 97.6 percent.

Table H-18 Runway 15R Shoreline Crossings Above 6,000 Feet for 2010

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	425	417	98.1%
Marblehead Gate	2180	2171	99.6%
Hull 2 Gate	217	208	95.9%
Hull 3 Gate	3,020	2,785	92.2%
Cohasset Gate	3,050	2,977	97.6%
Total	**8,892**	**8,558**	**96.2%**

Source: Massport, HMMH 2011.

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

The Squantum 2 and Hull 1 Gates (Figure H-3) are used to monitor the turn to 140 degrees over Boston Harbor and north of Hull. The shoreline gates are used to monitor shoreline crossings, as for Runways 4R, 9, and 15R above.

Table H-19 shows the dispersion of the jet departures from Runways 22R-22L as they pass through the Squantum 2 Gate. The first segment of the gate is the northernmost segment and is primarily over Boston Harbor. The other segments extend southward toward Quincy. Similar to 2009, over 90 percent of the flights were over the first two segments of this gate in 2010.

Table H-19 Runways 22R/22L Squantum 2 Gate Summary for 2010			
	Number of Tracks Through Gate Segment	Total Number of Tracks Through Gate	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	34,177	49,419	69.2%
12,000 - 14,000 ft	10,800	49,419	21.9%
14,000 - 21,000 ft	4,384	49,419	78.9%
21,000 - 27,000 ft	58	49,419	0.1%
Total	**49,419**	**49,419**	**100.0%**

Source: Massport, HMMH 2011.
Note: Percentages sum to more than 100 percent due to rounding.

Table H-20 shows that 96.7 percent of the tracks were north of the Hull peninsula as they passed through the Hull 1 Gate, which is a slight increase from 2009 (96.6 percent).

Table H-20 Runways 15R/22R/22L Gate Summary – North of Hull Peninsula for 2010			
	Number of Tracks Through Gate	Number of Tracks North of Hull Peninsula	Percentage of Tracks North of Hull Peninsula
Hull 1 Gate	60,630	58,637	96.7%

Source: Massport, HMMH 2011

Table H-21 indicates that 97.2 percent of Runway 22R/22L departures were above 6,000 feet when crossing the shoreline, as compared with 98.4 percent in 2009. For the Revere gate, the percent above 6,000 feet decreased from 98.3 percent in 2009 to 97.7 percent in 2010. The Swampscott gate also decreased from 99.8 percent in 2009 to 99.7 percent in 2010. The Marblehead gate had an increase in crossings (from 7,497 in 2009 to 8,385 in 2010) and decease the percent above 6,000 feet (from 99.7 percent in 2009 to 99.5 percent in 2010). The Hull gates to the south both decreased in percent above 6,000 feet from 98.1 percent in 2009 to 97.0 percent for Hull 2; and from 97.5 percent in 2009 to 94.9 percent for Hull 3. The number of crossings for the Cohasset gate increased (9,541 in 2009 versus 11,800 in 2010) and the percentage decreased from 98.1 percent in 2009 to 97.7 percent in 2010.

Table H-21 Runways 22R/22L Shoreline Crossings Above 6,000 Feet for 2010			
	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	176	172	97.7%
Swampscott Gate	4,660	4,645	99.7%
Marblehead Gate	8,385	8,345	99.5%
Hull 2 Gate	696	675	97.0%
Hull 3 Gate	14,894	14,129	94.9%
Cohasset Gate	11,800	11,523	97.7%
Total	**40,611**	**39,489**	**97.2%**

Source: Massport, HMMH 2011.

Runway 27

On September 15, 1996, the FAA implemented a new departure procedure for Runway 27 called the WYLYY RNAV procedure. In accordance with the provisions of the Record of Decision issued for the Runway 27 Environmental Impact Statement (EIS), Massport has been providing on-going radar flight track data and analysis to the FAA with respect to the new procedure. Table H-22 presents the results for the Runway 27 corridor complied for 2010. In October of 2009, FAA implemented a change (WYLYY SEVEN) designed to improve adherence to the corridor, the procedure did not provide the expected results and was redesigned. WTLLY EIGHT will be implemented in early 2011. The average percentage of tracks through the corridor was 53.5 percent, an increase from 50.2 percent for 2009 and an increase from 52.9 percent for 2008.

Table H-22 Runway 27 Corridor Percent of Tracks Through Each Gate for 2010

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A 1,400 ft[1]	Gate B 2,200 ft[1]	Gate C 2,900 ft[1]	Gate D 4,700 ft[1]	Gate E 6,300 ft[1]	Average Percent Through Each Gate
January	2,612	1,213	46.4%	54.4%	79.6%	89.7%	94.6%	94.0%	82.5%
February	2,151	1,087	50.5%	54.4%	80.3%	90.1%	93.9%	93.0%	82.3%
March	630	311	49.4%	55.2%	79.7%	89.0%	94.3%	94.1%	82.5%
April	1,440	840	58.3%	62.1%	85.9%	93.8%	96.5%	94.8%	86.6%
May	1,083	655	60.5%	63.7%	87.3%	94.3%	96.5%	95.1%	87.4%
June	616	381	61.9%	65.6%	84.9%	94.2%	97.1%	96.1%	87.6%
July	718	429	59.7%	62.4%	82.6%	90.9%	95.0%	95.5%	85.3%
August	300	193	64.3%	67.0%	89.0%	96.0%	98.0%	97.3%	89.5%
September	257	138	53.7%	58.0%	84.4%	92.2%	94.6%	94.2%	84.7%
October	1,337	770	57.6%	61.4%	85.0%	93.9%	96.0%	93.9%	86.1%
November	1,192	668	56.0%	59.1%	83.4%	94.4%	97.6%	96.1%	86.1%
December	2,310	1,208	52.3%	55.8%	82.5%	93.8%	97.1%	97.0%	85.2%
Average	**1,194**	**639**	**53.5%**	**60.6%**	**83.7%**	**92.7%**	**95.9%**	**95.1%**	**85.6%**

Source: Massport, HMMH 2011
1 Width of Each Gate in Feet.

Statistical Analyses of Flight Tracks — Runway 33L

The Somerville and Everett Gates (Figure H-3) extend from BOS 2 DME to BOS 5 DME and are used to monitor the departure procedure for Runway 33L. Turns to the left prior to the BOS 2 DME would pass through the Somerville Gate. Turns to the right prior to the BOS 2 DME would pass through the Everett Gate. Table H-23 shows the results of the analyses. The table indicates that in 2010 6.2 percent of tracks turned prior to reaching the BOS 2 DME. This is a decrease compared to 2009 when 8.3 percent of departures turned early before reaching 2 DME. The total number of tracks decreased from 26,221 in 2009 to 25,047 in 2010.

Table H-23 Runway 33L Gates — Passages Below 3,000 Feet for 2010

	Number of Departure Tracks	Number of Tracks Turning Before BOS 2 DME	Percentage of Tracks Turning Before BOS 2 DME
Everett Gate	25,047	633	2.5%
Somerville Gate	25,047	912	3.6%
Total	**25,047**	**1,545**	**6.2%**

Source: Massport, HMMH 2011

I

Air Quality/ Emissions Reduction

This appendix provides the following detailed information and tables in support of *Chapter 7, Air Quality/ Emissions Reduction*:

- 2010 Aircraft Fleet and Operational Data Used in EDMS v5.1.3
  - Table I-1 – 2010 Fleet Mix, Annual Landing-and-Takeoff Cycles (LTOs), and Taxi/Idle Time-in-Mode by Aircraft Type
- Ground Service Equipment (GSE)/Alternative Fuels Conversion
  - Table I-2 – Ground Service Equipment Alternative Fuel Conversion Summary (kg/day)
- Motor Vehicle Emissions
  - Table I-3 – MOBILE6.2.03 Input File
  - Table I-4 – MOBILE6.2.03 Output Files
- Fuel Storage and Handling
  - Table I-5 – Fuel Throughput by Fuel Category (gallons)
- Stationary Sources
  - Table I-6 – Stationary Source Fuel Throughput by Fuel Category (gallons)
- 1993 – 2003 Emissions Inventories
  - Table I-7 – Estimated Volatile Organic Compounds (VOC) Emissions (in kg/day) at Logan Airport
  - Table I-8 – Estimated Nitrogen Oxides (NO_X) Emissions (in kg/day) at Logan Airport
  - Table I-9 – Estimated Carbon Monoxide (CO) Emissions (in kg/day) at Logan Airport

- Greenhouse Gas (GHG) Emissions Inventory
  - Table I-10 – Logan Airport Greenhouse Gas (GHG)Inventory Input Data and Information
  - Table I-11 – Greenhouse Gas (GHG)Emission Factors
  - Table I-12 – Greenhouse Gas (GHG)Emissions (MMT CO_2 Eq)
  - Table I-13 – Logan Airport Greenhouse Gas (GHG)Emissions Compared to Massachusetts Totals
  - Table I-14 - Comparison of Estimated Total Greenhouse Gas (GHG) Emissions (MMT of CO_2eq) at Logan Airport – 2007 through 2010

2010 Aircraft Fleet and Operational Data used in EDMS Version 5.1.3

The Federal Aviation Administration (FAA) Emissions Dispersion System (EDMS) is the United States (U.S.) Environmental Protection Agency (EPA)-preferred and the FAA-required model for conducting airport air quality analyses. The most recent version of EDMS, Version 5.1.3 (EDMS v5.1.3), was used in support of the *2010 Environmental Data Report (2010 EDR)* Air Quality Analysis. Table I-1 contains the data that was used in EDMS v5.1.3 to represent actual conditions at Logan Airport in 2010. This data includes aircraft type, engine, landing takeoff cycles (LTOs) and taxi times. The aircraft are divided into four categories: air carrier, cargo, commuter, and general aviation (GA).

Table I-1 2010 Fleet Mix, Annual Landing-and-Takeoff Cycles (LTOs), and Taxi/Idle Time-in-Mode by Aircraft Type

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft				
Airbus A310-200 Series	CF6-80A3	202	AC SATA	24.99
Airbus A319-100 Series	CFM56-5A4	25	AC ACA	24.99
Airbus A319-100 Series	CFM56-5A5	3,042	AC DAL	24.99
Airbus A319-100 Series	CFM56-5B5/P	284	AC Frontier	24.99
Airbus A319-100 Series	CFM56-5A5	168	AC NWA	24.99
Airbus A319-100 Series	V2524-A5	1,420	AC Spirit	24.99
Airbus A319-100 Series	V2522-A5	1,029	AC UAL	24.99
Airbus A319-100 Series	CFM56-5B6/P	6,655	AC USA	24.99
Airbus A319-100 Series	CFM56-5B6/P	849	AC Virgin America	24.99
Airbus A320-200 Series	CFM56-5-A1	31	AC ACA	24.99
Airbus A320-200 Series	CFM56-5A3	1,609	AC DAL	24.99
Airbus A320-200 Series	V2527-A5	13,637	AC JBU	24.99
Airbus A320-200 Series	CFM56-5A3	63	AC NWA	24.99
Airbus A320-200 Series	V2527-A5	91	AC Spirit	24.99
Airbus A320-200 Series	V2527-A5	3,042	AC UAL	24.99
Airbus A320-200 Series	CFM56-5B4/P	1,859	AC USA	24.99
Airbus A320-200 Series	V2527-A5	848	AC Virgin America	24.99
Airbus A321-100 Series	CFM56-5B3/P	638	AC USA	24.99
Airbus A330-200 Series	CF6-80E1A3 Standard	11	AC AFR	24.99
Airbus A330-200 Series	CF6-80E1A4 Low emissions	280	AC AZA	24.99
Airbus A330-200 Series	CF6-80E1A2 1862M39	224	AC EIN	24.99
Airbus A330-200 Series	PW4168A Talon II	25	AC SWR	24.99
Airbus A330-300 Series	PW4168A Talon II	340	AC DAL	24.99
Airbus A330-300 Series	PW4168A Talon II	63	AC DLH	24.99
Airbus A330-300 Series	CF6-80E1A4 Standard	324	AC EIN	24.99
Airbus A330-300 Series	PW4168A Talon II	31	AC NWA	24.99
Airbus A330-300 Series	Trent 772 Improved traverse	18	AC SWR	24.99
Airbus A330-300 Series	PW4168A Talon II	5	AC USA	24.99
Airbus A340-300 Series	CFM56-5C2	217	AC AFR	24.99
Airbus A340-300 Series	CFM56-5C4/P SAC	248	AC DLH	24.99
Airbus A340-300 Series	CFM56-5C4/P SAC	209	AC Iberia	24.99
Airbus A340-300 Series	CFM56-5C4	317	AC SWR	24.99
Airbus A340-300 Series	CFM56-5C4/P SAC	188	AC VIR	24.99
Airbus A340-600 Series	Trent 556-61 Phase 5 tiled	403	AC DLH	24.99
Airbus A340-600 Series	Trent 556-61 Phase 5 tiled	9	AC Iberia	24.99
Airbus A340-600 Series	Trent 556-61 Phase 5 tiled	74	AC VIR	24.99
Boeing 717-200 Series	BR700-715A1-30	5,096	AC TRS	24.99
Boeing 727-200 Series	JT8D-15 Reduced emissions	18	AC Capital Cargo	24.99
Boeing 727-200 Series	JT8D-9 series Reduced emissions	7	AC Swift Air	24.99
Boeing 737-300 Series	CFM56-3-B1	14	AC COA	24.99
Boeing 737-300 Series	CFM56-3-B1	432	AC SWA	24.99
Boeing 737-300 Series	CFM56-3-B1	52	AC USA	24.99
Boeing 737-400 Series	CFM56-3B-2	11	AC Miami Air	24.99
Boeing 737-400 Series	CFM56-3B-2	20	AC Swift Air	24.99
Boeing 737-400 Series	CFM56-3B-2	793	AC USA	24.99

Table I-1 2010 Fleet Mix, Annual Landing-and-Takeoff Cycles (LTOs), and Taxi/Idle Time-in-Mode by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft (Cont'd.)				
Boeing 737-500 Series	CFM56-3C-1	1,852	AC COA	24.99
Boeing 737-500 Series	CFM56-3-B1	14	AC SWA	24.99
Boeing 737-700 Series	CFM56-7B22	82	AC Aeromexico	24.99
Boeing 737-700 Series	CFM56-7B24	2	AC ASA	24.99
Boeing 737-700 Series	CFM56-7B24	588	AC COA	24.99
Boeing 737-700 Series	CFM56-7B26/2	3	AC DAL	24.99
Boeing 737-700 Series	CFM56-7B22	79	AC Sun Country	24.99
Boeing 737-700 Series	CFM56-7B24	6,417	AC SWA	24.99
Boeing 737-700 Series	CFM56-7B22	1,776	AC TRS	24.99
Boeing 737-800 Series	CFM56-7B26	3,983	AC AAL	24.99
Boeing 737-800 Series	CFM56-7B26	864	AC ASA	24.99
Boeing 737-800 Series	CFM56-7B26	2,764	AC COA	24.99
Boeing 737-800 Series	CFM56-7B26	1,625	AC DAL	24.99
Boeing 737-800 Series	CFM56-7B26	56	AC Miami Air	24.99
Boeing 737-800 Series	CFM56-7B26	77	AC Sun Country	24.99
Boeing 737-900 Series	CFM56-7B27	181	AC COA	24.99
Boeing 747-400 Series	PW4056 Reduced emissions	269	AC AFR	24.99
Boeing 747-400 Series	RB211-524H	442	AC BAW	24.99
Boeing 747-400 Series	CF6-80C2B1F 1862M39	116	AC DLH	24.99
Boeing 747-400 Series	PW4056 Reduced emissions	6	AC Korean Air Lines	24.99
Boeing 747-400 Series	CF6-80C2B1F 1862M39	92	AC VIR	24.99
Boeing 757-200 Series	RB211-535E4B Phase 5	5,346	AC AAL	24.99
Boeing 757-200 Series	RB211-535E4	23	AC COA	24.99
Boeing 757-200 Series	PW2037	3,068	AC DAL	24.99
Boeing 757-200 Series	RB211-535E4	324	AC ICE	24.99
Boeing 757-200 Series	PW2037	2	AC NWA	24.99
Boeing 757-200 Series	PW2037	120	AC TACV-Cabo Verde	24.99
Boeing 757-200 Series	PW2037	4,049	AC UAL	24.99
Boeing 757-200 Series	RB211-535E4	11	AC USA	24.99
Boeing 757-300 Series	RB211-535E4B Phase 5	4	AC COA	24.99
Boeing 757-300 Series	PW2040	5	AC DAL	24.99
Boeing 757-300 Series	RB211-535E4B Phase 5	84	AC ICE	24.99
Boeing 767-200 Series	CF6-80A1	5	AC AAL	24.99
Boeing 767-200 Series	CF6-80C2B4F 1862M39	1	AC COA	24.99
Boeing 767-200 Series	CF6-80C2B2 1862M39	2	AC USA	24.99
Boeing 767-300 Series	CF6-80C2B6 1862M39	655	AC AAL	24.99
Boeing 767-300 Series	CF6-80C2B6 1862M39	26	AC AZA	24.99
Boeing 767-300 Series	RB211-524H	4	AC BAW	24.99
Boeing 767-300 Series	CF6-80A2	123	AC DAL	24.99
Boeing 767-300 Series	PW4060 Reduced emissions	27	AC UAL	24.99
Boeing 767-400 ER	CF6-80C2B8FA 1862M39	5	AC COA	24.99
Boeing 767-400 ER	CF6-80C2B7F 1862M39	1	AC DAL	24.99
Boeing 777-200 Series	Trent 892	6	AC AAL	24.99
Boeing 777-200 Series	GE90-90B DAC I	1	AC AFR	24.99
Boeing 777-200 Series	GE90-94B DAC II	7	AC AZA	24.99

Table I-1 2010 Fleet Mix, Annual Landing-and-Takeoff Cycles (LTOs), and Taxi/Idle Time-in-Mode by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft (Cont'd.)				
Boeing 777-200 Series	GE90-90B DAC I	595	AC BAW	24.99
Boeing 777-200 Series	GE90-92B DAC I	2	AC COA	24.99
Boeing 777-200 Series	Trent 892	2	AC DAL	24.99
Boeing 777-200 Series	PW4090	6	AC Korean Air Lines	24.99
Boeing 777-200 Series	GE90-90B DAC II	35	AC Other Charter (international)	24.99
Boeing 777-200 Series	PW4077	11	AC UAL	24.99
Boeing DC-9-30 Series	JT8D-9 series Reduced emissions	44	AC DAL	24.99
Boeing DC-9-30 Series	JT8D-9 series Reduced emissions	12	AC NWA	24.99
Boeing DC-9-40 Series	JT8D-11	132	AC DAL	24.99
Boeing DC-9-40 Series	JT8D-11	25	AC NWA	24.99
Boeing DC-9-50 Series	JT8D-17 Reduced emissions	719	AC DAL	24.99
Boeing DC-9-50 Series	JT8D-17 Reduced emissions	118	AC NWA	24.99
Boeing MD-82	JT8D-217 Environmental Kit	778	AC AAL	24.99
Boeing MD-83	JT8D-219 Environmental Kit	1,095	AC AAL	24.99
Boeing MD-83	JT8D-219 Environmental Kit	29	AC Other Charter (domestic)	24.99
Boeing MD-88	JT8D-219 Environmental Kit	3,933	AC DAL	24.99
Boeing MD-90	V2525-D5	213	AC DAL	24.99
Bombardier Challenger 300	AE3007A1 Type 2	42	AC Business Jet Solutions	24.99
Bombardier Challenger 300	AE3007A1 Type 2	17	AC Key Air	24.99
Bombardier Challenger 600	ALF 502L-2	13	AC Business Jet Solutions	24.99
Bombardier Learjet 40	TFE731-2-2B	26	AC Business Jet Solutions	24.99
Bombardier Learjet 45	TFE731-2-2B	14	AC Business Jet Solutions	24.99
Bombardier Learjet 60	TFE731-2/2A	16	AC Business Jet Solutions	24.99
Embraer ERJ170	CF34-8E5A1 LEC	1,688	AC ACA	24.99
Embraer ERJ190	CF34-10E	214	AC ACA	24.99
Embraer ERJ190	CF34-10E	12,484	AC JBU	24.99
Embraer ERJ190	CF34-10E	8,656	AC USA	24.99
Gulfstream G400	TAY Mk611-8	5	AC Key Air	24.99
Total Air Carrier Aircraft LTOs		**111,032**		
Cargo Aircraft				
Airbus A300F4-600 Series	CF6-80C2A5F 1862M39	213	Cargo FDX	24.99
Airbus A300F4-600 Series	PW4158 Reduced smoke	616	Cargo UPS	24.99
Airbus A310-200 Series	JT9D-7R4E, -7R4E1	12	Cargo FDX	24.99
ATR 42-300	PW120	2	Cargo Mountain Air Cargo	24.99
Boeing 727-200 Series	JT8D-15 Reduced emissions	187	Cargo Capital Cargo International	24.99
Boeing 727-200 Series	JT8D-15 Reduced emissions	4	Cargo Contract Air Cargo	24.99
Boeing 727-200 Series	JT8D-15 Reduced emissions	274	Cargo FDX	24.99
Boeing 747-400 Series	CF6-80C2B1F 1862M39	2	Cargo Cargolux	24.99
Boeing 757-200 Series	PW2040	43	Cargo UPS	24.99
Boeing 767-300 ER	CF6-80C2B7F 1862M39	27	Cargo UPS	24.99
Boeing DC-10-10 Series	CF6-6D	996	Cargo FDX	24.99
Boeing DC-8 Series 70	CFM56-2A series	6	Cargo Capital Cargo International	24.99
Boeing DC-8 Series 70	CFM56-2A series	257	Cargo DHL/Astar	24.99
Boeing MD-11	CF6-80C2D1F 1862M39	6	Cargo FDX	24.99
Bombardier Challenger 600	CF34-3B	7	Cargo FDX	24.99

Table I-1 2010 Fleet Mix, Annual Landing-and-Takeoff Cycles (LTOs), and Taxi/Idle Time-in-Mode by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Bombardier Learjet 25	CJ610-6	3	Cargo Royal Air Freight	24.99
Bombardier Learjet 35	TFE731-2-2B	4	Cargo Royal Air Freight	24.99
Bombardier Learjet 45	TFE731-2-2B	9	Cargo FDX	24.99
Cessna 208 Caravan	PT6A-114	35	Cargo Airnet Systems	24.99
Embraer EMB110 Bandeirante	PT6A-34	2	Cargo Business Air Freight	24.99
Embraer EMB110 Bandeirante	PT6A-34	1	Cargo Royal Air Freight	24.99
Piper PA-31 Navajo	TIO-540-J2B2	420	Cargo Airnet Systems	24.99
Raytheon Beech Baron 58	TIO-540-J2B2	11	Cargo Airnet Systems	24.99
Total Cargo Aircraft LTOs		**3,137**		
Commuter Aircraft				
Bombardier CRJ-100	CF34-3A1 LEC II	3,201	Comm Delta (Comair)	24.99
Bombardier CRJ-100	CF34-3B	1,685	Comm JZA	24.99
Bombardier CRJ-100	CF34-3B	4	Comm Mesa	24.99
Bombardier CRJ-200	CF34-3B	289	Comm Atlantic Southeast Airlines	24.99
Bombardier CRJ-200	CF34-3B	20	Comm Chautaugua	24.99
Bombardier CRJ-200	CF34-3B	207	Comm Delta (Comair)	24.99
Bombardier CRJ-200	CF34-3B	644	Comm Delta (Pinnacle)	24.99
Bombardier CRJ-200	CF34-3B	1,354	Comm JZA	24.99
Bombardier CRJ-200	CF34-3B	57	Comm Mesa	24.99
Bombardier CRJ-200	CF34-3B	3,133	Comm US Airways (Air Wisconsin)	24.99
Bombardier CRJ-200	CF34-3B	1	Comm US Airways (PSA)	24.99
Bombardier CRJ-700	CF34-8C1	469	Comm Atlantic Southeast Airlines	24.99
Bombardier CRJ-700	CF34-8C1	548	Comm Delta (Comair)	24.99
Bombardier CRJ-700	CF34-8C1	2	Comm EGF	24.99
Bombardier CRJ-700	CF34-8C1	156	Comm Mesa	24.99
Bombardier CRJ-900	CF34-8C5 LEC	1,242	Comm Delta (Comair)	24.99
Bombardier CRJ-900	CF34-8C5 LEC	547	Comm Delta (Mesaba)	24.99
Bombardier CRJ-900	CF34-8C5 LEC	138	Comm JZA	24.99
Bombardier de Havilland Dash 8 Q100	PW120A	298	Comm JZA	24.99
Bombardier de Havilland Dash 8 Q100	PW120A	481	Comm US Airways (Piedmont)	24.99
Bombardier de Havilland Dash 8 Q300	PW123	59	Comm JZA	24.99
Bombardier de Havilland Dash 8 Q400	PW150A	905	Comm Colgan	24.99
Bombardier de Havilland Dash 8 Q400	PW150A	1,434	Comm Porter Airlines	24.99
Cessna 402	TIO-540-J2B2	17,952	Comm Hyannis Air Service	24.99
Embraer ERJ135	AE3007A1/3 Type 3 (red. emiss.)	8,876	Comm EGF	24.99
Embraer ERJ145	AE3007A1E Type 3	1,143	Comm Chautaugua	24.99
Embraer ERJ145	AE3007A1E Type 3	7	Comm EGF	24.99
Embraer ERJ145	AE3007A1E Type 3	117	Comm Trans States	24.99
Embraer ERJ170	CF34-8E5 LEC	536	Comm Delta (Compass Airlines)	24.99
Embraer ERJ170	CF34-8E5 LEC	1,802	Comm Shuttle America	24.99
Embraer ERJ170	CF34-8E5 LEC	2,368	Comm US Airways (Republic)	24.99
Embraer ERJ190	CF34-10E6 SAC	510	Comm US Airways (Republic)	24.99
Piper PA-23 Apache/Aztec	TIO-540-J2B2	4	Comm Colgan	24.99
Saab 340-B-Plus	CT7-9B	4,623	Comm Colgan	24.99
Total Commuter Aircraft LTOs		**54,812**		

Table I-1 2010 Fleet Mix, Annual Landing-and-Takeoff Cycles (LTOs), and Taxi/Idle Time-in-Mode by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
General Aviation Aircraft				
Bombardier Challenger 300	AE3007A1 Type 2	168	GA	24.99
Bombardier Challenger 300	AE3007A1 Type 2	95	GA Bombardier Business Jet	24.99
Bombardier Challenger 600	ALF 502L-2	307	GA	24.99
Bombardier Challenger 600	ALF 502L-2	28	GA Bombardier Business Jet	24.99
Bombardier Challenger 600	ALF 502L-2	15	GA Executive Jet	24.99
Bombardier Learjet 35	TFE731-2-2B	157	GA	24.99
Bombardier Learjet 40	TFE731-2-2B	56	GA Bombardier Business Jet	24.99
Bombardier Learjet 45	TFE731-2-2B	27	GA Bombardier Business Jet	24.99
Bombardier Learjet 45	TFE731-2-2B	5	GA Executive Jet	24.99
Bombardier Learjet 60	TFE731-2/2A	171	GA	24.99
Bombardier Learjet 60	TFE731-2/2A	31	GA Bombardier Business Jet	24.99
Cessna 182	IO-360-B	24	GA Angel Flight	24.99
Cessna 208 Caravan	PT6A-114	170	GA Wiggins	24.99
Cessna 210 Centurion	TIO-540-J2B2	9	GA Angel Flight	24.99
Cessna 402	TIO-540-J2B2	118	GA	24.99
Cessna 525 CitationJet	JT15D-1 series	42	GA Citationshares	24.99
Cessna 550 Citation II	JT15D-4 series	206	GA	24.99
Cessna 560 Citation Excel	JT15D-5, -5A, -5B	182	GA	24.99
Cessna 560 Citation Excel	JT15D-5, -5A, -5B	44	GA Citationshares	24.99
Cessna 560 Citation Excel	JT15D-5, -5A, -5B	13	GA Executive Jet	24.99
Cessna 560 Citation Excel	JT15D-5, -5A, -5B	318	GA Netjets Aviation	24.99
Cessna 560 Citation V	JT15D-5, -5A, -5B	167	GA	24.99
Cessna 560 Citation V	JT15D-5, -5A, -5B	127	GA Netjets Aviation	24.99
Cessna 680 Citation Sovereign	PW308C Annular	33	GA Citationshares	24.99
Cessna 680 Citation Sovereign	PW308C Annular	13	GA Executive Jet	24.99
Cessna 680 Citation Sovereign	PW308C Annular	123	GA Netjets Aviation	24.99
Cessna 750 Citation X	AE3007C Type 1	158	GA	24.99
Cessna 750 Citation X	AE3007C Type 1	4	GA Citationshares	24.99
Cessna 750 Citation X	AE3007C Type 1	7	GA Executive Jet	24.99
Cessna 750 Citation X	AE3007C Type 1	15	GA Flight Options	24.99
Cessna 750 Citation X	AE3007C Type 1	178	GA Netjets Aviation	24.99
Cirrus SR22	TIO-540-J2B2	24	GA Angel Flight	24.99
Dassault Falcon 2000	PW308C Annular	224	GA	24.99
Dassault Falcon 2000	PW308C Annular	6	GA Executive Jet	24.99
Dassault Falcon 2000	PW308C Annular	76	GA Netjets Aviation	24.99
Dassault Falcon 50	TFE731-3	136	GA	24.99
Dassault Falcon 50	TFE731-3	13	GA Executive Jet	24.99
Dassault Falcon 900	TFE731-3	149	GA	24.99
Embraer ERJ135	AE3007A1/3 Type 3 (red. emiss.)	2	GA Executive Jet	24.99
Embraer ERJ135	AE3007A1/3 Type 3 (red. emiss.)	15	GA Flight Options	24.99
Embraer ERJ145	AE3007A1 Type 2	789	GA Continental Express	24.99
Gulfstream G400	TAY Mk611-8	351	GA	24.99
Gulfstream G400	TAY Mk611-8	23	GA Executive Jet	24.99
Gulfstream G400	TAY Mk611-8	62	GA Netjets Aviation	24.99
Gulfstream G500	BR700-710A1-10	186	GA	24.99

Table I-1 2010 Fleet Mix, Annual Landing-and-Takeoff Cycles (LTOs), and Taxi/Idle Time-in-Mode by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
General Aviation Aircraft (Cont'd.)				
Gulfstream G500	BR700-710A1-10	9	GA Executive Jet	24.99
Gulfstream G500	BR700-710A1-10	19	GA Netjets Aviation	24.99
Israel IAI-1126 Galaxy	PW306A Annular	14	GA Executive Jet	24.99
Israel IAI-1126 Galaxy	PW306A Annular	80	GA Netjets Aviation	24.99
Mooney M20-K	TSIO-360C	24	GA Angel Flight	24.99
Piaggio P.180 Avanti	PT6A-66	104	GA Wanair	24.99
Pilatus PC-12	PT6A-67B	560	GA	24.99
Piper PA-28 Cherokee Series	O-320	14	GA Angel Flight	24.99
Piper PA-32 Cherokee Six	TIO-540-J2B2	28	GA Angel Flight	24.99
Piper PA-34 Seneca	IO-360-B	9	GA Angel Flight	24.99
Raytheon Beech 99	PT6A-36	8	GA Wiggins	24.99
Raytheon Beech Baron 58	TIO-540-J2B2	97	GA	24.99
Raytheon Beech Bonanza 36	TIO-540-J2B2	34	GA Angel Flight	24.99
Raytheon Beechjet 400	JT15D-5, -5A, -5B	374	GA	24.99
Raytheon Beechjet 400	JT15D-5, -5A, -5B	59	GA Flight Options	24.99
Raytheon Beechjet 400	JT15D-5, -5A, -5B	67	GA Netjets Aviation	24.99
Raytheon Hawker 800	TFE731-3	429	GA	24.99
Raytheon Hawker 800	TFE731-3	6	GA Executive Jet	24.99
Raytheon Hawker 800	TFE731-3	32	GA Flight Options	24.99
Raytheon Hawker 800	TFE731-3	105	GA Netjets Aviation	24.99
Raytheon Super King Air 200	PT6A-41	106	GA	24.99
Raytheon Super King Air 300	PT6A-60A	96	GA	24.99
Total General Aviation Aircraft LTOs		**7,341**		
Total Fleet LTOs		**176,322**		

Notes: Due to rounding of the operations (1 LTO = 2 Operations) there may be some differences (+/-) between the values reported here and those reported in *Chapter 2, Activity Levels.*
Aircraft taxi times are based on Logan Airport data obtained from the FAA Aviation System Performance Metrics (ASPM) database for 2010.

Ground Service Equipment/Alternative Fuels Conversion

For the 2010 analyses, ground service equipment (GSE) emissions were calculated using EDMS emission factors which are based on the EPA NONROAD2005 model in combination with the 2004 GSE time-in-mode survey and the GSE fuel types obtained from the aerodrome permit applications. In this way, the most up-to-date GSE fleet operational, conversion and emissions characteristics are used.

Table I-2 Ground Service Equipment Alternative Fuel Conversion Summary (kg/day)					
Year	Pollutant	Percent Reduction	Calculated Emissions without Reduction	Reduction from AFVs	Calculated Emissions with Reduction
2000	Volatile Organic Compounds (VOCs)	13.72%	178	24	154
	Oxides of Nitrogen (NO_x)	9.87%	369	36	333
	Carbon Monoxide (CO)	12.88%	6,124	789	5,335
2001	VOCs	13.72%	166	23	143
	NO_x	9.87%	338	33	305
	CO	12.88%	5,960	768	5,193
2002	VOCs	13.6%	286	39	247
	NO_x	8.0%	350	28	322
	CO	16.3%	6,174	1,004	5,170
2003	VOCs	13.8%	263	36	227
	NO_x	8.0%	316	25	291
	CO	16.4%	5,692	934	4,758
2004	VOCs	11.9%	212	25	187
	NO_x	6.6%	357	24	333
	CO	15.4%	4,236	650	3,586
2005	VOCs	12.2%	203	25	178
	NO_x	6.9%	335	23	312
	CO	15.4%	4,175	643	3,531
	$PM_{10}/PM_{2.5}$	9.9%	11	1	10
2006	VOCs	10.7%	86	9	77
	NO_x	7.5%	324	24	300
	CO	13.8%	1,841	255	1,586
	$PM_{10}/PM_{2.5}$	10.8%	10	1	9
2007	VOCs	8.2%	85	7	78
	NO_x	5.1%	315	16	299
	CO	10.4%	2,124	220	1,904
	$PM_{10}/PM_{2.5}$	5.9%	10	<1	10
2008	VOCs	8.3%	72	6	66
	NO_x	4.8%	270	13	257
	CO	10.2%	1,792	183	1,609
	$PM_{10}/PM_{2.5}$	5.6%	16	<1	15
2009	VOCs	8.2%	61	5	56
	NO_x	4.8%	230	11	219
	CO	10.0%	1,516	152	1364
	$PM_{10}/PM_{2.5}$	3.5%	14	<1	14

Table I-2 Ground Service Equipment Alternative Fuel Conversion Summary (kg/day) (Continued)

Year	Pollutant	Percent Reduction	Calculated Emissions without Reduction	Reduction from AFVs	Calculated Emissions with Reduction
2010	VOCs	7.5%	53	4	49
	NO_x	3.9%	206	8	198
	CO	8.5%	1,335	113	1,222
	$PM_{10}/PM_{2.5}$	2.5%	13	<1	13

Notes: 2000 and 2001 analyses used EDMS v4.03. 2002 and 2003 analyses used EDMS v4.11, which used updated emission factors from the NONROAD2002 Model. 2004 analyses used EDMS v4.21, which again used emission factors from the EPA NONROAD2002 Model. 2005 analysis used EDMS v4.5, which used emission factors from the EPA NONROAD2002 Model. 2006 analysis used EDMS v5.0.1, which used emission factors from the EPA NONROAD2005 Model. 2007 analysis used EDMS v5.0.2, which used emission factors from the EPA NONROAD2005 Model. 2008 analysis used EDMS v5.1, which used emission factors from the EPA NONROAD2005 Model. 2009 analysis used EDMS v5.1.2, which used emission factors from the EPA NONROAD2005 Model. 2010 analysis used EDMS v5.1.3, which used emission factors from the EPA NONROAD2005 Model.

Motor Vehicle Emissions

The same methods that were previously used in the *2009 EDR* were also employed to calculate motor vehicle emissions in this *2010 EDR*.

In the *2010 EDR*, the resultant emission factors were multiplied by average daily vehicle miles to calculate daily emissions. The on-airport traffic data are summarized in the vehicle miles traveled (VMT) analyses tables of *Appendix G, Ground Access.* Due to the new roadway configuration of the Ted Williams Tunnel, through-traffic no longer traverses Airport property. Therefore, as of 2003, emissions from these vehicles are no longer included as part of the Logan Airport emissions inventory. Further, MOBILE6 was used to obtain vehicle emissions at idle to estimate parking and curbside motor vehicle emissions.[1] Idling emissions are determined for a unit of time and multiplied by total idling time to reach the associated emissions. The input and output files of MOBILE6.2.03 are included as Tables I-3 and I-4.

1 Idle emissions factors in grams per hour are determined by multiplying the emissions factors at 2.5 miles per hour by 2.5, in accordance with EPA guidance (*MOBILE6 Refers to Mobile5 User Information Sheet #5* EPA, July 30, 1993).

Table I-3 MOBILE6.2.03 Input File

```
* Calendar Year 2010 Generic MOBILE6 input file for Mesoscale Build/No-Build Analyses
* Filename MA10_ALL.INP created on 3/18/05 by Craig Woleader, MADEP 617-348-4046, craig.woleader@state.ma.us
* revised 12/2/05 to include actual diesel rebuild effects
* revised 12/17/08 to include new IM program program for 2009
* revised 6/27/11 by Wayne Arner, KBE, for specific speeds
****************    Header Section    ***************
MOBILE6 INPUT FILE
*
PARTICULATES       :
POLLUTANTS         : HC CO NOX CO2
DATABASE OUTPUT    :
WITH FIELDNAMES    :
AGGREGATED OUTPUT  :
EMISSIONS TABLE    : MA10_MES.tb1 REPLACE
REPORT FILE        : MA10_MES.txt REPLACE
*
RUN DATA
***************    Run Section #1    ***************
> *** Summer 2010 ***
* Pollutant output format
EXPRESS HC AS VOC  :
EXPAND BUS EFS     :

* Mass. specific user inputs -- require external data file
REG DIST           : 2005_REG.D
I/M DESC FILE      : 09NEWIM.D

* Set Diesel Rebuild effects to 10% as per EPA
REBUILD EFFECTS    : 0.10

STAGE II REFUELING :
91 3 84. 84.

* Inputs for LEV II
94+ LDG IMP        : MA_LEV2.D
T2 EXH PHASE-IN    : LEV2EXH.D
T2 EVAP PHASE-IN   : LEV2EVAP.D
T2 CERT            : LEV2CERT.D

* Meteorological inputs
MIN/MAX TEMP       : 70.4 93.7

* Fuel inputs
FUEL RVP           : 6.8
FUEL PROGRAM       : 2 N

DIESEL FRACTIONS   :
0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.003  0.003  0.002
0.002  0.002  0.002  0.001  0.001  0.001  0.000  0.001  0.001  0.003
```

Table I-3 MOBILE6.2.03 Input File

```
0.001  0.002  0.000  0.015  0.009
0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001
0.001  0.001  0.000  0.001  0.001  0.001  0.001  0.001  0.001  0.002
0.002  0.003  0.003  0.006  0.013
0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001
0.001  0.001  0.000  0.001  0.001  0.001  0.001  0.001  0.001  0.002
0.002  0.003  0.003  0.006  0.013
0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005
0.005  0.006  0.005  0.012  0.012  0.017  0.015  0.014  0.016  0.017
0.014  0.018  0.016  0.021  0.048
0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005
0.005  0.006  0.005  0.012  0.012  0.017  0.015  0.014  0.016  0.017
0.014  0.018  0.016  0.021  0.048
0.176  0.176  0.176  0.176  0.176  0.176  0.176  0.170  0.207  0.202
0.206  0.243  0.176  0.285  0.267  0.212  0.255  0.295  0.249  0.251
0.188  0.175  0.182  0.186  0.219
0.385  0.385  0.385  0.385  0.385  0.385  0.385  0.407  0.433  0.467
0.464  0.480  0.375  0.472  0.480  0.366  0.400  0.344  0.285  0.333
0.314  0.253  0.208  0.197  0.168
0.674  0.674  0.674  0.674  0.674  0.674  0.674  0.634  0.664  0.719
0.717  0.744  0.715  0.565  0.810  0.803  0.644  0.654  0.605  0.525
0.389  0.356  0.376  0.108  0.136
0.830  0.830  0.830  0.830  0.830  0.830  0.830  0.845  0.860  0.840
0.819  0.813  0.610  0.686  0.570  0.733  0.607  0.729  0.685  0.725
0.631  0.350  0.305  0.186  0.209
0.884  0.884  0.884  0.884  0.884  0.884  0.884  0.840  0.887  0.931
0.917  0.914  0.923  0.901  0.908  0.898  0.903  0.876  0.804  0.844
0.782  0.702  0.679  0.554  0.529
0.977  0.977  0.977  0.977  0.977  0.977  0.977  0.972  0.953  0.993
0.992  0.992  0.990  0.981  0.976  0.975  0.959  0.982  0.965  0.963
0.945  0.902  0.875  0.857  0.791
0.972  0.972  0.972  0.972  0.972  0.972  0.972  0.955  0.984  0.995
0.992  0.991  0.995  0.993  0.993  0.995  0.992  0.986  0.995  0.981
0.993  0.971  0.982  0.977  0.993
1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000
1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000
1.000  1.000  1.000  1.000  1.000
0.786  0.786  0.786  0.786  0.786  0.786  0.786  0.917  0.884  0.925
0.968  0.961  0.972  0.985  0.971  0.941  0.905  0.965  0.940  0.907
0.964  0.609  0.880  1.000  0.778
***************    Scenario Section    ***************
SCENARIO RECORD    : 2010 Idle Scenario - Summer (multiply g/mi by 2.5 mph to get g/hr)
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 7
PARTICULATE EF     : PMGZML.CSV  PMGDR1.CSV  PMGDR2.CSV  PMDZML.CSV  PMDDR1.CSV  PMDDR2.CSV
PARTICLE SIZE      : 10
DIESEL SULFUR      : 15
AVERAGE SPEED      : 2.5 Arterial 0.0 100.0 0.0 0.0
```

Table I-3 MOBILE6.2.03 Input File

```
SCENARIO RECORD    : 2010 15 mph - Summer
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 7
PARTICULATE EF     : PMGZML.CSV  PMGDR1.CSV  PMGDR2.CSV  PMDZML.CSV  PMDDR1.CSV  PMDDR2.CSV
PARTICLE SIZE      : 10
DIESEL SULFUR      : 15
AVERAGE SPEED      : 15 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : 2010 20 mph - Summer
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 7
PARTICULATE EF     : PMGZML.CSV  PMGDR1.CSV  PMGDR2.CSV  PMDZML.CSV  PMDDR1.CSV  PMDDR2.CSV
PARTICLE SIZE      : 10
DIESEL SULFUR      : 15
AVERAGE SPEED      : 20 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : 2010 25 mph - Summer
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 7
PARTICULATE EF     : PMGZML.CSV  PMGDR1.CSV  PMGDR2.CSV  PMDZML.CSV  PMDDR1.CSV  PMDDR2.CSV
PARTICLE SIZE      : 10
DIESEL SULFUR      : 15
AVERAGE SPEED      : 25 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : 2010 30 mph - Summer
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 7
PARTICULATE EF     : PMGZML.CSV  PMGDR1.CSV  PMGDR2.CSV  PMDZML.CSV  PMDDR1.CSV  PMDDR2.CSV
PARTICLE SIZE      : 10
DIESEL SULFUR      : 15
AVERAGE SPEED      : 30 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : 2010 35 mph - Summer
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 7
PARTICULATE EF     : PMGZML.CSV  PMGDR1.CSV  PMGDR2.CSV  PMDZML.CSV  PMDDR1.CSV  PMDDR2.CSV
PARTICLE SIZE      : 10
DIESEL SULFUR      : 15
AVERAGE SPEED      : 35 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : 2010 50 mph - Summer
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 7
PARTICULATE EF     : PMGZML.CSV  PMGDR1.CSV  PMGDR2.CSV  PMDZML.CSV  PMDDR1.CSV  PMDDR2.CSV
PARTICLE SIZE      : 10
DIESEL SULFUR      : 15
AVERAGE SPEED      : 50 Arterial 0.0 100.0 0.0 0.0

***************    End of This Run    ***************
```

Table I-4 MOBILE6.2.03 Output Files

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: MA10_ALL.INP (file 1, run 1).                               *
***************************************************************************
* *** Summer 2010 ***

* Reading Registration Distributions from the following external
* data file: 2005_REG.D
 M 49 Warning:
          1.00    MYR sum not = 1. (will normalize)
 M 49 Warning:
          0.998    MYR sum not = 1. (will normalize)
 M 49 Warning:
          0.998    MYR sum not = 1. (will normalize)
 M 49 Warning:
          0.998    MYR sum not = 1. (will normalize)
 M 49 Warning:
          1.00    MYR sum not = 1. (will normalize)
 M 49 Warning:
          1.00    MYR sum not = 1. (will normalize)
 M 49 Warning:
          0.999    MYR sum not = 1. (will normalize)
 M 49 Warning:
          0.998    MYR sum not = 1. (will normalize)
 M 49 Warning:
          1.00    MYR sum not = 1. (will normalize)
 M 49 Warning:
          0.999    MYR sum not = 1. (will normalize)
 M 49 Warning:
          1.00    MYR sum not = 1. (will normalize)
 M 49 Warning:
          1.00    MYR sum not = 1. (will normalize)
 M 49 Warning:
          1.00    MYR sum not = 1. (will normalize)
 M 49 Warning:
          1.00    MYR sum not = 1. (will normalize)

* Reading I/M program description records from the following external
* data file: 09NEWIM.D
* 15 Year Exemption Age
* New Annual OBD Exhaust I/M program for Light Duty MY 1996 through 2007 vehicles <=8,500 lb GVWR
* New Annual OBD Exhaust I/M program for Light Duty and Medium duty MY 2008 and later <=14,000 lb GVWR
* New Annual OBD Evap I/M program for Light Duty MY 1996 through 2007 vehicles <=8,500 lb GVWR
* New Annual OBD Evap I/M program for Light Duty and Medium duty MY 2008 and later <=14,000 lb GVWR
 M601 Comment:
        User has enabled STAGE II REFUELING.
```

Table I-4 MOBILE6.2.03 Output Files

```
* Reading 94+ LEV IMPLEMENTATION SCHEDULE from the following external
* data file: MA_LEV2.D

 Reading User Supplied Tier2 Exhaust bin phase-in fractions

   Data read from file: LEV2EXH.D


 Reading User Supplied Tier2 EVAP phase-in fractions

   Data read from file: LEV2EVAP.D


 Reading User Supplied Tier2 50K certification standards

   Data read from file: LEV2CERT.D

 M616 Comment:
          User has supplied post-1999 sulfur levels.
 M614 Comment:
          User supplied diesel sale fractions.

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 Idle Scenario - Summer (multiply g/mi by 2.5 mph to get g/hr)
* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
 M583 Warning:
        The user supplied arterial average speed of  2.5
        will be used for all hours of the day.  100% of VMT
        has been assigned to the arterial/collector roadway
        type for all hours of the day and all vehicle types.
```

Table I-4   MOBILE6.2.03 Output Files

```
*** I/M credits for Tech1&2 vehicles were read from the following external
   data file: TECH12.D
 M 48 Warning:
          there are no sales for vehicle class HDGV8b
 HDDV DEFEAT DEVICE EFFECTS ARE PRESENT. THE REBUILD FRACTION IS 0.10.

* Reading Ammonia (NH3) Basic Emissiion Rates
* from the external data file PMNH3BER.D

* Reading Ammonia (NH3) Sulfur Deterioration Rates
* from the external data file PMNH3SDR.D

 LEV phase-in data read from file MA_LEV2.D
                Calendar Year:  2010
                       Month:  July
                    Altitude:  Low
          Minimum Temperature:  70.4 (F)
          Maximum Temperature:  93.7 (F)
           Absolute Humidity:   75. grains/lb
          Fuel Sulfur Content:   30. ppm

          Exhaust I/M Program:  Yes
            Evap I/M Program:  Yes
                ATP Program:  No
            Reformulated Gas:  Yes

     Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV     MC   All Veh
           GVWR:             <6000    >6000     (All)
                  ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
  VMT Distribution:   0.3271   0.3908   0.1537           0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
 Fuel Economy (mpg):     24.1     18.5     14.2     17.1      9.9     32.5     18.4      7.3     50.0     16.3
 -----------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :    3.419    2.291    2.547    2.363    3.567    0.533    0.649    1.167    12.15    2.685
    Composite CO  :    15.60    12.17    14.00    12.68    30.82    4.015    1.790    7.572   120.29   14.265
    Composite NOX :    0.889    0.787    1.176    0.897    1.187    0.839    0.704   10.578     1.12    1.738
    Composite CO2 :    368.1    478.4    623.3    519.3    895.8    313.6    553.9   1402.3    177.4   558.27
 -----------------------------------------------------------------------------------------------------------
        Veh. Type:   GasBUS   URBAN   SCHOOL
                  ------  ------  ------
          VMT Mix:   0.0003   0.0009   0.0015
 Fuel Economy (mpg):      6.4      4.3      6.2
-----------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :    2.558    0.967    1.469
    Composite CO  :    47.07   11.662    6.625
    Composite NOX :    1.711   17.731   12.547
    Composite CO2 :   1375.2   2344.1   1646.6
-----------------------------------------------------------------------------------------------------------
```

Table I-4 MOBILE6.2.03 Output Files

```
* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 15 mph - Summer
* File 1, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
 M583 Warning:
      The user supplied arterial average speed of 15.0
      will be used for all hours of the day.  100% of VMT
      has been assigned to the arterial/collector roadway
      type for all hours of the day and all vehicle types.
 M 48 Warning:
       there are no sales for vehicle class HDGV8b

 LEV phase-in data read from file MA_LEV2.D
            Calendar Year:  2010
                 Month:  July
               Altitude:  Low
       Minimum Temperature:  70.4 (F)
       Maximum Temperature:  93.7 (F)
        Absolute Humidity:   75. grains/lb
       Fuel Sulfur Content:   30. ppm

       Exhaust I/M Program:  Yes
         Evap I/M Program:  Yes
            ATP Program:  No
         Reformulated Gas:  Yes

    Vehicle Type:   LDGV   LDGT12   LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV     MC   All Veh
         GVWR:              <6000    >6000     (All)
                  ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
 VMT Distribution:  0.3271   0.3908   0.1537           0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
```

Table I-4 MOBILE6.2.03 Output Files

```
Fuel Economy (mpg):    24.1    18.5    14.2    17.1     9.9    32.5    18.4     7.3    50.0    16.3
 -----------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
   Composite VOC :   0.577   0.432   0.530   0.460   0.779   0.335   0.402   0.646    4.55   0.542
   Composite CO  :    5.39    4.91    5.58    5.10   11.52   1.969   0.860   3.076   25.25   5.330
   Composite NOX :   0.482   0.472   0.713   0.540   1.341   0.546   0.457   6.914    1.01   1.100
   Composite CO2 :   368.1   478.4   623.3   519.3   895.8   313.6   553.9  1402.3   177.4  558.27
 -----------------------------------------------------------------------------------------------------
      Veh. Type:   GasBUS   URBAN   SCHOOL
                   ------   ------  ------
        VMT Mix:   0.0003   0.0009  0.0015
Fuel Economy (mpg):   6.4      4.3     6.2
-----------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
   Composite VOC :   0.760   0.535   0.813
   Composite CO  :   17.59   4.737   2.691
   Composite NOX :   1.933  11.249   7.899
   Composite CO2 :  1375.2  2344.1  1646.6
-----------------------------------------------------------------------------------------------------

* #########################
* 2010 20 mph - Summer
* File 1, Run 1, Scenario 3.
* #########################

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
 M583 Warning:
        The user supplied arterial average speed of 20.0
        will be used for all hours of the day.  100% of VMT
        has been assigned to the arterial/collector roadway
        type for all hours of the day and all vehicle types.
 M 48 Warning:
          there are no sales for vehicle class HDGV8b
```

Table I-4 MOBILE6.2.03 Output Files

```
LEV phase-in data read from file MA_LEV2.D
              Calendar Year:  2010
                    Month:  July
                  Altitude:  Low
          Minimum Temperature:  70.4 (F)
          Maximum Temperature:  93.7 (F)
            Absolute Humidity:   75. grains/lb
          Fuel Sulfur Content:   30. ppm

          Exhaust I/M Program:  Yes
            Evap I/M Program:  Yes
                ATP Program:  No
            Reformulated Gas:  Yes

     Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV     MC   All Veh
           GVWR:             <6000    >6000     (All)
                     ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
  VMT Distribution:   0.3271  0.3908  0.1537           0.0367  0.0003  0.0014  0.0860  0.0039  1.0000
Fuel Economy (mpg):     24.1    18.5    14.2    17.1     9.9    32.5    18.4     7.3    50.0    16.3
---------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
   Composite VOC :    0.506   0.375   0.459   0.399   0.621   0.291   0.346   0.530    4.10   0.468
   Composite CO  :    4.93    4.55    5.17    4.73    8.55   1.626   0.704   2.323   20.08   4.779
   Composite NOX :    0.430   0.430   0.653   0.493   1.403   0.489   0.409   6.199    1.06   0.998
   Composite CO2 :   368.1   478.4   623.3   519.3   895.8   313.6   553.9  1402.3   177.4  558.27
---------------------------------------------------------------------------------------------------
       Veh. Type:   GasBUS   URBAN   SCHOOL
                     ------  ------  ------
         VMT Mix:   0.0003   0.0009  0.0015
Fuel Economy (mpg):     6.4     4.3     6.2
---------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
   Composite VOC :    0.604   0.439   0.667
   Composite CO  :   13.06    3.577   2.032
   Composite NOX :    2.022   9.984   6.992
   Composite CO2 :  1375.2   2344.1  1646.6
---------------------------------------------------------------------------------------------------


* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 25 mph - Summer
* File 1, Run 1, Scenario 4.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV
```

Table I-4 MOBILE6.2.03 Output Files

```
* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
 M583 Warning:
       The user supplied arterial average speed of 25.0
       will be used for all hours of the day.  100% of VMT
       has been assigned to the arterial/collector roadway
       type for all hours of the day and all vehicle types.
 M 48 Warning:
        there are no sales for vehicle class HDGV8b

 LEV phase-in data read from file MA_LEV2.D
              Calendar Year:  2010
                    Month:  July
                  Altitude:  Low
         Minimum Temperature:  70.4 (F)
         Maximum Temperature:  93.7 (F)
           Absolute Humidity:   75. grains/lb
         Fuel Sulfur Content:   30. ppm

         Exhaust I/M Program:  Yes
           Evap I/M Program:  Yes
               ATP Program:  No
           Reformulated Gas:  Yes

    Vehicle Type:    LDGV   LDGT12  LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV     MC   All Veh
          GVWR:              <6000   >6000    (All)
                    ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
  VMT Distribution:  0.3271  0.3908  0.1537          0.0367  0.0003  0.0014  0.0860  0.0039  1.0000
 Fuel Economy (mpg):    24.1    18.5    14.2    17.1     9.9    32.5    18.4     7.3    50.0    16.3
 ------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
   Composite VOC :   0.467   0.347   0.423   0.368   0.526   0.259   0.306   0.445    3.82   0.426
   Composite CO  :    4.73    4.40    5.00    4.57    6.71   1.404   0.604   1.836   16.91   4.509
   Composite NOX :   0.397   0.404   0.617   0.464   1.465   0.453   0.379   5.750    1.12   0.936
   Composite CO2 :   368.1   478.4   623.3   519.3   895.8   313.6   553.9  1402.3   177.4  558.27
 ------------------------------------------------------------------------------------------------------
       Veh. Type:   GasBUS   URBAN   SCHOOL
                    ------  ------  ------
        VMT Mix:    0.0003  0.0009  0.0015
```

Table I-4 MOBILE6.2.03 Output Files

```
 Fuel Economy (mpg):      6.4      4.3      6.2
------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :     0.509     0.368     0.559
    Composite CO  :    10.25      2.827     1.606
    Composite NOX :     2.111     9.189     6.422
    Composite CO2 :  1375.2    2344.1    1646.6
------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 30 mph - Summer
* File 1, Run 1, Scenario 5.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M583 Warning:
          The user supplied arterial average speed of 30.0
          will be used for all hours of the day.  100% of VMT
          has been assigned to the arterial/collector roadway
          type for all hours of the day and all vehicle types.
  M 48 Warning:
            there are no sales for vehicle class HDGV8b

 LEV phase-in data read from file MA_LEV2.D
                   Calendar Year:  2010
                           Month:  July
                        Altitude:  Low
            Minimum Temperature:  70.4 (F)
            Maximum Temperature:  93.7 (F)
              Absolute Humidity:   75. grains/lb
            Fuel Sulfur Content:   30. ppm

            Exhaust I/M Program:  Yes
```

Table I-4 MOBILE6.2.03 Output Files

```
            Evap I/M Program:  Yes
               ATP Program:  No
            Reformulated Gas:  Yes

      Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV     MC   All Veh
           GVWR:            <6000    >6000    (All)
                    ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
   VMT Distribution:   0.3271   0.3908   0.1537          0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
 Fuel Economy (mpg):     24.1     18.5     14.2     17.1      9.9     32.5     18.4      7.3     50.0     16.3
 --------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :    0.442    0.329    0.401    0.349    0.462    0.235    0.276    0.381     3.62    0.399
    Composite CO  :     4.69     4.38     4.97     4.55     5.56    1.260    0.538    1.519    14.61    4.403
    Composite NOX :    0.375    0.387    0.592    0.445    1.526    0.434    0.363    5.514     1.17    0.900
    Composite CO2 :    368.1    478.4    623.3    519.3    895.8    313.6    553.9   1402.3    177.4   558.27
 --------------------------------------------------------------------------------------------------------------
         Veh. Type:   GasBUS    URBAN   SCHOOL
                    ------  ------  ------
          VMT Mix:   0.0003   0.0009   0.0015
 Fuel Economy (mpg):      6.4      4.3      6.2
--------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :    0.445    0.316    0.480
    Composite CO  :     8.50    2.339    1.329
    Composite NOX :    2.200    8.772    6.124
    Composite CO2 :   1375.2   2344.1   1646.6
--------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 35 mph - Summer
* File 1, Run 1, Scenario 6.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
```

Table I-4 MOBILE6.2.03 Output Files

```
* from the external data file PMDDR2.CSV
 M583 Warning:
          The user supplied arterial average speed of 35.0
          will be used for all hours of the day.  100% of VMT
          has been assigned to the arterial/collector roadway
          type for all hours of the day and all vehicle types.
 M 48 Warning:
            there are no sales for vehicle class HDGV8b

 LEV phase-in data read from file MA_LEV2.D
                   Calendar Year:  2010
                           Month:  July
                        Altitude:  Low
            Minimum Temperature:  70.4 (F)
            Maximum Temperature:  93.7 (F)
              Absolute Humidity:   75. grains/lb
            Fuel Sulfur Content:   30. ppm

            Exhaust I/M Program:  Yes
               Evap I/M Program:  Yes
                    ATP Program:  No
               Reformulated Gas:  Yes

      Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT     HDGV     LDDV     LDDT     HDDV      MC   All Veh
          GVWR:              <6000    >6000    (All)
                    ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
   VMT Distribution:   0.3271   0.3908   0.1537             0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
 Fuel Economy (mpg):     24.1     18.5     14.2     17.1      9.9     32.5     18.4      7.3     50.0     16.3
 -----------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :    0.424    0.316    0.385    0.336    0.418    0.217    0.253    0.334     3.46    0.379
    Composite CO  :     4.77     4.47     5.05     4.63     4.87    1.167    0.496    1.315    12.91    4.425
    Composite NOX :    0.361    0.379    0.581    0.436    1.588    0.431    0.360    5.467     1.22    0.889
    Composite CO2 :    368.1    478.4    623.3    519.3    895.8    313.6    553.9   1402.3    177.4   558.27
 -----------------------------------------------------------------------------------------------------------
       Veh. Type:   GasBUS   URBAN   SCHOOL
                    ------  ------  ------
         VMT Mix:   0.0003   0.0009   0.0015
 Fuel Economy (mpg):   6.4      4.3      6.2
-----------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :   0.402    0.277    0.420
    Composite CO  :    7.44    2.025    1.150
    Composite NOX :   2.289    8.689    6.064
    Composite CO2 :  1375.2   2344.1   1646.6
-----------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 50 mph - Summer
```

Table I-4 MOBILE6.2.03 Output Files

```
* File 1, Run 1, Scenario 7.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
 M583 Warning:
        The user supplied arterial average speed of 50.0
        will be used for all hours of the day.  100% of VMT
        has been assigned to the arterial/collector roadway
        type for all hours of the day and all vehicle types.
 M 48 Warning:
         there are no sales for vehicle class HDGV8b

 LEV phase-in data read from file MA_LEV2.D
               Calendar Year:  2010
                      Month:  July
                   Altitude:  Low
         Minimum Temperature:  70.4 (F)
         Maximum Temperature:  93.7 (F)
           Absolute Humidity:  75. grains/lb
         Fuel Sulfur Content:  30. ppm

          Exhaust I/M Program:  Yes
             Evap I/M Program:  Yes
                 ATP Program:  No
            Reformulated Gas:  Yes

      Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV      MC  All Veh
             GVWR:            <6000    >6000    (All)
                     ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
  VMT Distribution:   0.3271   0.3908   0.1537           0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
 Fuel Economy (mpg):    24.1     18.5     14.2     17.1      9.9     32.5     18.4      7.3     50.0     16.3
 ----------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
```

Table I-4 MOBILE6.2.03 Output Files

```
    Composite VOC :   0.394   0.300   0.362   0.318   0.347  0.187   0.217   0.257    3.26   0.350
    Composite CO  :   5.66    5.27    5.90    5.45    4.56   1.079   0.456   1.120   10.68   5.128
    Composite NOX :   0.380   0.402   0.608   0.460   1.773  0.513   0.430   6.504    1.34   1.005
    Composite CO2 :  368.1   478.4   623.3   519.3   895.8  313.6   553.9  1402.3   177.4  558.27
 ---------------------------------------------------------------------------------------------------

       Veh. Type:   GasBUS   URBAN   SCHOOL
                    ------   ------  ------
        VMT Mix:    0.0003   0.0009  0.0015
 Fuel Economy (mpg):    6.4     4.3     6.2
 ---------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :   0.336   0.212   0.323
    Composite CO  :   6.96    1.726   0.980
    Composite NOX :   2.556  10.523   7.379
    Composite CO2 : 1375.2  2344.1  1646.6
 ---------------------------------------------------------------------------------------------------
```

```
*****************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                                *
* Input file: MA10_ALL.INP (file 1, run 1).                                 *
*****************************************************************************


* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 Idle Scenario - Summer (multiply g/mi by 2.5 mph to get g/hr)
* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                     Calendar Year:  2010
                             Month:  July
      Gasoline Fuel Sulfur Content:   30. ppm
        Diesel Fuel Sulfur Content:   15. ppm
              Particle Size Cutoff: 10.00 Microns
                 Reformulated Gas:  Yes

     Vehicle Type:    LDGV   LDGT12  LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV     MC   All Veh
            GVWR:             <6000   >6000   (All)
                     ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
   VMT Distribution:  0.3271  0.3908  0.1537           0.0367  0.0003  0.0014  0.0860  0.0039  1.0000
 ---------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
            Lead:  0.0000  0.0000  0.0000  0.0000  0.0000  ------  ------  ------  0.0000  0.0000
           GASPM:  0.0039  0.0038  0.0038  0.0038  0.0309  ------  ------  ------  0.0205  0.0046
         ECARBON:  ------  ------  ------  ------  ------  0.0821  0.0182  0.0977  ------  0.0085
         OCARBON:  ------  ------  ------  ------  ------  0.0232  0.0262  0.0485  ------  0.0042
             SO4:  0.0005  0.0006  0.0006  0.0006  0.0013  0.0002  0.0003  0.0009  0.0002  0.0006
 Total Exhaust PM:  0.0044  0.0044  0.0044  0.0044  0.0321  0.1054  0.0447  0.1471  0.0207  0.0178
           Brake:  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125
            Tire:  0.0080  0.0080  0.0080  0.0080  0.0085  0.0080  0.0080  0.0248  0.0040  0.0094
        Total PM:  0.0249  0.0250  0.0249  0.0250  0.0532  0.1260  0.0652  0.1845  0.0372  0.0398
             SO2:  0.0067  0.0087  0.0115  0.0095  0.0164  0.0029  0.0052  0.0131  0.0033  0.0091
```

Table I-4 MOBILE6.2.03 Output Files

```
              NH3:   0.1013   0.1015   0.1016   0.1016   0.0451   0.0068   0.0068   0.0270   0.0113   0.0925
 -----------------------------------------------------------------------------------------------------------
        Veh. Type:   GasBUS   URBAN   SCHOOL
                     ------   ------   ------
          VMT Mix:   0.0003   0.0009   0.0015
 -----------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:   0.0000   ------   ------
            GASPM:   0.0363   ------   ------
         ECARBON:    ------   0.1211   0.0715
         OCARBON:    ------   0.0951   0.0562
              SO4:   0.0012   0.0015   0.0011
  Total Exhaust PM:   0.0376   0.2178   0.1287
            Brake:   0.0125   0.0125   0.0125
             Tire:   0.0120   0.0120   0.0120
         Total PM:   0.0622   0.2423   0.1532
              SO2:   0.0253   0.0218   0.0153
              NH3:   0.0451   0.0270   0.0270
 -----------------------------------------------------------------------------------------------------------

* #########################
* 2010 15 mph - Summer
* File 1, Run 1, Scenario 2.
* #########################

                     Calendar Year:  2010
                             Month:  July
          Gasoline Fuel Sulfur Content:   30. ppm
            Diesel Fuel Sulfur Content:   15. ppm
                Particle Size Cutoff: 10.00 Microns
                     Reformulated Gas:  Yes

      Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT     HDGV     LDDV     LDDT     HDDV      MC   All Veh
           GVWR:               <6000    >6000    (All)
                     ------   ------   ------   ------   ------   ------   ------   ------   ------   ------
  VMT Distribution:   0.3271   0.3908   0.1537            0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
 -----------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:   0.0000   0.0000   0.0000   0.0000   0.0000   ------   ------   ------   0.0000   0.0000
            GASPM:   0.0039   0.0038   0.0038   0.0038   0.0309   ------   ------   ------   0.0205   0.0046
         ECARBON:    ------   ------   ------   ------   ------   0.0821   0.0182   0.0977   ------   0.0085
         OCARBON:    ------   ------   ------   ------   ------   0.0232   0.0262   0.0485   ------   0.0042
              SO4:   0.0005   0.0006   0.0006   0.0006   0.0013   0.0002   0.0003   0.0009   0.0002   0.0006
  Total Exhaust PM:   0.0044   0.0044   0.0044   0.0044   0.0321   0.1054   0.0447   0.1471   0.0207   0.0178
            Brake:   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125
             Tire:   0.0080   0.0080   0.0080   0.0080   0.0085   0.0080   0.0080   0.0248   0.0040   0.0094
         Total PM:   0.0249   0.0250   0.0249   0.0250   0.0532   0.1260   0.0652   0.1845   0.0372   0.0398
              SO2:   0.0067   0.0087   0.0115   0.0095   0.0164   0.0029   0.0052   0.0131   0.0033   0.0091
              NH3:   0.1013   0.1015   0.1016   0.1016   0.0451   0.0068   0.0068   0.0270   0.0113   0.0925
```

Table I-4 MOBILE6.2.03 Output Files

```
 ----------------------------------------------------------------------------------------------------------------
        Veh. Type:   GasBUS   URBAN   SCHOOL
                     ------   ------  ------
         VMT Mix:    0.0003   0.0009  0.0015
 ----------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
            Lead:   0.0000   ------   ------
           GASPM:   0.0363   ------   ------
         ECARBON:   ------   0.1211   0.0715
         OCARBON:   ------   0.0951   0.0562
             SO4:   0.0012   0.0015   0.0011
  Total Exhaust PM:   0.0376   0.2178   0.1287
           Brake:   0.0125   0.0125   0.0125
            Tire:   0.0120   0.0120   0.0120
        Total PM:   0.0622   0.2423   0.1532
             SO2:   0.0253   0.0218   0.0153
             NH3:   0.0451   0.0270   0.0270
 ----------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 20 mph - Summer
* File 1, Run 1, Scenario 3.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                    Calendar Year:  2010
                           Month:  July
         Gasoline Fuel Sulfur Content:   30. ppm
           Diesel Fuel Sulfur Content:   15. ppm
              Particle Size Cutoff: 10.00 Microns
                 Reformulated Gas:  Yes

     Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV     MC   All Veh
            GVWR:            <6000    >6000     (All)
                     ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
  VMT Distribution:   0.3271   0.3908   0.1537           0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
 ----------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
            Lead:   0.0000   0.0000   0.0000   0.0000   0.0000   ------   ------   ------   0.0000   0.0000
           GASPM:   0.0039   0.0038   0.0038   0.0038   0.0309   ------   ------   ------   0.0205   0.0046
         ECARBON:   ------   ------   ------   ------   ------   0.0821   0.0182   0.0977   ------   0.0085
         OCARBON:   ------   ------   ------   ------   ------   0.0232   0.0262   0.0485   ------   0.0042
             SO4:   0.0005   0.0006   0.0006   0.0006   0.0013   0.0002   0.0003   0.0009   0.0002   0.0006
  Total Exhaust PM:   0.0044   0.0044   0.0044   0.0044   0.0321   0.1054   0.0447   0.1471   0.0207   0.0178
           Brake:   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125
            Tire:   0.0080   0.0080   0.0080   0.0080   0.0085   0.0080   0.0080   0.0248   0.0040   0.0094
        Total PM:   0.0249   0.0250   0.0249   0.0250   0.0532   0.1260   0.0652   0.1845   0.0372   0.0398
             SO2:   0.0067   0.0087   0.0115   0.0095   0.0164   0.0029   0.0052   0.0131   0.0033   0.0091
             NH3:   0.1013   0.1015   0.1016   0.1016   0.0451   0.0068   0.0068   0.0270   0.0113   0.0925
 ----------------------------------------------------------------------------------------------------------------
```

Table I-4 MOBILE6.2.03 Output Files

```
        Veh. Type:   GasBUS    URBAN   SCHOOL
                     ------   ------   ------
         VMT Mix:   0.0003   0.0009   0.0015
-------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
             Lead:   0.0000   ------   ------
           GASPM:   0.0363   ------   ------
         ECARBON:   ------   0.1211   0.0715
         OCARBON:   ------   0.0951   0.0562
              SO4:   0.0013   0.0015   0.0011
 Total Exhaust PM:   0.0376   0.2178   0.1287
            Brake:   0.0125   0.0125   0.0125
             Tire:   0.0120   0.0120   0.0120
         Total PM:   0.0622   0.2423   0.1532
              SO2:   0.0253   0.0218   0.0153
              NH3:   0.0451   0.0270   0.0270
-------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2010 25 mph - Summer
* File 1, Run 1, Scenario 4.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                    Calendar Year:  2010
                            Month:  July
        Gasoline Fuel Sulfur Content:   30. ppm
          Diesel Fuel Sulfur Content:   15. ppm
             Particle Size Cutoff: 10.00 Microns
                 Reformulated Gas:  Yes

    Vehicle Type:     LDGV   LDGT12   LDGT34     LDGT     HDGV     LDDV     LDDT     HDDV       MC   All Veh
           GVWR:               <6000    >6000    (All)
                     ------   ------   ------   ------   ------   ------   ------   ------   ------   ------
 VMT Distribution:   0.3271   0.3908   0.1537             0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
-------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
             Lead:   0.0000   0.0000   0.0000   0.0000   0.0000   ------   ------   ------   0.0000   0.0000
           GASPM:   0.0040   0.0038   0.0038   0.0038   0.0307   ------   ------   ------   0.0205   0.0046
         ECARBON:   ------   ------   ------   ------   ------   0.0821   0.0182   0.0977   ------   0.0085
         OCARBON:   ------   ------   ------   ------   ------   0.0232   0.0262   0.0485   ------   0.0042
              SO4:   0.0004   0.0005   0.0005   0.0005   0.0015   0.0002   0.0003   0.0009   0.0001   0.0006
 Total Exhaust PM:   0.0044   0.0044   0.0044   0.0044   0.0322   0.1054   0.0447   0.1471   0.0206   0.0178
            Brake:   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125
             Tire:   0.0080   0.0080   0.0080   0.0080   0.0085   0.0080   0.0080   0.0248   0.0040   0.0094
         Total PM:   0.0249   0.0249   0.0249   0.0249   0.0533   0.1260   0.0652   0.1845   0.0372   0.0398
              SO2:   0.0067   0.0088   0.0115   0.0095   0.0163   0.0029   0.0052   0.0131   0.0033   0.0091
              NH3:   0.1013   0.1015   0.1016   0.1016   0.0451   0.0068   0.0068   0.0270   0.0113   0.0925
-------------------------------------------------------------------------------------------------------------------
        Veh. Type:   GasBUS    URBAN   SCHOOL
```

Table I-4 MOBILE6.2.03 Output Files

```
                  ------  ------  ------
       VMT Mix:   0.0003  0.0009  0.0015
-----------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
           Lead:  0.0000  ------  ------
          GASPM:  0.0362  ------  ------
        ECARBON:  ------  0.1211  0.0715
        OCARBON:  ------  0.0951  0.0562
            SO4:  0.0015  0.0015  0.0011
 Total Exhaust PM:  0.0377  0.2178  0.1287
          Brake:  0.0125  0.0125  0.0125
           Tire:  0.0120  0.0120  0.0120
       Total PM:  0.0623  0.2423  0.1532
            SO2:  0.0253  0.0218  0.0153
            NH3:  0.0451  0.0270  0.0270
-----------------------------------------------------------------------------------------

* #########################
* 2010 30 mph - Summer
* File 1, Run 1, Scenario 5.
* #########################

                    Calendar Year:  2010
                            Month:  July
      Gasoline Fuel Sulfur Content:   30. ppm
        Diesel Fuel Sulfur Content:   15. ppm
           Particle Size Cutoff: 10.00 Microns
                 Reformulated Gas:  Yes

   Vehicle Type:   LDGV  LDGT12  LDGT34   LDGT   HDGV   LDDV   LDDT   HDDV     MC  All Veh
          GVWR:          <6000   >6000   (All)
                 ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
 VMT Distribution:  0.3271  0.3908  0.1537          0.0367  0.0003  0.0014  0.0860  0.0039  1.0000
-----------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
           Lead:  0.0000  0.0000  0.0000  0.0000  0.0000  ------  ------  ------  0.0000  0.0000
          GASPM:  0.0040  0.0039  0.0039  0.0039  0.0306  ------  ------  ------  0.0205  0.0046
        ECARBON:  ------  ------  ------  ------  ------  0.0821  0.0182  0.0977  ------  0.0085
        OCARBON:  ------  ------  ------  ------  ------  0.0232  0.0262  0.0485  ------  0.0042
            SO4:  0.0003  0.0005  0.0005  0.0005  0.0017  0.0002  0.0003  0.0009  0.0001  0.0005
 Total Exhaust PM:  0.0043  0.0044  0.0044  0.0044  0.0323  0.1054  0.0447  0.1471  0.0206  0.0178
          Brake:  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125  0.0125
           Tire:  0.0080  0.0080  0.0080  0.0080  0.0085  0.0080  0.0080  0.0248  0.0040  0.0094
       Total PM:  0.0249  0.0249  0.0249  0.0249  0.0533  0.1260  0.0652  0.1845  0.0371  0.0398
            SO2:  0.0067  0.0088  0.0115  0.0096  0.0163  0.0029  0.0052  0.0131  0.0033  0.0091
            NH3:  0.1013  0.1015  0.1016  0.1016  0.0451  0.0068  0.0068  0.0270  0.0113  0.0925
-----------------------------------------------------------------------------------------
      Veh. Type:  GasBUS   URBAN  SCHOOL
                  ------  ------  ------
```

Table I-4 MOBILE6.2.03 Output Files

```
          VMT Mix:   0.0003   0.0009   0.0015
 -----------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:   0.0000   ------   ------
            GASPM:   0.0361   ------   ------
          ECARBON:   ------   0.1211   0.0715
          OCARBON:   ------   0.0951   0.0562
              SO4:   0.0017   0.0015   0.0011
  Total Exhaust PM:  0.0378   0.2178   0.1287
            Brake:   0.0125   0.0125   0.0125
             Tire:   0.0120   0.0120   0.0120
         Total PM:   0.0623   0.2423   0.1532
              SO2:   0.0252   0.0218   0.0153
              NH3:   0.0451   0.0270   0.0270
 -----------------------------------------------------------------------------------------------

* #########################
* 2010 35 mph - Summer
* File 1, Run 1, Scenario 6.
* #########################

                     Calendar Year:  2010
                             Month:  July
      Gasoline Fuel Sulfur Content:   30. ppm
        Diesel Fuel Sulfur Content:   15. ppm
          Particle Size Cutoff: 10.00 Microns
               Reformulated Gas:  Yes

     Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT    HDGV    LDDV    LDDT    HDDV     MC   All Veh
             GVWR:            <6000    >6000    (All)
                    ------   ------   ------   ------   ------   ------   ------   ------   ------   ------
  VMT Distribution:  0.3271   0.3908   0.1537            0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
 -----------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:   0.0000   0.0000   0.0000   0.0000   0.0000   ------   ------   ------   0.0000   0.0000
            GASPM:   0.0041   0.0039   0.0039   0.0039   0.0305   ------   ------   ------   0.0205   0.0047
          ECARBON:   ------   ------   ------   ------   ------   0.0821   0.0182   0.0977   ------   0.0085
          OCARBON:   ------   ------   ------   ------   ------   0.0232   0.0262   0.0485   ------   0.0042
              SO4:   0.0002   0.0004   0.0004   0.0004   0.0019   0.0002   0.0003   0.0009   0.0001   0.0005
  Total Exhaust PM:  0.0043   0.0044   0.0044   0.0044   0.0324   0.1054   0.0447   0.1471   0.0206   0.0178
            Brake:   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125
             Tire:   0.0080   0.0080   0.0080   0.0080   0.0085   0.0080   0.0080   0.0248   0.0040   0.0094
         Total PM:   0.0248   0.0249   0.0249   0.0249   0.0534   0.1260   0.0652   0.1845   0.0371   0.0398
              SO2:   0.0068   0.0088   0.0115   0.0096   0.0162   0.0029   0.0052   0.0131   0.0033   0.0092
              NH3:   0.1013   0.1015   0.1016   0.1016   0.0451   0.0068   0.0068   0.0270   0.0113   0.0925
 -----------------------------------------------------------------------------------------------
        Veh. Type:   GasBUS   URBAN   SCHOOL
                     ------   ------   ------
          VMT Mix:   0.0003   0.0009   0.0015
```

Table I-4 MOBILE6.2.03 Output Files

```
 ---------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
           Lead:   0.0000   ------   ------
          GASPM:   0.0360   ------   ------
        ECARBON:   ------   0.1211   0.0715
        OCARBON:   ------   0.0951   0.0562
            SO4:   0.0019   0.0015   0.0011
 Total Exhaust PM:   0.0379   0.2178   0.1287
          Brake:   0.0125   0.0125   0.0125
           Tire:   0.0120   0.0120   0.0120
       Total PM:   0.0624   0.2423   0.1532
            SO2:   0.0252   0.0218   0.0153
            NH3:   0.0451   0.0270   0.0270
 ---------------------------------------------------------------------------------------------------------------

* ########################################
* 2010 50 mph - Summer
* File 1, Run 1, Scenario 7.
* ########################################

                      Calendar Year:  2010
                             Month:  July
         Gasoline Fuel Sulfur Content:   30. ppm
           Diesel Fuel Sulfur Content:   15. ppm
               Particle Size Cutoff: 10.00 Microns
                   Reformulated Gas:  Yes

     Vehicle Type:    LDGV   LDGT12   LDGT34    LDGT     HDGV     LDDV     LDDT     HDDV      MC    All Veh
           GVWR:              <6000    >6000    (All)
                     ------   ------   ------   ------   ------   ------   ------   ------   ------   ------
 VMT Distribution:   0.3271   0.3908   0.1537            0.0367   0.0003   0.0014   0.0860   0.0039   1.0000
 ---------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
           Lead:   0.0000   0.0000   0.0000   0.0000   0.0000   ------   ------   ------   0.0000   0.0000
          GASPM:   0.0041   0.0039   0.0039   0.0039   0.0305   ------   ------   ------   0.0205   0.0047
        ECARBON:   ------   ------   ------   ------   ------   0.0821   0.0182   0.0977   ------   0.0085
        OCARBON:   ------   ------   ------   ------   ------   0.0232   0.0262   0.0485   ------   0.0042
            SO4:   0.0002   0.0004   0.0004   0.0004   0.0019   0.0002   0.0003   0.0009   0.0001   0.0005
 Total Exhaust PM:   0.0043   0.0044   0.0044   0.0044   0.0324   0.1054   0.0447   0.1471   0.0206   0.0178
          Brake:   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125
           Tire:   0.0080   0.0080   0.0080   0.0080   0.0085   0.0080   0.0080   0.0248   0.0040   0.0094
       Total PM:   0.0248   0.0249   0.0249   0.0249   0.0534   0.1260   0.0652   0.1845   0.0371   0.0398
            SO2:   0.0068   0.0088   0.0115   0.0096   0.0162   0.0029   0.0052   0.0131   0.0033   0.0092
            NH3:   0.1013   0.1015   0.1016   0.1016   0.0451   0.0068   0.0068   0.0270   0.0113   0.0925
 ---------------------------------------------------------------------------------------------------------------
       Veh. Type:   GasBUS    URBAN    SCHOOL
                    ------   ------   ------
        VMT Mix:    0.0003   0.0009   0.0015
 ---------------------------------------------------------------------------------------------------------------
```

Table I-4 MOBILE6.2.03 Output Files

```
Composite Emission Factors (g/mi):
          Lead:   0.0000   ------   ------
         GASPM:   0.0360   ------   ------
       ECARBON:   ------   0.1211   0.0715
       OCARBON:   ------   0.0951   0.0562
           SO4:   0.0019   0.0015   0.0011
Total Exhaust PM:   0.0379   0.2178   0.1287
         Brake:   0.0125   0.0125   0.0125
          Tire:   0.0120   0.0120   0.0120
      Total PM:   0.0624   0.2423   0.1532
           SO2:   0.0252   0.0218   0.0153
           NH3:   0.0451   0.0270   0.0270
----------------------------------------------------------------------------------------------------------------------
```

Fuel Storage and Handling

As in previous years, volatile organic compounds (VOC) emissions from fuel storage and handling were calculated using methods based on EPA's AP-42[2] document. Calculations account for evaporative emissions from breathing losses, working losses, and spillage from above-ground storage tanks, underground storage tanks, and aircraft refueling. In 2003, additional information became available on the fire training fuel, Tek-Flame®. Emissions of VOCs from this fuel were estimated by EDMS. Table I-5 presents Logan Airport's fuel throughput by category.

Table I-5 Fuel Throughput by Fuel Category (gallons)

Fuel Category	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Jet Fuel	354,095,516	441,901,932	416,748,819	358,190,362	319,439,910	373,996,141	368,645,392	364,450,864	367,585,187	345,631,788	327,358,619	**335,693,997**
Fire Training Fuel[1]	NA	NA	NA	NA	13,719	12,227	8,105	5,000	8,631	5,971	3,510	**800**
Aviation Gas	99,726	90,922	60,691	35,111	32,515	34,717	52,487	35,098	29,067	25,037	18,238	**15,268**
Auto Gas	7,200,000	7,569,206	6,181,472	5,754,740	5,436,322	5,803,442	5,903,424	6,028,931	6,022,237	5,693,178	5,736,724	**5,696,505**
Diesel	768,106	839,751	1,239,904	1,067,847	1,030,185	1,078,665	1,567,688	1,164,493	1,141,335	1,071,707	1,121,241	**1,168,761**
Heating Oil No.2	480,733	494,500	582,283	340,492	370,903	381,852	367,899	259,768	423,181	303,143	409,049	**319,727**
Heating Oil No.6	1,600,893	1,555,527	1,641,693	1,079,283	1,122,975	2,940,752	3,098,126	1,396,529	1,073,260	16,385	368,690	**9,010**

Source: Massport, 2011.
1 Tek-Flame® Fuel was not used until 2003. Jet A Fuel was used prior to 2003.
NA Not available.

2 Compilation of Air Pollutant Emission Factors, AP-42, Office of Air Quality Planning and Standards, EPA, Fifth Edition,1995.

Stationary Sources

Stationary sources include the Central Heating and Cooling Plant, emergency generators, snow melters, and boilers. Emission factors from EPA's AP-42 or NO_x Reasonably Available Control Technology (RACT) compliance testing were combined with the actual 2010 fuel throughput of the stationary sources to obtain emissions of VOCs, nitrogen oxides (NO_X), carbon monoxide (CO), and particulate matter with a diameter of less than or equal to 10 micrograms or 2.5 micrograms ($PM_{10}/PM_{2.5}$).

Title V of the 1990 Clean Air Act (CAA) Amendments requires facilities with air emissions to document their emissions and obtain a single permit combining all sources. The permitting program ensures that all emission sources are accounted for, the proper permits have been received, and permit conditions are being followed. A Title V Air Operating Permit covers all of the stationary sources at Logan Airport including boilers, emergency generators, snow melters, cooling towers, paint booths, deicing facilities, and storage tanks. Table I-6 presents Logan Airport's stationary source fuel throughput by fuel category.

Table I-6 Stationary Source Fuel Throughput by Fuel Category (gallons)

Fuel Category	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Natural Gas (ft^3)	183,943,000	283,720,049	199,500,000	268,359,282	201,714,114	62,610,000	92,460,000	112,390,000	338,430,000	458,680,000	430,810,000	**449,640,000**
Heating Oil No. 2	480,733	494,500	582,283	340,492	370,903	381,852	367,899	259,768	423,181	303,143	409,050	**319,727**
Heating Oil No. 6	1,600,893	1,555,527	1,641,693	1,079,283	1,122,975	2,940,752	3,098,126	1,396,529	1,073,260	16,385	368,690	**9,010**
Diesel Fuel[1]	57,441	NA	NA	NA	NA	67,198	77,848	77,848	258,606	146,718	145,778	**116,511**
Fire Training Fuel[2]	23,000	NA	NA	NA	13,719	12,227	8,105	5,000	8,631	5,971	3,510	**800**

Source: Massport, 2011.
NA Not available.
1 Diesel fuel was from the stationary snow melter usage. Starting in 2007, portable snow melter usage was also included.
2 Fire Training Fuel used in 1999 was Jet A Fuel while in 2003 through 2010 it was Tek-Flame®.

1993 Through 2003 Emissions Inventories

Tables I-7 through I-9 contain the 1993 through 2003 Emissions Inventory summary tables for Logan Airport.

Table I-7 Estimated Volatile Organic Compounds (VOC) Emissions (in kg/day) at Logan Airport[1]

	1993	1994	1995	1996	1997	1998	1999[2]	2000	2001	2002	2003
Aircraft/GSE Model	**Logan Dispersion Modeling System (LDMS)**					**EDMS v3.22**	**EDMS v4.21**	**EDMS v4.03**		**EDMS v4.11**	
Motor Vehicle Model	**MOBILE5a**					**MOB5a_h**	**MOB6.2.03**	**MOBILE 6.0**			**MOB6.2.01**
Aircraft Sources											
Air carriers	1,958	1,554	1,407	1,390	1,227	736	653	514	374	248	208
Commuter aircraft	943	543	531	622	498	154	196	140	113	75	95
Cargo aircraft	89	244	236	214	207	43	318	207	149	127	94
General aviation	51	48	36	24	27	13	141	42	43	52	61
Total aircraft sources	3,041	2,389	2,210	2,250	1,959	946	1,308	903	679	502	458
Ground Service Equipment[3]	636	533	521	497	530	145	243	153	143	247[4]	227
Motor Vehicles											
Ted Williams Tunnel through-traffic	NA	NA	NA	NA	NA	NA	15	12	10	9	0[5]
Parking/curbside	173	148	127	102	102	118	101	89	77	51	45
On-airport vehicles[6]	238	215	179	223	205	258	256	206	170	152	135
Total motor vehicle sources	411	363	306	325	307	376	372	307	257	212	180
Other Sources											
Fuel storage/handling	408	434	318	356	381	372	352	412	372	329	297
Miscellaneous sources[7]	5	5	5	6	6	2	16	2	2	2	3
Total other sources	413	439	323	362	387	374	368	414	374	331	300
Total Airport Sources	4,501	3,724	3,360	3,434	3,183	1,841	2,291	1,777	1,453	1,292	1,165

kg/day kilograms per day. 1 kg/day is approximately equivalent to 0.40234 tons per year (tpy).
NA Not available.
MOB MOBILE model for motor vehicle emissions (MOB5a_h=MOBILE5a_h, MOB6.2=MOBILE6.2 version .01 or version .03)
1 The emissions inventory for 1990 is shown in the 2005 EDR. Emission inventories for 1991 and 1992 were not prepared.
2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the 2004 ESPR Air Quality Analysis.
3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. APU emissions are also included.
4 Updates to the EDMS resulted in an increase of GSE NOx emissions between 2001 and 2002 as the result of new emission factors from the NONROAD emission factor database.
5 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.
6 1999 through 2003 emissions inventory include reductions attributable to CNG shuttle buses.
7 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire Training emissions were included in 1999 and 2003. Diesel snow melter usage was added in 1999.

Table I-8 Estimated Nitrogen Oxides (NO_X) Emissions (in kg/day) at Logan Airport[1]

	1993	1994	1995	1996	1997	1998	1999[2]	2000	2001	2002	2003
Aircraft/GSE Model	**Logan Dispersion Modeling System (LDMS)**					**EDMS v3.22**	**EDMS v4.21**	**EDMS v4.03**		**EDMS v4.11**	
Motor Vehicle Model	**MOBILE5a**					**MOB5a_h**	**MOB6.2.03**	**MOBILE 6.0**			**MOB6.2.01**
Aircraft Sources											
Air carriers	4,271	4,317	3,861	3,781	4,150	4,471	4,183	4,202	3,707	2,721	2,479
Commuter aircraft	202	158	192	137	159	203	166	125	233	208	185
Cargo aircraft	213	257	332	363	262	254	286	284	267	246	213
General aviation	13	13	17	18	21	5	12	49	34	38	45
Total aircraft sources	4,699	4,745	4,402	4,299	4,592	4,933	4,647	4,660	4,241	3,213	2,922
Ground Service Equipment[3]	722	617	607	588	622	317	444	333	305	322[4]	291
Motor Vehicles											
Ted Williams Tunnel through-traffic	NA	NA	NA	NA	NA	NA	28	26	22	20	0[5]
Parking/curbside	25	24	24	24	24	37	39	52	46	32	28
On-airport vehicles[6]	240	239	229	257	244	372	449	425	369	341	302
Total motor vehicle sources	265	263	253	281	268	409	516	503	437	393	330
Other Sources											
Fuel storage/handling[7]	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[8]	278	330	320	275	244	284	165	211	185	175	151
Total other sources	278	330	320	275	244	284	165	211	185	175	151
Total Airport Sources	5,964	5,955	5,582	5,443	5,726	5,943	5,772	5,707	5,168	4,103	3,694

kg/day kilograms per day. 1 kg/day is approximately equivalent to 0.40234 tons per year (tpy).
NA Not available.
MOB MOBILE model for motor vehicle emissions (MOB5a_h=MOBILE5a_h, MOB6.2=MOBILE6.2 version .01 or version .03)
1 The emissions inventory for 1990 is shown in the 2005 EDR. Emission inventories for 1991 and 1992 were not prepared.
2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the 2004 ESPR Air Quality Analysis.
3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. APU emissions are also included.
4 Updates to the EDMS resulted in an increase of GSE NOx emissions between 2001 and 2002 as the result of new emission factors from the NONROAD emission factor database.
5 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.
6 1999 through 2003 emissions inventory include reductions attributable to CNG shuttle buses.
7 Fuel storage and handling facilities are not sources of NOx emissions.
8 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire Training emissions were included in 1999 and 2003. Diesel snow melter usage was added in 1999.

Table I-9 Estimated Carbon Monoxide (CO) Emissions (in kg/day) at Logan Airport[1]

	1993	1994	1995	1996	1997	1998	1999[2]	2000	2001	2002	2003
Aircraft/GSE Model	**Logan Dispersion Modeling System (LDMS)**					**EDMS 3.22**	**EDMS v4.21**	**EDMS v4.03**		**EDMS v4.11**	
Motor Vehicle Model	**MOBILE5a**					**MOB5a_h**	**MOB6.2.03**	**MOBILE 6.0**			**MOB6.2.01**
Aircraft Sources											
Air carriers	5,663	4,660	4,691	4,812	4,698	3,079	3,754	2,994	2,475	2,156	2,128
Commuter aircraft	1,309	927	934	859	770	482	1,404	1,188	1,072	783	846
Cargo aircraft	344	572	598	580	514	218	503	400	323	285	209
General aviation	353	356	339	549	654	269	940	295	407	256	276
Total aircraft sources	7,669	6,515	6,562	6,800	6,636	4,048	6,601	4,877	4,277	3,480	3,459
Ground Service Equipment[3]	7,482	6,187	6,029	5,740	6,098	5,113	4,532	5,335	5,193	5,170	4,758
Motor Vehicles											
Ted Williams Tunnel through-traffic	NA	NA	NA	NA	NA	NA	151	133	121	112	0[4]
Parking/curbside	952	820	650	644	586	772	437	495	440	295	253
On-airport vehicles[5]	1,575	1,451	1,087	1,514	1,283	1,883	2,547	2,245	2,001	1,872	1,685
Total motor vehicle sources	2,527	2,271	1,737	2,158	1,869	2,655	3,135	2,873	2,562	2,279	1,938
Other Sources											
Fuel storage/handling[6]	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[7]	26	30	29	39	37	37	168	27	24	23	22
Total other sources	26	30	29	39	37	37	168	27	24	23	22
Total Airport Sources	17,704	15,003	14,357	14,737	14,640	11,853	14,436	13,112	12,056	10,952	10,177

kg/day kilograms per day. 1 kg/day is approximately equivalent to 0.40234 tons per year (tpy).
NA Not available.
MOB MOBILE model for motor vehicle emissions (MOB5a_h=MOBILE5a_h, MOB6.2=MOBILE6.2 version .01 or version .03)
1 The emissions inventory for 1990 is shown in the 2005 EDR. Emission inventories for 1991 and 1992 were not prepared.
2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the 2004 ESPR Air Quality Analysis.
3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. APU emissions are also included.
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 1999 through 2003 emission inventory include reductions attributable to CNG shuttle buses.
6 Fuel storage and handling facilities are not sources of CO emissions.
7 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire Training emissions were included in 1999 and 2003. Diesel snow melter usage was added in 1999.

Greenhouse Gas Emissions Inventory

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) has published the *MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol*.[3] These guidelines require that certain projects undergoing review under the Massachusetts Environmental Policy Act (MEPA) quantify the GHG emissions generated by proposed projects, and identify measures to avoid, minimize, or mitigate such emissions.[4] Even though the *2010 EDR* does not assess any proposed projects and is therefore not subject to the GHG policy, Massport has voluntarily prepared an emission inventory of GHG emissions directly and indirectly associated with Logan Airport.

In April 2009, the Transportation Research Board (TRB) Airport Cooperative Research Program (ACRP); published the *Guidebook on Preparing Airport Greenhouse Gas Emission Inventories (ACRP Report 11)*, which provides recommended instructions to airport operators on how to prepare an airport-specific GHG emissions inventory.[5] The 2010 GHG emissions estimates include aircraft (within the ground taxi/delay and up to 3,000 feet), GSE, auxiliary power units (APU), motor vehicles, a variety of stationary sources, and electricity usage. Aircraft cruise emissions over the 3,000-foot level were not included. This work was accomplished following the EEA guidelines and uses widely-accepted emission factors that are considered appropriate for this application, including International Organization for Standardization (ISO) New England electricity-based values.

Methodology

Airport GHG emissions are calculated in much the same way criteria pollutants,[6] 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).

In this case, the input data were either based on Massport records, or data and information derived from the latest version of the FAA EDMS Version 5.1.3. Table I-10 summarizes these data and information used in the 2010 GHG inventory.

Massport will update the GHG Emissions Inventory for Logan Airport annually.

3 Revised *MEPA Greenhouse Gas Emissions Policy and Protocol*, Massachusetts Executive Office of Energy and Environmental Affairs, effective May 10, 2010.

4 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.

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

6 Criteria pollutants are pollutants for which there are National Ambient Air Quality Standards (i.e., carbon monoxide, sulfur dioxide, nitrogen dioxide, etc.).

Table I-10 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information[1]				
Activity	**Fuel Type**	**Usage**	**Units**	**Source**
Aircraft				
Aircraft Taxi	Jet A[2]	18,839,054	gallons	EDMS v5.1.3
	AvGas[3]	857	gallons	EDMS v5.1.3
Engine Startup	Jet A	218,101	gallons	EDMS v5.1.3
Aircraft Ground up to 3,000 feet	Jet A[2]	17,194,408	gallons	EDMS v5.1.3
	AvGas[3]	782	gallons	EDMS v5.1.3
Aircraft Support Equipment				
GSE	Diesel	705,908	gallons	Massport
	Gasoline	569,126	gallons	Massport
	Propane	3,531	gallons	EDMS v5.1.3
	CNG	953,868	ft^3	EDMS v5.1.3
APU	Jet A	768,703	gallons	EDMS v5.1.3
Motor Vehicles				
On-airport Vehicles	Composite[5]	59,453,150	VMT	Massport
On-airport Parking/Curbsides	Composite[5]	1,098,468	Idle hours	Massport
Massport Shuttle Bus	CNG	280,303	GEG	Massport
	Diesel	1,987	gallons	Massport
Massport Express Bus	Diesel	330,123	gallons	Massport
Masspoort Fire Rescue	Diesel	6,005	gallons	Massport
Aquircultural Equipment	Diesel	80,430	gallons	Massport
Massport Fleet Vehicles (Honda Civic)	CNG	10,000	GEG	Massport
Massport Fleet Vehicles (Fueled Onsite)	Gasoline	123,483	gallons	Massport
Massport Fleet Vehicles (Fueled Offsite)	Gasoline	6,106	gallons	Massport
Massport Fleet Vehicles (Fueled Onsite)	Diesel	187,241	gallons	Massport
Off-airport Vehicles (Public)	Composite[5]	142,441,748	VMT	Massport
Off-airport Vehicles (Airport Employees)	Composite[5]	3,474,010	VMT	Massport
Off-airport Vehicles (Tenant Employees)	Composite[5]	47,884,115	VMT	Massport
Stationary and Portable Sources				
Boilers and Space Heaters	No 2 Oil	319,727	gallons	Massport
	No 6 Oil	9,010	gallons	Massport
	Natural Gas	450,221	million ft^3	Massport
Generators	Diesel	42,481	gallons	Massport
Snow melters	ULSD	116,511	gallons	Massport
	CNG	0.51	million ft^3	Massport
Fire Training Facility	Tekflame	800	gallons	Massport
	AvGas	100	gallons	Massport
Electrical Consumption – Airport/Tenent	-	179,417,307	kWh	Massport

Notes: APU – Auxiliary power units; CNG – compressed natural gas; GEG – gasoline equivalent gallons; GSE – ground support equipment; kWh – kilowatt hours; VMT – vehicle miles traveled; ULSD – ultra low sulfur diesel

1 Based on 2010 activity levels and conditions.
2 Jet A density of 6.84 pounds per gallon.
3 AvGas density of 6.0 pounds per gallon.
4 The LTO (landing and take-off operation) includes landing, taxi-in, taxi-out, take-off, and up to an altitude of 3,000 feet.
5 Composite means gasoline and diesel-fueled motor vehicle feel mix based on MOBILE62.

Emission factors were obtained from the U.S. Energy Information Administration, the International Panel on Climate Change (IPCC), and the EPA.[7,8,9] Table I-11 presents these emission factors for CO_2, N_2O, and CH_4.

Table I-11 Greenhouse Gas (GHG) Emission Factors

Sources	Fuel	CO_2	N_2O	CH_4	Units
Aircraft[1]	Jet A	21.095	0.000188	0.00052	lb/gallon
	AvGas	18.355	0.000188	0.00052	lb/gallon
Ground Support Equipment/ Auxiliary Power Units[1]	Diesel	22.384	0.0002	0.00053	lb/gallon
	Gasoline	19.564	0.0002	0.00055	lb/gallon
	CNG	120.593	0.0002	0.00020	lb/1000 ft^3
	Propane	12.669	2.30E-07	0.000003	lb/gallon
	Jet A	21.095	0.000188	0.00052	lb/gallon
Motor Vehicles[2]	Composite	368	0.005	0.017	g/mile
	Composite	921	0.0125	0.190	g/hour
	CNG	120.593	0.0002	0.00020	lb/1000 ft^3
	Diesel	22.384	0.0002	0.000534	lb/gallon
	Gasoline	19.564	0.0002	0.00055	lb/gallon
Stationary and Portable[1]	No 2 Oil	22.384	0.000193	0.000534	lb/gallon
	No 6 Oil	26.033	0.000208	0.000225	lb/gallon
	Natural Gas	120.593	0.0002	0.0002	lb/1000 ft^3
	ULSD	22.384	0.000193	0.000534	lb/gallon
Fire Training Facility[1]	Tekflame[3]	12.669	2.30E-07	0.000003	lb/gallon
	AvGas	18.355	0.000188	0.00052	lb/gallon
Electrical Consumption[4]	-	0.906	0.0000146	0.0000207	lb/kW-hr

Notes: CH_4 – methane; CNG – compressed natural gas; CO_2 – carbon dioxide; g- grams; kWhr – kilowatt hour; lb – pound; N_20 – nitrous oxides.

1 Energy Information Administration, www.eia.doe.gov/oiaf/1605/coefficients.html.
2 Environmental Protection Agency, MOBILE6.2 Emissions Model and Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
3 As propane
4 ISO New England 2007 New England Marginal Emission Rate Analysis, July 2009 and Energy Information Administration, www.eia.doe.gov/oiaf/1605/ee-factors.html.

7 U.S. Energy Information Administration, *Voluntary Reporting of Greenhouse Gases Program Fuel and Energy Source Codes and Emission Coefficients*, www.eia.doe.gov/oiaf/1605/coefficients.html
8 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, 2006, www.ipcc-nggip.iges.or.jp/public/2006gl/index.html
9 U.S. Environmental Protection Agency, MOBILE6.2 Emissions Model, www.epa.gov/otaq/m6.htm

Results

Table I-12 presents the results of the 2010 GHG emissions inventory for Logan Airport by emission source (i.e., aircraft, GSE, motor vehicles, and stationary sources) and compound (i.e., CO_2, N_20, and CH_4).

Table I-12 Greenhouse Gas (GHG) Emissions (MMT CO_2 Eq)[1]

Activity	CO_2	N_2O	CH_4	Total
Aircraft Sources				
Aircraft Taxi	0.18	<0.01	<0.01	0.18
Engine Startup	<0.01	<0.01	<0.01	<0.01
Aircraft AGL to 3,000 feet	0.16	<0.01	<0.01	0.17
Aircraft Support Equipment				
GSE	0.01	<0.01	<0.01	0.01
APU	0.01	<0.01	<0.01	0.01
Motor Vehicles				
On-airport Vehicles	0.02	<0.01	<0.01	0.02
On-airport Parking/Curbsides	<0.01	<0.01	<0.01	<0.01
Massport Shuttle Buses	<0.01	<0.01	<0.01	<0.01
Massport Fleet Vehicles	<0.01	<0.01	<0.01	<0.01
Off-airport Vehicles (Public)	0.03	<0.01	<0.01	0.03
Off-airport Vehicles (Airport Employees)	<0.01	<0.01	<0.01	<0.01
Off-airport Vehicles (Tenant Employees)	0.02	<0.01	<0.01	0.02
Stationary Sources				
Boilers	0.03	<0.01	<0.01	0.03
Generators, Snow melters, etc.	<0.01	<0.01	<0.01	<0.01
Fire Training Facility	<0.01	<0.01	<0.01	<0.01
Electrical Consumption	0.07	<0.01	<0.01	0.07

1 Units expressed as million metric tons of CO_2 equivalent (MMT CO_2 Eq): 1 metric ton = 1.1 short tons.

Table I-13 compares the total GHG emission from Logan Airport to the totals GHG emissions for Massachusetts.

Table I-13 Logan Airport Greenhouse Gas (GHG) Emissions Compared to Massachusetts Totals[1]

	CO_2	N_2O	CH_4	Totals
Logan Airport Emissions[2]	0.56	<0.01	<0.01	0.56
Massachusetts[3]	82.1	1.3	1.2	84.6
Percent of Logan Airport to Massachusetts[4]	<1%	<1%	<1%	<1%

1 Units expressed as million metric tons of CO_2 equivalents (MMT CO_2 Eq): 1 metric ton = 1.1 short tons.
2 Total from Massport, tenants, and public categories.
3 Climate Analysis Indicators Tool (CAIT US) Version 4.0. (Washington, DC: World Resources Institute, 2010)
4 Percentages represent the relative amount Logan-related emissions compared to the state totals.

Table I-14 provides a comparison between Airport-related GHG emissions from 2007 though 2010. GHG emissions in 2010 were slightly lower (0.4 percent) than 2009 levels. In order to equally compare to previous years, the 2010 emissions are summarized in a manner similar to previous years.

Table I-14 Comparison of Estimated Total Greenhouse Gas (GHG) Emissions (MMT of CO_2eq) at Logan Airport – 2007 through 2010

Source	2007	2008	2009	2010
Direct Emissions[2]				
Aircraft[3]	0.22	0.21	0.19	0.18
GSE/APUs	0.08	0.08	0.02	0.02
Motor vehicles[4]	0.03	0.03	0.03	0.03
Other sources[5]	0.04	0.03	0.03	0.03
Total Direct Emissions	0.37	0.35	0.27	0.27
Indirect Emissions[6]				
Aircraft[7]	0.18	0.17	0.17	0.17
Motor vehicles[8]	0.05	0.05	0.05	0.05
Electrical consumption[9]	0.09	0.08	0.07	0.07
Total Indirect Emissions	0.32	0.30	0.29	0.29
Total Emissions[10]	0.69	0.65	0.56	0.56
Percent of State Totals[11]	<1	<1	<1	<1

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 Direct emissions are those that occur in areas located within the Airport's geographic boundaries.
3 Direct aircraft emissions based engine start-up, taxi-in, taxi-out and ground-based delay emissions.
4 Direct motor vehicle emissions based on on-site vehicle miles traveled (VMT).
5 Other sources include Central Heating and Cooling Plant, emergency generators, snow melters and live fire training facility.
6 Indirect emissions are those that occur off the Airport site.
7 Indirect aircraft emissions are based on take-off, climb-out and landing emissions which occur up to an altitude of 3,000 ft., the limits of the landing/take-off (LTO) cycle
8 Indirect motor vehicle emissions based on off-site Airport-related VMT and an average round trip distance of 60.2 miles (2003 Passenger Ground Access Survey).
9 Electrical consumption emissions occur off-airport at power generating plants.
10 Total Emissions = Direct +Indirect.
11 Percentage based on relative amount of Airport total of direct emissions to statewide total from World Resources Institute (cait.wri.org).

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Water Quality/ Environmental Compliance and Management

This appendix provides detailed information in support of *Chapter 8, Water Quality/ Environmental Compliance and Management:*

- Table J-11 Logan Airport 2010 Quarterly Wet Weather Monitoring Results – Northwest and Runway/Perimeter Stormwater Outfalls
- Table J-12 Logan Airport 2010 Wet Weather Deicing Monitoring Results – North and West Stormwater Outfalls
- Table J-13 Logan Airport 2010 Wet Weather Deicing Toxicity Monitoring Results – North and West Stormwater Outfalls
- Table J-14 Logan Airport Stormwater Outfall NPDES Water Quality Monitoring Results – 1993 to 2010
- Table J-15 Logan Airport Oil and Hazardous Material Spills and Jet Fuel Handling – 1990 to 2010
- Table J-16 Type and Quantity of Oil and Hazardous Material Spills at Logan Airport – 1999 to 2010
- Letter to Environmental Protection Agency Regarding Discharge Monitoring Reports for Logan Airport Outfalls for April 2010, dated May 17, 2010.
- Letter to Environmental Protection Agency Regarding Discharge Monitoring Reports for Logan Airport Outfalls for May 2010, dated June 14, 2010.
- Letter to Environmental Protection Agency Regarding Discharge Monitoring Reports for Logan Airport Outfalls for November 2010, dated December 15, 2010.
- EnviroNews Issue Vol. 36, Issue 1 – 2010
  Issue Vol. 36, Issue 2 – 2010
  Issue Vol. 36, Issue 3 – 2010
  Issue Vol. 36, Issue 4 – 2010

Table J-1 NPDES Permit Stormwater Outfall Monitoring Requirements

	North Outfall 001		West Outfall 002		Maverick Outfall 003	
Monitoring Event	**Field Measurement**	**Laboratory Analysis**	**Field Measurement**	**Laboratory Analysis**	**Field Measurement**	**Laboratory Analysis**
Monthly Dry Weather	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform Enterococcus	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform Enterococcus	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform Enterococcus
Monthly Wet Weather	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform Enterococcus	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform Enterococcus	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform Enterococcus
Quarterly Wet Weather	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene
Deicing Episode (2/Deicing Season)	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolytriazole	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolytriazole	Not Required	Not Required
Whole Effluent Toxicity (1st and 3rd Year Deicing Season)	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Not Required
Treatment System Sampling (Internal Outfalls)[7]	pH Quanity, Gallons	Oil and Grease TSS[1] Benzene[2]	Not Required	Not Required	Not Required	Not Required

Table J-1 NPDES Permit Stormwater Outfall Monitoring Requirements (continued)

	Northwest Outfall 005		Porter Outfall 003 (3 upstream locations)		Select Runway/Perimeter Outfalls	
Monitoring Event	**Field Measurement**	**Laboratory Analysis**	**Field Measurement**	**Laboratory Analysis**	**Field Measurement**	**Laboratory Analysis**
Monthly Dry Weather	Not Required	Not Required	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform Enterococcus	Not Required	Not Required
Monthly Wet Weather	Not Required	Not Required	pH Flow Rate	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform Enterococcus	Not Required	Not Required
Quarterly Wet Weather	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2]	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH	Oil and Grease TSS[1] Benzene[2]
Deicing Episode (2/Deicing Season)	Not Required	Not Required	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolytriazole	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolytriazole
Whole Effluent Toxicity (1st and 3rd Year Deicing Season)	Not Required	Not Required	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Not Required
Treatment System Sampling (Internal Outfalls)[7]	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required

Notes: Requirements are from NPDES Permit MA0000787, issued July 31, 2007.
1 TSS - Total Suspended Solids
2 Benzene must be collected with HDPE bailer.
3 PAH - Polycyclic Aromatic Hydrocarbons
4 BOD5 - Biological Oxygen Demand
5 COD - Chemical Oxygen Demand
6 Flow Rate will be estimated based on measured precipitation and the hydraulic model developed for the Logan Airport drainage system.
7 Outfalls 001D and 001E samples collected by Swissport.

Table J-2 Logan Airport 2010 Monthly Monitoring Results for First Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (ug/L)	Surfactant (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)
001A – North Outfall	1/25/2010	Wet Weather	3.36	0.56	6.96	<4.4	24	<1.0	0.10	1,000	1,200
002A – West Outfall	1/25/2010	Wet Weather	12.52	1.82	7.07	<4.0	9.5	<1.0	0.13	870	140
004A – Maverick Street Outfall	1/25/2010	Wet Weather	0.81	0.09	7.40	<4.4	23	<1.0	0.21	250	380
001C – North Outfall	1/7/2010	Dry Weather				<4.0	22	1.1	0.17	340	10
002C – West Outfall	1/7/2010	Dry Weather				<4.0	28	<1.0	0.13	2,800	1,900
004C – Maverick Street Outfall[1]	1/7/2010	Dry Weather				NS	NS	NS	NS	NS	NS
001A – North Outfall	2/16/2010	Wet Weather	4.7	0.6	7.90	<4.0	14.5	<1.0	0.09	730	<10
002A – West Outfall	2/16/2010	Wet Weather	13.4	2.2	6.80	<4.0	12.0	<1.0	0.27	1,300	20
004A – Maverick Street Outfall	2/16/2010	Wet Weather	1.1	0.1	7.48	<4.4	5.0	<1.0	<0.05	280	230
001C – North Outfall	2/5/2010	Dry Weather				<4.0	9.0	<1.0	0.20	80	<10
002C – West Outfall	2/5/2010	Dry Weather				<4.0	13.0	<1.0	0.22	2,500	1,600
004C – Maverick Street Outfall	2/5/2010	Dry Weather				<4.0	<4.0	<1.0	0.13	5,700	3,400
001A – North Outfall	3/23/2010	Wet Weather	13.2	1.9	6.51	<4.0	<5.0	<1.0	0.28	260	500
002A – West Outfall	3/23/2010	Wet Weather	47.7	7.0	6.55	<4.0	13	<1.0	0.16	640	270
004A – Maverick Street Outfall	3/23/2010	Wet Weather	3.2	0.4	6.50	<4.4	7.9	<1.0	0.13	1,900	1,900
001C – North Outfall	3/5/2010	Dry Weather				<4.0	27.0	<1.0	0.36	470	80
002C – West Outfall	3/5/2010	Dry Weather				5.7	24.5	<1.0	0.26	5,300	610
004C – Maverick Street Outfall	3/5/2010	Dry Weather				<4.4	6.0	<1.0	<0.05	<10	30
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report
Average Daily			Report	Report	6.0 to 8.5	–	Report	Report	Report	Report	Report

Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
Bold values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

1 The Maverick Street outfall was dry during the January dry sampling event, therefore no sample was collected.

TSS Total Suspended Solids

NS Not Sampled

Table J-3 Logan Airport 2010 Stormwater Outfalls Monthly Monitoring Results for First Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (ug/L)	Surfactant (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)
003 - Porter Street Outfall 1	1/25/2010	Wet Weather	-	-	7.21	<4.4	15.5	<1.0	0.11	<10	<10
003 - Porter Street Outfall 2	1/25/2010	Wet Weather	-	-	8.11	4.5	28.5	<1.0	0.38	40	30
003 - Porter Street Outfall 3	1/25/2010	Wet Weather	-	-	7.49	<4.0	<4.0	<1.0	0.15	<10	<10
003 - Porter Street Outfall Average	1/25/2010	Wet Weather	1.94	0.32	7.60	1.5	15	0.0	0.21	3.4	3.1
003 - Porter Street Outfall 1	1/7/2010	Dry Weather				6.6	130	<1.0	<0.05	<10	30
003 - Porter Street Outfall 2	1/7/2010	Dry Weather				4.9	25	<1.0	0.13	<10	20
003 - Porter Street Outfall 3	1/7/2010	Dry Weather				<4.4	<5.0	<1.0	0.14	<10	<10
003 - Porter Street Outfall Average	1/7/2010	Dry Weather				3.8	51.7	0.0	0.09	1.0	8.4
003 - Porter Street Outfall 1	2/16/2010	Wet Weather	-	-	8.14	5.1	43	<1.0	0.27	<10	<10
003 - Porter Street Outfall 2	2/16/2010	Wet Weather	-	-	8.34	<4.0	64.5	<1.0	0.35	<10	10
003 - Porter Street Outfall 3	2/16/2010	Wet Weather	-	-	7.62	<4.0	<4.0	<1.0	0.14	<10	<10
003 - Porter Street Outfall Average	2/16/2010	Wet Weather	2.7	0.4	8.03	1.7	35.8	0.0	0.25	1.0	2.2
003 - Porter Street Outfall 1	2/5/2010	Dry Weather				<4.0	12.0	<1.0	<0.05	<10	<10
003 - Porter Street Outfall 2	2/5/2010	Dry Weather				<4.0	27.5	<1.0	0.55	<10	<10
003 - Porter Street Outfall 3	2/5/2010	Dry Weather				<4.0	<4.0	<1.0	0.18	<10	<10
003 - Porter Street Outfall Average	2/5/2010	Dry Weather				0.0	13.2	0.0	0.24	1.0	1.0
003 - Porter Street Outfall 1	3/23/2010	Wet Weather	-	-	7.43	<4.4	5.6	<1.0	0.10	20	<10
003 - Porter Street Outfall 2	3/23/2010	Wet Weather	-	-	6.81	<4.4	<5.0	<1.0	0.34	<10	20
003 - Porter Street Outfall 3	3/23/2010	Wet Weather	-	-	6.63	<4.0	6.1	<1.0	0.18	110	110
003 - Porter Street Outfall Average	3/23/2010	Wet Weather	9.8	1.3	6.96	0.0	3.9	0.0	0.21	13.0	13.0
003 - Porter Street Outfall 1	3/5/2010	Dry Weather				<4.4	<4.0	<1.0	0.08	<10	<10
003 - Porter Street Outfall 2	3/5/2010	Dry Weather				<4.4	19.0	<1.0	0.12	<10	220
003 - Porter Street Outfall 3	3/5/2010	Dry Weather				<4.4	<4.0	<1.0	0.13	<10	10
003 - Porter Street Outfall Average	3/5/2010	Dry Weather				0.0	6.3	0.0	0.11	1.0	13.0
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Daily			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Notes: Porter Street Outfall location 3 (PSO-MH75) exhibited low flow during the wet sampling event and was dry during the dry sampling event, therefore PSO-MH78 was sampled in its place for both samples.
Bold values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids
NA Not Analyzed

Table J-4 Logan Airport 2010 Stormwater Outfalls Monthly Monitoring Results for Second Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (ug/L)	Surfactant (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)	Klebsiella[1] (cfu/100mL)
001A – North Outfall	4/16/2010	Wet Weather	2.86	0.37	7.09	<4.0	32	<1.0	0.40	27,000	340	7300
002A – West Outfall	4/16/2010	Wet Weather	7.46	1.61	6.96	<4.0	23	<1.0	0.16	1,600	250	NA
004A – Maverick Street Outfall	4/16/2010	Wet Weather	0.71	0.09	6.62	6.2	**370**	<1.0	0.23	4,300	3,000	NA
001C – North Outfall	4/8/2010	Dry Weather				<4.4	28.0	<1.0	0.06	60	<10	
002C – West Outfall	4/8/2010	Dry Weather				<4.0	15	<1.0	0.08	1,100	480	
004C – Maverick Street Outfall	4/8/2010	Dry Weather				<4.4	15	<1.0	0.06	10	<10	
001A – North Outfall	5/19/2010	Wet Weather	3.93	0.42	7.26	<4.4	<5.0	<1.0	0.11	540	360	
002A – West Outfall	5/19/2010	Wet Weather	11.47	1.72	7.37	<4.4	7.7	<1.0	0.13	550	1,500	
004A – Maverick Street Outfall	5/19/2010	Wet Weather	0.96	0.11	6.50	<4.8	62	<1.0	0.10	7,100	1,300	
001C – North Outfall	5/24/2010	Dry Weather				<4.0	28	<1.0	0.11	440	<10	
002C – West Outfall	5/24/2010	Dry Weather				<4.0	11	<1.0	0.14	<10	520	
004C – Maverick Street Outfall[2]	5/24/2010	Dry Weather				NS	NS	NS	NS	NS	NS	
001A – North Outfall[3]		Wet Weather	2.41	0.37	NS	NS	NS	NS	NS	NS	NS	
002A – West Outfall[3]		Wet Weather	8.55	1.46	NS	NS	NS	NS	NS	NS	NS	
004A – Maverick Street Outfall[3]		Wet Weather	0.60	0.09	NS	NS	NS	NS	NS	NS	NS	
001C – North Outfall	6/16/2010	Dry Weather				<4.4	6.7	<1.0	<0.05	7,900	250	
002C – West Outfall	6/16/2010	Dry Weather				<4.0	17	<1.0	<0.05	70	900	
004C – Maverick Street Outfall	6/16/2010	Dry Weather				<4.4	13	<1.0	<0.05	1,800	200	
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	Report
Average Daily			Report	Report	6.0 to 8.5	–	Report	Report	Report	Report	Report	Report

Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
Bold values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

1 Klebsiella is an indication of non-fecal coliform bacteria and is tested for at the N. Outfall when fecal coliform concentration exceeds 5000 cfu/100ml.
2 The Maverick Street outfall was dry during the May dry sampling event, therefore no sample was collected.
3 Due to unusal weather and tidal conditions, a wet event was not conducted during June 2010.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled

Table J-5 Logan Airport 2010 Stormwater Outfalls Monthly Monitoring Results for Second Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (ug/L)	Surfactant (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)
003 - Porter Street Outfall 1	4/16/2010	Wet Weather	---	---	7.55	<4.0	23	<1.0	0.36	640	600
003 - Porter Street Outfall 2	4/16/2010	Wet Weather	---	---	7.98	<4.0	<5.0	<1.0	0.14	200	270
003 - Porter Street Outfall 3	4/16/2010	Wet Weather	---	---	6.71	<4.0	<5.0	<1.0	0.11	<10	<10
003 - Porter Street Outfall Average	4/16/2010	Wet Weather	1.79	0.24	7.41	0.0	7.7	0.0	0.20	50.4	54.5
003 - Porter Street Outfall 1	4/8/2010	Dry Weather				<4.4	<5.0	<1.0	0.05	10	<10
003 - Porter Street Outfall 2	4/8/2010	Dry Weather				<4.4	22	<1.0	<0.05	<10	<10
003 - Porter Street Outfall 3	4/8/2010	Dry Weather				<4.4	<5.0	<1.0	0.13	<10	10
003 - Porter Street Outfall Average	4/8/2010	Dry Weather				0.0	7.3	0.0	0.06	2.2	2.2
003 - Porter Street Outfall 1	5/19/2010	Wet Weather	---	---	7.72	9.8	<5.0	<1.0	0.07	<10	<10
003 - Porter Street Outfall 2	5/19/2010	Wet Weather	---	---	7.25	<4.0	<5.0	<1.0	0.57	410	60
003 - Porter Street Outfall 3	5/19/2010	Wet Weather	---	---	7.43	<4.0	<5.0	<1.0	0.09	10	20
003 - Porter Street Outfall Average	5/19/2010	Wet Weather	2.07	0.27	7.47	3.3	0.0	0.0	0.24	16	10.6
003 - Porter Street Outfall 1	5/24/2010	Dry Weather				<4.4	<5.0	<1.0	<0.05	<10	<10
003 - Porter Street Outfall 2	5/24/2010	Dry Weather				<4.0	<5.0	<1.0	0.06	10	<10
003 - Porter Street Outfall 3	5/24/2010	Dry Weather				<4.0	13	<1.0	0.12	<10	10
003 - Porter Street Outfall Average	5/24/2010	Dry Weather				0.0	4.3	0.0	0.06	2.2	2.2
003 - Porter Street Outfall 1[1]		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2[1]		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3[1,2]		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Wet Weather	1.79	0.23	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	6/16/2010	Dry Weather				<4.4	<5.0	<1.0	<0.05	<10	<10
003 - Porter Street Outfall 2	6/16/2010	Dry Weather				<4.0	15	<1.0	<0.05	40	310
003 - Porter Street Outfall 3[2]	6/16/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	6/16/2010	Dry Weather				0.0	7.5	0.0	0.00	6.3	17.6
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Daily			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Notes: Porter Street Outfall location 3 (PSO-MH75) exhibited low flow during the wet sampling event and was dry during the dry sampling event, therefore PSO-MH78 was sampled in its place for both samples.
Bold values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

1 Due to unusal weather and tidal conditions, a wet event was not conducted during June 2010.
2 In June, the Porter Street Outfall 3 was not accessible due to construction, therefore no sample was collected.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled

Table J-6 Logan Airport 2010 Stormwater Outfalls Monthly Monitoring Results for Third Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (ug/L)	Surfactant (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)	Klebsiella[1] (cfu/100mL)
001A – North Outfall	7/29/2010	Wet Weather	4.20	0.2	6.95	<4.0	24	<1.0	0.08	1,000	60	
002A – West Outfall	7/29/2010	Wet Weather	14.4	0.9	7.00	<4.0	14	<1.0	0.08	190	170	
004A – Maverick Street Outfall[2]	7/29/2010	Wet Weather	1.4	0.1	NS	NS	NS	NS	NS	NS	NS	
001C – North Outfall	7/1/2010	Dry Weather				<4.0	<5.0	<1.0	<0.05	33,000	170	18,000
002C – West Outfall	7/1/2010	Dry Weather				<4.0	12	<1.0	0.09	80	160	NA
004C – Maverick Street Outfall	7/1/2010	Dry Weather				<4.0	13	<1.0	<0.05	380	60	NA
001A – North Outfall	8/23/2010	Wet Weather	8.39	0.52	7.27	<4.4	<5.0	<1.0	0.12	4,400	3,000	
002A – West Outfall	8/23/2010	Wet Weather	26.50	1.80	7.09	<4.0	<5.0	<1.0	0.09	2,900	4,400	
004A – Maverick Street Outfall	8/23/2010	Wet Weather	2.50	0.12	6.99	<4.4	7.6	<1.0	0.11	32,000	15,000	
001C – North Outfall	8/3/2010	Dry Weather				<4.0	20	<1.0	0.09	3,900	760	
002C – West Outfall	8/3/2010	Dry Weather				<4.4	8.3	<1.0	0.11	1,100	300	
004C – Maverick Street Outfall	8/3/2010	Dry Weather				<4.0	24	<1.0	<0.05	150	40	
001A – North Outfall	9/27/2010	Wet Weather	2.13	0.17	7.31	<4.0	18	<1.0	0.10	1,700	50	2.13
002A – West Outfall	9/27/2010	Wet Weather	6.80	0.64	7.19	<4.0	10	<1.0	0.11	66,000	320	6.80
004A – Maverick Street Outfall	9/27/2010	Wet Weather	0.56	0.03	6.51	<4.4	18	<1.0	0.06	520	310	0.56
001C – North Outfall	9/2/2010	Dry Weather				<4.4	21	<1.0	0.06	2,100	10	
002C – West Outfall	9/2/2010	Dry Weather				<4.0	11	<1.0	0.09	23,000	490	
004C – Maverick Street Outfall	9/2/2010	Dry Weather				<4.4	8.3	<1.0	<0.05	100	20	
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	Report
Average Daily			Report	Report	6.0 to 8.5	----	Report	Report	Report	Report	Report	Report

Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
Bold values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

1 Klebsiella is an indication of non-fecal coliform bacteria and is tested for at the N. Outfall when fecal coliform concentration exceeds 5000 cfu/100ml.

2 The Maverick Street Outfall was dry during the July wet sampling event; therefore no sample was collected.

TSS Total Suspended Solids

NA Not Analyzed

NS Not Sampled

Table J-7 Logan Airport 2010 Stormwater Outfalls Monthly Monitoring Results for Third Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (ug/L)	Surfactant (mg/L)	Fecal Coliform[1] (cfu/100mL)	Enterococcus[1] (cfu/100mL)
003 - Porter Street Outfall 1	7/29/2010	Wet Weather	---	---	7.95	<4.4	14	<1.0	0.44	20	<10
003 - Porter Street Outfall 2	7/29/2010	Wet Weather	---	---	7.98	<4.4	<5.0	<1.0	0.20	2,600	480
003 - Porter Street Outfall 3[1]	7/29/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	7/29/2010	Wet Weather	2.8	0.2	7.97	0.0	7.0	0.0	0.32	228	22
003 - Porter Street Outfall 1	7/1/2010	Dry Weather				<4.0	<5.0	<1.0	<0.05	<10	<10
003 - Porter Street Outfall 2	7/1/2010	Dry Weather				<4.0	11	<1.0	0.11	60	30
003 - Porter Street Outfall 3[1]	7/1/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	7/1/2010	Dry Weather				0.0	5.5	0.0	0.06	7.7	5.5
003 - Porter Street Outfall 1	8/23/2010	Wet Weather	---	---	7.51	<4.0	37	<1.0	0.19	22,000	14,000
003 - Porter Street Outfall 2	8/23/2010	Wet Weather	---	---	7.63	<4.4	<5.0	<1.0	0.05	410	80
003 - Porter Street Outfall 3[1]	8/23/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	8/23/2010	Wet Weather	7.35	0.37	7.57	0.0	18.5	0.0	0.12	3,003	1,058
003 - Porter Street Outfall 1	8/3/2010	Dry Weather				18	5.4	<1.0	<0.05	<10	<10
003 - Porter Street Outfall 2	8/3/2010	Dry Weather				14	21	<1.0	0.12	40	80
003 - Porter Street Outfall 3[1]	8/3/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	8/3/2010	Dry Weather				16	13.2	0.0	0.06	6.3	8.9
003 - Porter Street Outfall 1	9/27/2010	Wet Weather	---	---	8.40	<4.0	11	<1.0	<0.05	<10	<10
003 - Porter Street Outfall 2	9/27/2010	Wet Weather	---	---	8.43	<4.0	<5.0	<1.0	0.28	3,600	130
003 - Porter Street Outfall 3[1]	9/27/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	9/27/2010	Wet Weather	1.03	0.08	8.42	0.0	5.5	0.0	0.14	60	11.4
003 - Porter Street Outfall 1	9/2/2010	Dry Weather				<4.4	76	<1.0	<0.05	<10	<10
003 - Porter Street Outfall 2	9/2/2010	Dry Weather				<4.0	5.7	<1.0	<0.05	150	<10
003 - Porter Street Outfall 3[1]	9/2/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	9/2/2010	Dry Weather				0.0	40.9	0.0	0.0	12.2	1.0
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Daily			Report	Report	6.0 to 8.5	–	Report	Report	Report	Report	Report

Notes: **Bold** values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

1 In July, August, and September, the Porter Street Outfall 3 was not accessible due to construction, therefore no sample was collected.

TSS Total Suspended Solids

NA Not Analyzed

NS Not Sampled

Table J-8 Logan Airport 2010 Stormwater Outfalls Monthly Monitoring Results for Fourth Quarter —North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (ug/L)	Surfactant (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)
001A – North Outfall	10/27/2010	Wet Weather	4.90	0.44	8.26	<4.0	15	<1.0	0.14	760	1,800
002A – West Outfall	10/27/2010	Wet Weather	17.12	1.69	7.52	<4.0	18	<1.0	0.08	20,000	710
004A – Maverick Street Outfall	10/27/2010	Wet Weather	1.16	0.10	7.78	<4.4	30	<1.0	0.23	23,000	6,500
001C – North Outfall	10/25/2010	Dry Weather				<4.0	9.5	<1.0	0.17	260	10
002C – West Outfall	10/25/2010	Dry Weather				<4.0	7.6	<1.0	0.09	31,000	1,400
004C – Maverick Street Outfall	10/25/2010	Dry Weather				<4.4	12	<1.0	0.05	20	<10
001A – North Outfall	11/4/2010	Wet Weather	3.11	0.38	6.48	<4.4	15	<1.0	0.20	3,100	1,800
002A – West Outfall	11/4/2010	Wet Weather	11.19	1.51	6.23	<4.4	21	<1.0	0.25	4,600	2,700
004A – Maverick Street Outfall	11/4/2010	Wet Weather	0.83	0.09	7.08	<4.4	22	<1.0	0.14	12,000	4,100
001C – North Outfall	11/12/2010	Dry Weather				<4.0	**140**	<1.0	0.08	330	200
002C – West Outfall	11/12/2010	Dry Weather				<4.0	14	<1.0	0.08	1,600	1,800
004C – Maverick Street Outfall[1]	11/12/2010	Dry Weather				NS	NS	NS	NS	NS	NS
001A – North Outfall	12/12/2010	Wet Weather	3.28	0.62	7.02	<4.0	17	<1.0	0.12	NA	NA
002A – West Outfall	12/12/2010	Wet Weather	15.68	2.01	7.31	<4.0	22	<1.0	0.08	NA	NA
004A – Maverick Street Outfall	12/12/2010	Wet Weather	0.95	0.13	6.91	<4.4	13	<1.0	<0.05	NA	NA
001C – North Outfall	12/8/2010	Dry Weather				<4.0	8.0	<1.0	0.12	110	<10
002C – West Outfall	12/8/2010	Dry Weather				<4.0	15	<1.0	0.11	320	200
004C – Maverick Street Outfall	12/8/2010	Dry Weather				<4.0	9.3	<1.0	0.05	<10	<10
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report
Average Daily			Report	Report	6.0 to 8.5	–	Report	Report	Report	Report	Report

Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
Bold values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

1 The Maverick Street Outfall was dry during the dry sampling event, therefore no sample was analyzed.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled. No discharge therefore no sample collected.

Table J-9 Logan Airport 2010 Stormwater Outfalls Monthly Monitoring Results for Fourth Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (ug/L)	Surfactant (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)
003 - Porter Street Outfall 1[1]	10/27/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	10/27/2010	Wet Weather	---	---	8.26	<4.4	<5.0	<1.0	0.10	540	160
003 - Porter Street Outfall 3[1]	10/27/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	10/27/2010	Wet Weather	3.29	0.28	8.26	0.0	0.0	0.0	0.10	540	160
003 - Porter Street Outfall 1[1]	10/25/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	10/25/2010	Dry Weather				<4.4	<5.0	<1.0	0.20	<10	<10
003 - Porter Street Outfall 3[1]	10/25/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	10/25/2010	Dry Weather				0.0	0.0	0.0	0.20	1.0	1.0
003 - Porter Street Outfall 1[1]	11/4/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	11/4/2010	Wet Weather	---	---	6.86	<4.4	<5.0	<1.0	0.06	<10	20
003 - Porter Street Outfall 3[1]	11/4/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	11/4/2010	Wet Weather	2.10	0.25	6.86	0.0	0.0	0.0	0.06	1	20
003 - Porter Street Outfall 1[1]	11/12/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	11/12/2010	Dry Weather				<4.4	6.3	<1.0	<0.05	60	30
003 - Porter Street Outfall 3[1]	11/12/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	11/12/2010	Dry Weather				0.0	6.3	0.0	0.0	60	30
003 - Porter Street Outfall 1[1]	12/12/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	12/12/2010	Wet Weather	---	---	7.96	<4.0	<5.0	<1.0	0.07	NA	NA
003 - Porter Street Outfall 3[1]	12/12/2010	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	12/12/2010	Wet Weather	4.10	0.36	7.96	0.0	0.0	0.0	0.07	NA	NA
003 - Porter Street Outfall 1[1]	12/8/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	12/8/2010	Dry Weather				<4.0	15	<1.0	0.07	<10	<10
003 - Porter Street Outfall 3[1]	12/8/2010	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	12/8/2010	Dry Weather				0.0	15	0.0	0.07	1.0	1.0
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Daily			Report	Report	6.0 to 8.5	–	Report	Report	Report	Report	Report

Notes: **Bold** values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

1 The Porter Street Outfall 1 and Outfall 3 were not accessible due to construction, therefore samples were not collected from either location.

TSS Total Suspended Solids

NA Not Analyzed

NS Not Sampled

Table J-10 Logan Airport 2010 Quarterly Wet Weather Monitoring Results – North, West, Maverick Street, and Porter Street Stormwater Outfalls

		Wet Weather									
	Date	pH (S.U.)	Benzo(a)-anthracene (ug/L)	Benzo(a)-pyrene (ug/L)	Benzo(b)-fluoranthene (ug/L)	Benzo(k)-fluoranthene (ug/L)	Chrysene (ug/L)	Dibenzo(a,h,)-anthracene (ug/L)	Indeno(1,2,3-cd)-pyrene (ug/L)	Naphthalene (ug/L)	Total PAHs (ug/L)
001 - North Outfall	2/10/2010	7.02	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
002 - West Outfall	2/10/2010	7.14	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	2.7	2.7
004 - Maverick Street Outfall	2/10/2010	7.38	<0.20	<0.20	0.39	<0.20	0.30	<0.20	0.28	<0.20	0.97
003 - Porter Street Outfall 1	2/10/2010	8.62	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.37	0.37
003 - Porter Street Outfall 2	2/10/2010	**9.19**	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
003 - Porter Street Outfall 3	2/10/2010	7.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
003 - Porter Street Outfall Average	2/10/2010	8.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.12
001 - North Outfall	5/19/2010	7.26	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.38	0.38
002 - West Outfall	5/19/2010	7.37	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
004 - Maverick Street Outfall	5/19/2010	6.50	0.55	0.62	0.62	0.50	0.45	<0.20	0.65	<0.20	3.39
003 - Porter Street Outfall 1	5/19/2010	7.72	0.43	0.47	0.53	0.34	0.22	<0.20	0.54	<0.20	2.53
003 - Porter Street Outfall 2	5/19/2010	7.25	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
003 - Porter Street Outfall 3	5/19/2010	7.43	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
003 - Porter Street Outfall Average	5/19/2010	7.47	0.14	0.16	0.18	0.11	0.07	0.00	0.18	0.00	0.84
001 - North Outfall	9/27/2010	7.31	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
002 - West Outfall	9/27/2010	7.19	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
004 - Maverick Street Outfall	9/27/2010	6.51	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
003 - Porter Street Outfall 1	9/27/2010	8.40	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
003 - Porter Street Outfall 2	9/27/2010	8.43	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
003 - Porter Street Outfall 3[1]	9/27/2010	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	9/27/2010	8.42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
001 - North Outfall	12/12/2010	7.02	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
002 - West Outfall	12/12/2010	7.31	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
004 - Maverick Street Outfall	12/12/2010	6.91	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
003 - Porter Street Outfall 1[1]	12/12/2010	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	12/12/2010	7.96	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<7.0	<5.0	ND
003 - Porter Street Outfall 3[1]	12/12/2010	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average	12/12/2010	7.96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily		6.0 to 8.5	Report	Report	Report	Report	Report	Report	Report	Report	Report Total

Notes: **Bold** values exceed maximum daily discharge limitation.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit.
1 The Porter Street Outfall 1 and Outfall 3 were not accessible due to construction, therefore samples were not collected from either location.
ND Not Detected; NS Not Sampled; PAH Polynuclear Aromatic Hydrocarbons

Table J-11 Logan Airport 2010 Quarterly Wet Weather Monitoring Results – Northwest and Runway/Perimeter Stormwater Outfalls

	Date	Maximum Daily Flow (MGD)	Average Quarterly Flow (MGD)	pH (SU)	Oil and Grease (mg/L)	Total Suspended Solids (mg/L)	Benzene (ug/L)
005 - Northwest Outfall	2/10/2010	0.6	0.1	7.29	<4.4	10.0	<1.0
006- Runway/ Perimeter Outfall (A9)	2/10/2010	0.4	0.1	7.39	<4.0	10.0	<1.0
006- Runway/ Perimeter Outfall (A18)	2/10/2010	0.1	0.01	7.70	<4.0	31.0	<1.0
006- Runway/ Perimeter Outfall (A19)	2/10/2010	0.1	0.01	7.36	<4.4	23.0	<1.0
006- Runway/ Perimeter Outfall (A21)	2/10/2010	2.7	0.4	7.32	<4.4	8.5	<1.0
006- Runway/ Perimeter Outfall (A23)	2/10/2010	0.3	0.04	7.47	<4.4	14.0	<1.0
006- Runway/ Perimeter Outfall (A33)	2/10/2010	0.2	0.04	7.23	<4.0	32.0	<1.0
006- Runway/ Perimeter Outfall (A38)	2/10/2010	0.3	0.03	7.05	<4.0	<4.0	<1.0
006- Runway/Perimeter Outfall Average	2/10/2010	0.59	0.09	7.36	0.0	17	0.0
005 - Northwest Outfall	5/19/2010	0.51	0.04	6.95	<4.0	63	<1.0
006- Runway/ Perimeter Outfall (A9)	5/19/2010	0.28	0.04	7.20	<4.0	<5.0	<1.0
006- Runway/ Perimeter Outfall (A17)	5/19/2010	0.10	0.01	7.05	<4.4	<5.0	<1.0
006- Runway/ Perimeter Outfall (A21)	5/19/2010	2.04	0.32	6.94	<4.0	<5.0	<1.0
006- Runway/ Perimeter Outfall (A25)	5/19/2010	0.25	0.03	7.19	<4.4	<5.0	<1.0
006- Runway/ Perimeter Outfall (A33)	5/19/2010	0.17	0.03	7.30	<4.4	<5.0	<1.0
006- Runway/ Perimeter Outfall (A34)	5/19/2010	0.71	0.11	6.91	<4.4	<5.0	<1.0
006- Runway/ Perimeter Outfall (A38)	5/19/2010	0.24	0.02	7.01	<4.0	5.2	<1.0
006- Runway/Perimeter Outfall Average	5/19/2010	0.54	0.08	7.09	0.0	0.7	0.0
005 - Northwest Outfall	9/27/2010	0.27	0.02	7.34	<4.0	97	<1.0
006- Runway/ Perimeter Outfall (A9)	9/27/2010	0.09	0.01	7.86	<4.0	<5.0	<1.0
006- Runway/ Perimeter Outfall (A15)	9/27/2010	0.03	0.00	7.90	<4.4	<5.0	<1.0
006- Runway/ Perimeter Outfall (A18)	9/27/2010	0.02	0.00	7.98	<4.0	69	<1.0
006- Runway/ Perimeter Outfall (A21)	9/27/2010	1.07	0.08	7.34	<4.4	12	<1.0
006- Runway/ Perimeter Outfall (A23)	9/27/2010	0.08	0.01	7.81	<4.0	18	<1.0
006- Runway/ Perimeter Outfall (A33)	9/27/2010	0.06	0.01	7.64	<4.0	6.4	<1.0
006- Runway/ Perimeter Outfall (A38)	9/27/2010	0.12	0.01	7.13	<4.0	30	<1.0
006- Runway/Perimeter Outfall Average	9/27/2010	0.21	0.02	7.67	0.0	19.3	0.0
005 - Northwest Outfall	12/12/2010	0.45	0.06	7.41	5.7	180	<1.0
006- Runway/ Perimeter Outfall (A9)	12/12/2010	0.20	0.03	7.42	<4.0	<5.0	<1.0
006- Runway/ Perimeter Outfall (A17)	12/12/2010	1.59	0.28	7.19	<4.0	11	<1.0
006- Runway/ Perimeter Outfall (A20)	12/12/2010	0.83	0.14	7.29	<4.0	9.7	<1.0
006- Runway/ Perimeter Outfall (A21)	12/12/2010	0.19	0.03	7.24	<4.0	7.1	<1.0
006- Runway/ Perimeter Outfall (A23)	12/12/2010	0.15	0.02	7.20	13	330	<1.0
006- Runway/ Perimeter Outfall (A33)	12/12/2010	0.14	0.03	6.86	<4.0	6.2	<1.0
006- Runway/ Perimeter Outfall (A38)	12/12/2010	0.19	0.02	6.97	<4.0	<5.0	<1.0
006- Runway/Perimeter Outfall Average	12/12/2010	0.47	0.08	7.17	1.9	52	0.0
Discharge Limitations		Report	Report	Report	Report	Report	Report

Requirements are from NPDES Permit MA 0000787, issued July 31, 2007

Table J-12 Logan Airport 2010 Wet Weather Deicing Monitoring Results – North, West and Porter Street Stormwater Outfalls

	Date	Ethylene Glycol, Total (mg/L)	Propylene Glycol, Total (mg/L)	BOD_5 (mg/L)	COD (mg/L)	Total Ammonia Nitrogen (mg/L of N)	Nonylphenol (ug/L)	4-Methyl-1-H-benzotriazole (ug/L)	5-Methyl-1-H-benzotriazole (ug/L)	Tolytriazole (ug/L)	Whole Effluent Toxicity[1]
001 - North Outfall	1/18/2010	59	<25	100	240	1.95	0.04	16.390	24.018	40.408	NS
002 - West Outfall	1/18/2010	<250	420	860	1,700	1.06	4.74	30.681	43.604	74.285	NS
003B - Porter Street 1	1/18/2010	78	30	76	690	2.03	0.26	14.068	17.016	31.084	NS
003B - Porter Street 2	1/18/2010	5.0	7.2	18	84	0.265	<0.03	3.517 J	4.421 J	7.938	NS
003B - Porter Street 3	1/18/2010	<5.0	<5.0	<2.0	73	<0.075	0.04	0.760 J	0.121 J	0.881	NS
003B - Porter Street Outfall Average	1/18/2010	27.7	12.4	31.3	282	0.765	0.10	6.115	7.186	13.301	NA
001 - North Outfall	2/10/2010	<50	<50	<50	700	1.25	0.30	7.403	6.611	14.014	NS
002 - West Outfall	2/10/2010	<50	<50	570	900	3.76	1.94	43.520	31.834	75.354	NS
003B - Porter Street 1	2/10/2010	<50	<50	18	110	0.598	2.17	0.156 J	0.807 J	0.963	NS
003B - Porter Street 2	2/10/2010	<50	<50	330	1100	108	1.43	16.564	23.822	40.386	NS
003B - Porter Street 3	2/10/2010	<50	<50	<2.0	140	3.55	0.03	0.081 J	0.083 J	0.164	NS
003B - Porter Street Outfall Average	2/10/2010	0.0	0.0	116.0	450	37.4	1.21	5.60	8.24	13.84	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily		Report	Report	Report	Report	Report	Report	Report	Report	Report	Report

Notes: For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit.
J = Value is an estimate calculated by the lab from the response factors of the other two triazole compounds.

1 Whole Effluent Toxicity sample required years 1 and 3.

BOD_5 Five-day Biochemical Oxygen Demand

COD Chemical Oxygen Demand

NA Not Applicable

NS Not Sampled

Table J-13 Logan Airport 2010 Wet Weather Deicing Monitoring Results – Runway/ Perimeter Stormwater Outfalls

	Date	Ethylene Glycol, Total (mg/L)	Propylene Glycol, Total (mg/L)	BOD_5 (mg/L)	COD (mg/L)	Total Ammonia Nitrogen (mg/L of N)	Nonylphenol (ug/L)	4-Methyl-1-H-benzotriazole (ug/L)	5-Methyl-1-H-benzotriazole (ug/L)	Tolytriazole (ug/L)[2]	Whole Effluent Toxicity[1]
006- Runway/ Perimeter (A9)	1/18/2010	410	<100	200	530	2.81	0.05	31.387	30.114	61.501	NS
006- Runway/ Perimeter (A17)	1/18/2010	270	<100	140	440	2.94	0.40	23.169	25.623	48.792	NS
006- Runway/ Perimeter (A18)	1/18/2010	530	<250	360	840	5.75	0.12	62.807	71.878	134.685	NS
006- Runway/ Perimeter (A21)	1/18/2010	110	<25	58	170	2.23	<0.03	11.058	10.375	21.433	NS
006- Runway/ Perimeter (A23)	1/18/2010	150	30	180	360	4.59	0.23	90.771	104.068	194.839	NS
006- Runway/ Perimeter (A33)	1/18/2010	190	27	260	470	4.29	0.43	74.610	79.279	153.889	NS
006- Runway/ Perimeter (A38)	1/18/2010	<5.0	<5.0	5.3	32	0.090	<0.02	0.912 J	1.110 J	2.022	NS
006- Runway/Perimeter Outfall Average	1/18/2010	237	8.1	172	406	3.24	0.18	41.972	46.064	88.166	NA
006- Runway/ Perimeter (A9)	2/10/2010	<50	<50	<2.0	75	0.34	0.12	6.199	1.599 J	7.798	NS
006- Runway/ Perimeter (A18)	2/10/2010	<50	<50	19	140	19	1.09	24.382	5.265 J	29.647	NS
006- Runway/ Perimeter (A19)	2/10/2010	<50	<50	8.5	84	19.2	0.74	18.030	6.186	24.216	NS
006- Runway/ Perimeter (A21)	2/10/2010	<50	<50	5.1	400	3.02	0.21	4.384 J	1.005 J	5.389	NS
006- Runway/ Perimeter (A23)	2/10/2010	<50	<50	13	82	6.13	0.06	16.796	3.507 J	20.303	NS
006- Runway/ Perimeter (A33)	2/10/2010	<50	<50	18	53	8.14	0.61	13.476	2.020 J	15.496	NS
006- Runway/ Perimeter (A38)	2/10/2010	<50	<50	<2.0	130	0.763	0.23	0.106 J	<0.200	0.306	NS
006- Runway/Perimeter Outfall Average	2/10/2010	0.0	0.0	9.1	137.7	8.08	0.44	13.88	2.80	14.74	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily		Report	Report	Report	Report	Report	Report	Report	Report	Report	NA

Notes: For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit.
J = Value is an estimate calculated by the lab from the response factors of the other two triazole compounds.

1 Whole Effluent Toxicity sample required years 1 and 3.
BOD_5 Five-day Biochemical Oxygen Demand
COD Chemical Oxygen Demand
NA Not Applicable
NS Not Sampled

Table J-14 Logan Airport Stormwater Outfall NPDES Water Quality Monitoring Results - 1993 to 2010

	1993	1994	1995	1996	1997	1998	1999	2000	2001[1]	2002	2003[1]	2004	2005	2006	2007	2008	2009	2010[1]
# / # = Number of samples at or below NPDES limits / Total number of samples taken																		
Oil and Grease (mg/L)																		
North Outfall	30/31	35/36	33/35	29/35	30/35	35/36	29/30	34/36	28/28	36/36	30/32	32/34	33/35	33/33	29/29	23/23	24/24	24/24
West Outfall	29/30	36/36	34/34	36/36	34/35	36/36	30/30	35/35	27/28	36/36	31/32	33/34	35/35	32/33	28/28	22/23	24/24	24/24
Porter Street Outfall[2]	30/30	35/36	34/34	36/36	35/35	34/36	30/30	35/36	28/28	34/36	32/32	33/34	34/35	33/33	22/22	50/50	72/72	50/50
Maverick Street Outfall	29/29	36/36	35/35	36/36	35/35	35/36	30/30	34/34	26/28	35/36	32/32	34/34	35/35	32/33	29/29	22/23	20/21	19/19
Settleable Solids[3] (ml/L)																		
North Outfall	19/19	34/35	34/35	32/35	31/34	34/36	30/30	34/36	29/29	32/36	32/32	34/34	33/35	32/34	22/22	n/a	n/a	n/a
West Outfall	19/19	32/36	34/34	35/36	34/34	35/36	29/30	36/36	27/28	36/36	31/32	34/34	32/35	33/33	22/22	n/a	n/a	n/a
TSS (mg/L)																		
North Outfall	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6/6	24/24	24/24	22/23
West Outfall	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5/6	24/24	24/24	23/23
Maverick Street Outfall	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4/6	22/24	20/21	18/19
pH																		
North Outfall	34/35	33/36	35/35	35/35	35/35	36/36	30/30	36/36	29/29	36/36	32/32	34/34	35/35	34/34	26/26	12/12	16/16	11/11
West Outfall	34/34	28/36	33/34	35/36	35/35	36/36	30/30	36/36	29/29	36/36	32/32	34/34	35/35	33/33	26/26	12/12	16/16	11/11
Porter Street Outfall[2]	35/35	30/36	34/34	36/36	35/35	36/36	30/30	36/36	28/28	36/36	32/32	34/34	35/35	33/33	22/22	21/21	48/48	24/24
Maverick Street Outfall	35/35	35/36	35/35	36/36	34/35	36/36	30/30	35/35	28/28	36/36	32/32	34/34	35/35	33/33	26/26	10/10	16/16	10/10

Notes: Sampling requirements changed in 2007 with the issuance of a new NPDES permit. Results through 2007 are based on NPDES Permit MA0000787, issued March 1, 1978. Stormwater outfall water quality monitoring results collected in accordance with the requirements of former NPDES permit. A portion of the Porter Street Drainage Area was incorporated into the West Drainage Area as part of roadway construction projects at Logan Airport.

1 In 2001, 2003, and 2010, exceptional weather, tidal conditions, or insufficient discharge precluded the collection of some samples, leading to a fewer number of samples collected than in other years.

2 In 2010, Porter Street Outfall 1 and Porter Street Outfall 3 were not accessible due to construction, leading to a fewer number of samples collected than in other years.

3 Settleable solids analyses were replaced with TSS in 2008.

Table J-15 Logan Airport Oil and Hazardous Material Spills[1] and Jet Fuel Handling – 1990 to 2010

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)
1990	173	NA	NA	438,100,000	3,745
1991	186	NA	NA	NA	2,471
1992	195	NA	NA	NA	4,355
1993	188	NA	NA	451,900,000	3,131
1994	217	NA	NA	476,700,000	4,046
1995	161	NA	NA	309,200,000	21,412[2]
1996	159	NA	NA	346,700,000	1,321
1997	147	NA	NA	377,488,161	2,029[3]
1998	191	NA	NA	387,224,004	10,047[4]
1999	196	43	7,151	425,937,051	7,012[5]
2000	136	20	1,318	441,901,932	1,227
2001	139	37	1,924	416,748,819	1,771
2002	101	16	653	358,190,362	559
2003	128	19	10,364	319,439,910	10,188[6]
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**

Source: Massport Fire-Rescue Department.
NA Not available.
1 Materials include: jet fuel, hydraulic oil, diesel fuel, gasoline, and other materials such as glycol and paint.
2 One tenant spill, which occurred on October 15, 1995, totaled 18,000 gallons (84 percent of the annual spill total). The spill did not enter the Airport's storm drain system.
3 On October 23, 1997, a fuel line on an aircraft failed, resulting in the release of approximately 2,500 gallons, all but 60 gallons of which were recovered in drums before reaching the ground. Only the 60 gallons is included in the 1997 total.
4 Includes a 7,200-gallon spill that was discovered on September 2, 1998, and a 1,300-gallon spill that occurred on June 3, 1998. Neither spill entered the Airport's storm drain system.
5 Includes a 5,000-gallon spill, none of which entered the Airport's storm drainage system.
6 In 2003, one fuel spill comprised 9,460 gallons or 94 percent of the total volume of the MA DEP/MCP reportable spills that year. The fuel spill was contained and did not enter the drainage system.

Table J-16 Type and Quantity of Oil and Hazardous Material Spills at Logan Airport - 1999 to 2010

	Jet Fuel			Hydraulic Oil			Diesel Fuel			Gasoline			Other		
Year	No. of Spills	Quantity (Gallons)	No. of Spills ≥10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ≥10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ≥10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ≥10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ≥10 Gallons
1999	151	7,012	40	24	67	1	13	49	2	5	7	0	3	16	0
2000	115	1,227	18	8	59	2	3	11	0	8	16	0	2	5	0
2001	104	1,771	32	21	92	3	5	30	1	6	26	1	3	5	0
2002	79	559	15	7	38	0	8	37	1	4	8	0	3	11	0
2003	89	10,188	15	15	91	3	15	30	0	7	24	0	2	31	1
2004	82	574	12	17	189	4	14	52	0	7	26	0	6[1]	53[2]	2[3]
2005	66	585	12	14	78	1	7	1,610	2	7	45	0	3[4]	1	0
2006	65	644	9	10	25	0	6	57	1	4	9	0	7	17	1
2007	66	361	4	16	37	0	16	57	1	3	8	0	7	141[5]	2
2008	74	662	19	15	56	2	5	14	0	1	7	0	4	205[6]	1
2009	95	915	6	21	51	0	9	20	0	3	3	0	11	15	0
2010	**54**	**360**	**12**	**17**	**50**	**1**	**5**	**56**	**2**	**2**	**3**	**0**	**7**	**7**	**0**

Notes:
1 Includes two Unknown spills (14 gallons), plus one spill of each of the following: Ethylene Glycol, Propylene Glycol, AVGAS, and Paint.
2 Ethylene Glycol (25 gallons), Propylene Glycol (10 gallons), AVGAS (1 gallon) and Paint (3 gallons).
3 One spill of Ethylene Glycol; one spill of Propylene Glycol.
4 Includes two spills of an unknown substance and volume.
5 Includes one spill of motor oil (4 gallons); one spill of kerosene (5 gallons); one spill of cooking oil (120 gallons); one spill of fuel oil (10 gallons); one spill from a battery (1 gallon); two spills of an unknown substance (1 gallon).
6 Includes one spill of transformer oil (200 gallons).

Massachusetts Port Authority
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May 17, 2010

Water Technical Unit (SEW)
U.S. Environmental Protection Agency
P.O. Box 8127
Boston, MA 02114

Re: Discharge Monitoring Report
Logan International Airport
NPDES Permit No. MA0000787

To Whom It May Concern:

Enclosed are the Discharge Monitoring Reports (DMRs) for Logan Airport Outfalls for the month of April 2010.

As indicated on the attached report, a stormwater sample that was collected from the Maverick Street Outfall (Outfall 004) was found to have a Total Suspended Solids (TSS) concentration of 370 milligrams per liter (mg/l). The permit limit for TSS is 100 mg/l. The sample was obtained during a wet weather stormwater sampling event on April 16, 2010. Massport was informed of the exceedance on May 4, 2010, by our environmental consultant, Camp Dresser & McKee, Inc. (CDM), following confirmation of the analytical data by the laboratory.

As indicated in our January 19, 2010 letter, Massport and its tenants conducted a significant drainage structure clean out program in the Maverick Outfall drainage area which was completed in November 2009. The program consisted of cleaning 80 catch basins and installing filter inserts. No stormwater discharge exceedances were measured in the interim months, prior to the April 16th occurrence.

Massport believes the recent exceedance may be attributable to sediment in the drainage system deposited as a result of a water main break which occurred on March 20, 2010. During this event, a 16-inch diameter water main ruptured approximately 2,500 feet upgradient of the Maverick Street outfall (as measured along the storm drain lines), accidentally conveying over one million gallons of water and sediment into the drainage system. Massport is in the process of re-inspecting drainage structures within the roadways and parking areas to identify locations where there is a build-up of sediment. The sediment will be removed and properly disposed of by Massport's term contractor, Clean Harbors. We anticipate that the work within the Maverick Outfall drainage area will be completed by the end of June.

As a result of this exceedance, tenants within the Maverick Outfall drainage area were notified by Massport on May 5, 2010 that the April 16th exceedance had occurred. Massport required that the tenants, most of which are car rental facilities, conduct and document inspections to ensure that Best Management Practices were in place including catch basin inserts and pavement sweeping. To date, three of the four tenants within the drainage area have provided documentation of their completed inspections.

A SWPPP inspection of the Maverick Outfall drainage area was conducted by CDM on May 6, 2010. Inspection of the car rental facilities identified several locations where catch basin inserts are damaged and need to be replaced. Car rental facility managers have informed Massport that new catch basin inserts have been ordered and will be installed. Accumulated dirt and debris were observed in some areas of the car rental facilities. Massport facility personnel have been working with the car rental facilities over the past week to relocate parked cars so that areas can be swept. This work will be completed by the end of May. Massport continues to sweep roadways and Massport operated parking areas on a daily basis. During the CDM inspection, runoff was observed coming from car wash facilities. Massport has informed the car rental facility operators that all water from car wash operations must be contained within the buildings.

Massport will provide an update on the above activities with the submittal of the DMRs in June. If you have any questions regarding the current DMRs, or the actions taken to address the exceedance, please contact me at (617) 568-3552. Thank you.

Sincerely,
Massachusetts Port Authority

James W. Stolecki

James W. Stolecki, P.E.
Senior Environmental Project Manager

Enclosure: Discharge Monitoring Reports

cc: Edward Pawlowski, MADEP NERO
M. Ashan, MADEP NERO
MADEP Division of Watershed Management
Bryan Glascock, City of Boston Environment Department
Leon Bethune, Boston Public Health Commission

massport

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June 14, 2010

Water Technical Unit (SEW)
U.S. Environmental Protection Agency
P.O. Box 8127
Boston, MA 02114

Re: Discharge Monitoring Report
Logan International Airport
NPDES Permit No. MA0000787

To Whom It May Concern:

Enclosed are the Discharge Monitoring Reports (DMRs) for Logan Airport Outfalls for the month of May 2010. As indicated in the DMRs, there were no exceedances of permit limits detected in any of the stormwater samples.

The following information is provided as an update on the actions taken to address the exceedance that Massport reported last month. A stormwater sample collected from the Maverick Street Outfall (Outfall 004) on April 16, 2010 was found to have a Total Suspended Solids (TSS) concentration of 370 milligrams per liter (mg/l). A water main break that occurred on March 20, 2010 was identified as a possible source of the sediment in the stormwater drainage system.

To address the April TSS exceedance at the Maverick Street Outfall, Massport conducted inspection and cleaning of catch basins and manholes within the drainage area particularly in the vicinity of the water main break. Massport's term contractor, Clean Harbors, inspected and cleaned eight drainage structures, removing a total of approximately 2½ cubic yards of sediment. A significant portion of this material was removed from two catch basins immediately adjacent to the location of the water main break. The sediment has been stockpiled within a staging area at the airport, and it will be transported to a permitted facility. Clean Harbors is making arrangements to clean an additional 6-10 structures within the Maverick Street Outfall at locations where access is limited due to heavy traffic. This work will be completed by the end of June.

In addition to the above actions, Massport required the tenants located within the Maverick Outfall drainage area to conduct inspections, clean structures and replace filter inserts as needed. Massport is working with tenants to ensure that this work is completed and documented. Massport's Facilities Department has completed sweeping of the tenant areas and continues to sweep roadways and Massport operated parking areas on a daily basis.

If you have any questions regarding the current DMRs, or the actions taken to address the stormwater exceedance that occurred in April, please contact me at (617) 568-3552. Thank you.

Sincerely,
Massachusetts Port Authority

James W. Stolecki

James W. Stolecki, P.E.
Senior Environmental Project Manager

Enclosure: Discharge Monitoring Reports

cc: Edward Pawlowski, MADEP NERO
M. Ahsan, MADEP NERO
MADEP Division of Watershed Management

massport

Massachusetts Port Authority
One Harborside Drive, Suite 200S
East Boston, MA 02128-2090
Telephone (617) 568-5950
www.massport.com

December 15, 2010

Water Technical Unit (SEW)
U.S. Environmental Protection Agency
P.O. Box 8127
Boston, MA 02114

Re: Discharge Monitoring Report
Logan International Airport
NPDES Permit No. MA0000787

To Whom It May Concern:

Enclosed are the Discharge Monitoring Reports (DMRs) for Logan Airport Outfalls for the month of November 2010.

As indicated on the attached report, a sample that was collected from the North Outfall (Outfall 001) was found to have a Total Suspended Solids (TSS) concentration of 140 milligrams per liter (mg/l). The permit limit for TSS is 100 mg/l. The sample was obtained during a dry weather sampling event on November 12, 2010. Massport was informed of the exceedance by our environmental consultant, Camp Dresser & McKee, Inc. (CDM), following confirmation of the analytical data by the laboratory.

This is the first exceedance of a permit limit at the North Outfall since issuance of the NPDES permit on July 31, 2007. Review of the conditions within the North Outfall drainage area did not identify any construction or airport operations that would have resulted in a discharge of sediment to the stormwater drainage system. Massport will continue to monitor this area and will document conditions during the monthly Stormwater Pollution Prevention Plan inspections.

If you have any questions regarding the current DMRs, please contact me at (617) 568-3552. Thank you.

Sincerely,
Massachusetts Port Authority

James W. Stolecki

James W. Stolecki, P.E.
Senior Environmental Project Manager

Enclosure: Discharge Monitoring Reports

cc: M. Ashan, MADEP NERO
MADEP Division of Watershed Management
Bryan Glascock, City of Boston Environment Department, w/o enclosure
Leon Bethune, Boston Public Health Commission, w/o enclosure
James McKenna, Winthrop Town Manager, w/o enclosure

Capital Programs and Environmental Affairs

EnviroNews

A Massport Tenant Newsletter

Volume 36, Issue 1

May 2010

INSIDE THIS ISSUE:

EnviroNews is a newsletter published quarterly for Massport Tenants. Your comments and suggestions are welcome—please contact Tricia Haederle (phaederle@massport.com) at 617.568.5963.

Terminal B Garage Produces Power from Sun

New solar panels on the roof of the Terminal B Garage at Logan Airport began producing power in February, and are predicted to produce approximately 166,000 kW of electricity a year, or approximately 5% of the garage's total annual electric consumption. The panels were installed as part of the current $55.7 million dollar renovation of the garage, which also includes installation of LED lighting, expected to reduce energy consumption by 49%.

No Butts About It: Cigarettes Tops in Marine Litter

We've all seen them: strewn on sidewalks, washed down gutters, in the sand at the beach. These filters have a negative effect on the environment and the animals and children that accidentally ingest them. Here are a few facts:

Cigarette butts don't disappear. About 95% of cigarette filters are composed of cellulose acetate (not cotton!) , a form of plastic which does not quickly degrade and can persist in the environment. (Clean Virginia Waterways, www.longwood.edu)

In 2009, 25% of all marine debris collected world wide was smoking-related; cigarettes and filters were the most common debris found with a total of over 2 million pieces collected world wide. (oceanconservancy.org)

(Continued on page 3)

Used Oil is Hazardous Waste in Massachusetts

Under Massachusetts regulations, waste or used oil must be handled, stored and disposed of as Hazardous Waste. Before generating, accumulating, or shipping any hazardous waste, you must either register as a generator with MassDEP or notify the agency of your hazardous waste activities. If you generate or accumulate hazardous waste without registering, you may incur a violation that carries **fines of up to $25,000 per day.**

During generation and storage, at a minimum, containers of waste oil must be labeled with the words “WASTE OIL”, “HAZARDOUS WASTE” and “TOXIC” in letters at least one inch high, per the regulations. Containers must be in good condition and compatible with the waste stored. Depending on your generator status (see below), you may also have to label the container with an accumulation start date. Containers must be stored in a secure area and on a surface free of cracks or adjacent to drains. Except when in use, storage containers must remain closed.

For complete requirements, registration instructions, copies of regulations and fact sheets go to MassDEP web site at http://www.mass.gov/dep/recycle/hazwaste.htm.

Know Your Massachusetts Hazardous Waste Generator Status

Your state hazardous waste generator status determines how much waste you may accumulate at your site at one time, and how quickly you need to ship it off-site for recycling or disposal.

GENERATOR STATUS	STORAGE LIMIT	STORAGE PERIOD
Very Small Quantity Generator (VSQG)	Less than 220 pounds (approximately 27 gallons) of hazardous waste or waste oil per month and no acutely hazardous waste.	Up to 2,200 pounds (about 270 gallons) for an indefinite period of time.
Small Quantity Generator (SQG)	Between 220 and 2,200 pounds per month (approximately 27 to 270 gallons), and/or up to 1 kilogram (2.2 pounds) of acutely hazardous waste per month	Up to 13,200 pounds (1,500 to 1,620 gallons) for no more than 180 days
Large Quantity Generator (LQG).	Greater than 2,200 pounds (approximately 270 gallons) and/or more than 1 kilogram (2.2 pounds) of acutely hazardous waste per month.	Accumulate any quantity on-site, but must ship it within 90 days.

Note: The same numerical thresholds apply to both hazardous waste and waste oil. You may register separately and maintain different generator status for each, depending on the quantities you generate.

(source: MADEP)

For further information go to Massachusetts Department of Environmental Protection web site at http://www.mass.gov/dep/recycle/hazardous/hwgens.htm.

(Continued from page 1)

A typical cigarette butt can take 18 months to 10 years or more to decompose. (sidneyherald.com)

Filters are harmful to waterways and wildlife. About 18% of litter, traveling primarily through storm water systems, ends up in local streams, rivers, and waterways. Nearly 80% of marine debris comes from land-based sources. Cigarette butt litter can also pose a hazard to animals and marine life when they mistake filters for food. (Clean Virginia Waterways, www.longwood.edu)

Cigarette smoking in America has decreased 28% in the past decade, yet cigarette butts remain the most littered item--in the U.S. and across the globe. (keepamericabeautiful.org)

Cigarette butts trap particulates and toxic chemicals, which enter the environment as the filters degrade. Among the chemicals: arsenic, lead, cadmium, benzene, hydrogen cyanide and formaldehyde. (www.smokefreeoregon.com)

The chemicals from just one filtered cigarette butt have the ability to kill half the fish living in a one liter container. (cigwaste.org)

Unrecyclable Recyclables

PAPER COFFEE CUPS

Currently, paper coffee cups (also called hot cups) are accepted for recycling at only few communities in the U.S. The thin polyethylene plastic coating on the cups that helps prevent liquid leaking has made it difficult for most processing services to recycle the cups. With about 58 billion paper cups used each year in the U.S., the best thing you can do is simply reduce your usage.

Bring along a reusable mug or ask your barista if they offer mugs for serving if you're staying in the store to sip your drink. Secondly, if your community offers composting, look for cups made with plant-based coating (called PolyLactic Acid, or PLA, which is made from corn and other vegetable sugars), which allows the cups to be composted.

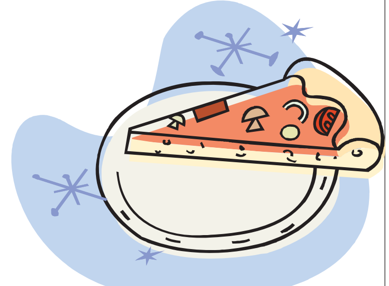
PIZZA BOXES, USED PAPER PLATES & NAPKINS

Many people assume that pizza boxes are recyclable. In fact, most boxes have recycling symbols on them and are traditionally made from corrugated cardboard. They are, in and of themselves, recyclable. However, what makes parts of them non-recyclable is the hot, tasty treat that comes inside them, specifically, the grease and cheese from pizza that soil the cardboard.

"Food is one of the worst contaminants in the paper recycling process."

Food is one of the worst contaminants in the paper recycling process. Grease and oil are not as big of a problem for plastic, metal and glass, as those materials are recycled using a heat process. But when paper products are recycled, they are mixed with water and turned into a slurry. Since we all know water and oil don't mix, the issue is clear.

Grease from pizza boxes causes oil to form at the top of the slurry, and paper fibers cannot separate from oils during the pulping process. Essentially, this contaminant causes the entire batch to be ruined.



Source: Marisa McNatt, Earth911.com

Massport Drives Home Worker Traffic Safety

In order to decrease the risk of worker injury and illness in and around work and construction zones from traffic, over 130 Massport employees recently received day-long work zone safety training.

In this training, students utilized the Manual on Uniform Traffic Control Devices (MUTCD), the Federal Highway Administration standard for installing and maintaining traffic control devices. They practiced how to develop and implement a traffic control plan, and simulated the use of assorted barriers, traffic calmers (such as cones or barrels), high-visibility clothing and traffic controls when working on or near public roads.

Massport's Safety Unit reminds everyone that when working near vehicle traffic, it is important to be seen. Use signs, cones, flashing lights, wear high visibility clothing and place your vehicles to slow vehicle traffic and create a safe work area.

For those of us who drive through work zones, the most common contributing factors to accidents in these areas are speed and distraction. To combat the problem of work zone accidents, the **Massachusetts Move Over Law** took effect March 22, 2009. The law requires drivers approaching a parked vehicle with flashing lights to move to the next adjacent lane if it is safe to do so, and to reduce their speed. Failure to comply could result in a **fine of up to $100.**

The Massachusetts Highway Department offers the following additional safety tips when driving in a work zone:

- Expect the unexpected.
- Don't tailgate.
- Pay attention to signs.
- Expect delays.
- Don't drive too closely to the work zone.
- Report a road hazard.
- Seek an alternate route.
- If on foot, follow marked pedestrian pathways.
- Focus your attention on driving.

For more highway safety tips and information, visit MassDOT at: www.massdot.state.ma.us/Highway/

or the Federal Highway Administration at:

www.fhwa.dot.gov/.

AVOID CONSTRUCTION DELAYS

Call the MassDOT-managed traveler information line: 5-1-1 from a cell phone or 617-374-1234 from a landline. This provides recorded, real time updates for various popular commuting routes (including to and from Logan Airport).

Callers are guided through the system and asked to make information choices by pressing numbers followed by the "star" (*) key.

The system will be upgraded beginning Memorial Day weekend to include easier phone navigation, improved real-time information, and personalized traffic information. More information is available on line at:

http://www.mhd.state.ma.us.

511 Travel Info

Call 511

or

617-374-1234

ROUTE	CODE	ROUTE	CODE
Cape Cod	7*	I-93	93*
Route 2	2*	I-95	95*
Route 3	3*	I-290	290*
Route 9	9*	I-495	495*
Route 24	24*		

ROUTE	CODE
Route 1/Tobin	1*
MassPike/I-90	90*
O'Neil Tunnel/River Roads	6*
511 Operators	4*
Logan Airport/Tunnels/Parking	5*
MBTA	8*
Mass Rides	227*
MassHighway Hotline	321*
MassHighway General Info	322*

Capital Programs and Environmental Affairs

ENVIRONEWS

A Massport Tenant Newsletter

Volume 36, Issue 2

July 2010

INSIDE THIS ISSUE:

EnviroNews is a newsletter published quarterly for Massport Tenants. Your comments and suggestions are welcome—please contact Tricia Haederle (phaederle@massport.com) at 617.568.5963.

SUMMER GRILL SAFETY

Gas leaks or breaks in gas lines are the leading contributor to grill-related fires

Half of emergency room visits involving grills resulted in contact burns; 25% of those visits were children under 5

33% of grill injuries were burns resulting from lighting

33% of structure fires involving grills start on a balcony or porch

Source: NFPA.org

Safe Shipping at Conley Terminal

When container ships dock at Conley Terminal, the clock starts ticking—the goal is to get the ship unloaded as quickly as possible, because, after all, time is money. But if Lance Bliss, Massport Manager of Maritime Safety & Training has anything to do with it, the ships get unloaded as **SAFELY** and as quickly as possible. And to make sure that is the case, Lance has just completed a two year long, intensive effort developing a safety training program for the terminal.

Similar to airside SIDA training that Massport staff undergo at Logan, Lance developed the first of its kind computer-based training module customized to maritime functions at Conley. This training, prepared with the assistance of the American Association of Airport Executives, is provided to new Conley employees, and covers job-specific safety considerations for longshoremen. The hour and a half training includes ergonomics, personal protective equipment, electrical safety and lashing.

Lance Bliss, Massport Maritime Safety & Training Manager, demonstrates the "three points of contact" technique to ensure a safe entry and exit from a vehicle.

Up and running for over a year now, Lance is confident that the computer training has already paid off: "We have seen a fifty to sixty percent reduction in workers compensation claims this year as compared to the prior two", and he hopes that other port authorities will elect to use this type of training in their own programs.

Safety doesn't stop at computer training though, and Lance conducts hands-on training throughout the year. He works closely with the International Longshoremen's Association, the maritime trade union in North America to which many Conley workers belong, to provide training to their members who are unable to obtain it off site otherwise. His training covers topics such as fall protection (an Occupational Safety and Health Administration requirement and necessary because the ships that berth at Conley are 100 feet high—as tall as a ten story building, and a fall from that height

(Continued on page 2)

What Does that Mean?
Port Lingo for Laypeople

"Reefer" = Refrigerated Cargo Container

"Hustler" = Tractor

"RTG" = Rubber tired gantry crane. Used to lift containers onto truck beds for transport.

"Longshoremen" = individuals employed in the unloading and loading of ships at a port.

"Stevedore" = person who unloads ships

(Continued from page 1)

would be deadly), yard operations [with tractor trailers, cranes, and containers moving simultaneously around the terminal, situational awareness is a high priority), hustler and powered industrial truck (forklift) training.

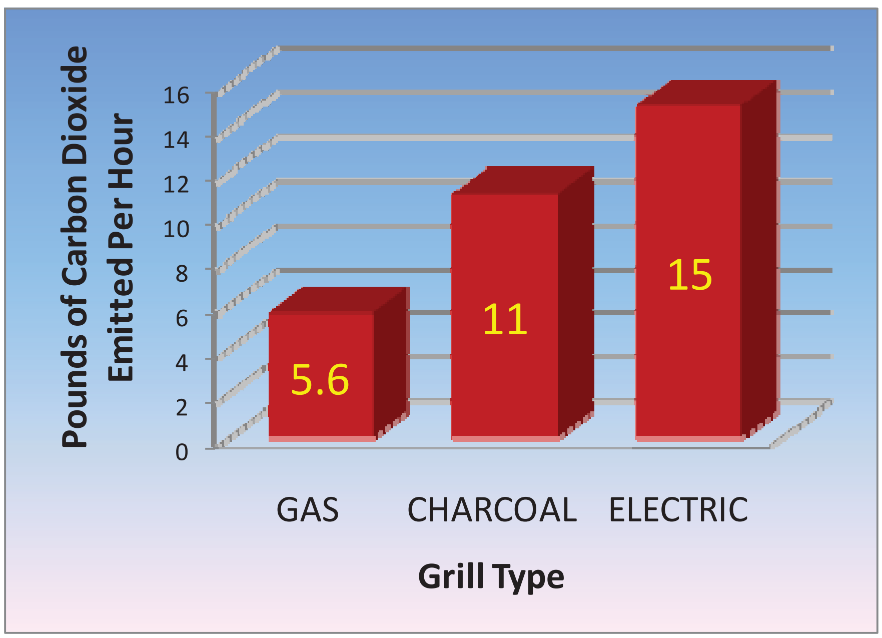
Training is augmented by terminal and vessel safety audits. This proactive approach has helped to identify safety issues and correct them before personal injury and accidents occur. Should an accident happen, however, Conley is prepared for that too: Lance had two Automatic Electrical Defibrillators (AEDs) installed at the terminal and arranged for appropriate training for Massport and ILA staff who were interested.

How About Some Carbon Dioxide with that Burger?

Carbon dioxide (CO_2), a greenhouse gas, is present in the air we breathe, and is generated when we light barbeque grills. Increased carbon dioxide in the atmosphere has been linked to global warming. About 60 million Americans grill during the summer, and here are some quick facts related to your summer grilling habits:

- **225,000 metric tons:** The amount of CO_2 released by American grills each year.
- **75 percent:** U.S. households who own at least one barbecue.
- **3,000 pounds per year:** The amount of CO_2 saved by becoming a vegetarian.
- **250 pounds per year:** The amount of CO_2 you'd save by cutting your beef consumption by one quarter.
- **13 pounds per year:** The amount of CO_2 saved by letting your leftovers cool to room temperature before putting them in the refrigerator.

Sources: *Ready, Set, Green: Eight Weeks to Modern Eco-Living*, Oak Ridge National Laboratory, Sierra Club



Tristam West, a researcher with the Department of Energy's Oak Ridge National Laboratory, compared the carbon output of gas, charcoal and electric powered grills when producing 35,000 Btu's per hour, a typical industry baseline. West's calculations showed that gas produced 5.6 pounds of carbon dioxide each hour, compared to 11 pounds for charcoal. Electric grills produce a whopping 15 pounds of carbon dioxide for every hour at 35,000 Btu's, so they aren't the best choice from a carbon perspective.

Source: Olivia Zaleski, http://www.huffingtonpost.com

Trashing Batteries

Because of their contents, batteries, in general, should not be disposed of in the trash. Depending upon the type of battery, they are considered hazardous waste and must be disposed of properly. Here are the details on a few of the more common types:

Alkaline or Carbon Zinc

These common batteries come in a variety of sizes (AA, AAA, C, D and 6 and 9 volt) and include those marked as "Heavy Duty" "General Purpose" and "Power Cell". They are often labeled as "no added mercury" or have a green tree logo. Domestically manufactured batteries made after 1994 no longer contain mercury and can be disposed of in the trash.

Nickel-cadmium rechargeable batteries (NiCads)

These exist in many sizes and shapes and are marked as rechargeable. Some may be built into rechargeable appliances. NiCads contain cadmium, a metal that is toxic to humans when inhaled or ingested. **DO NOT DISPOSE IN THE TRASH.** Take to a retail collection location or a municipal recycling center that accepts rechargeable batteries.

YOU CAN RECYCLE THESE BATTERIES FOR FREE—SEE BELOW!

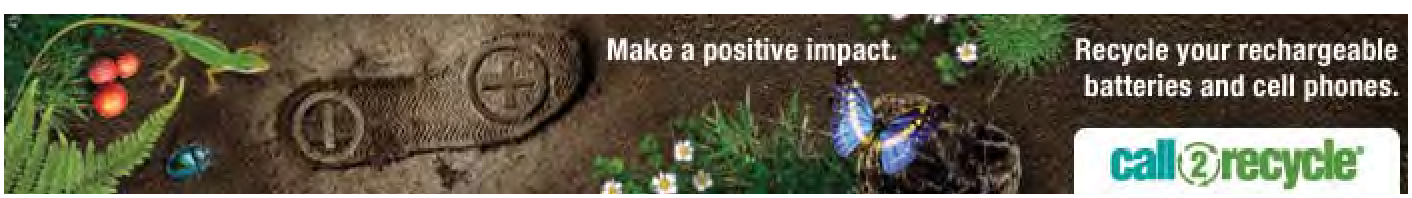
Lead Acid

These batteries, including 6 and 12 volt automotive batteries and 2, 6 and 12 volt batteries, such as those used in video cameras, power tools, ATVs, wheelchairs, and **CANNOT BE DISPOSED OF IN THE TRASH.** Automotive dealers or parts stores may accept these for recycling, as will your local hazardous waste collection day. Log on to websites such as earth911.com or call2recycle.org to search for recycling locations by zip code.

Button Batteries

Found in watches, animated greeting cards, hearing aids, calculators and cameras, these button cells contain hazardous materials including mercury, cadmium, silver and zinc and **CANNOT BE DISPOSED OF IN THE TRASH.** Log on to websites such as earth911.com or call2recycle.org to search for recycling locations by zip code.

Sources: USEPA, MADEP, earth911.com, call2recycle.org and ehso.com.



Massport has recycled NEARLY 200 POUNDS of batteries and cell phones through this program in the past 2 years.

Tenants can participate in this FREE program—go to www.call2recycle.org to enroll.

Did you witness an unsafe act on the Logan apron?
Do you know of unsafe equipment on the ramp?
Are you concerned that physical conditions pose a safety hazard?
Are you unsure who to call?

CALL THE LOGAN AIRPORT SAFETY HOTLINE

617-568-3600

The hotline is a voluntary, confidential reporting system **for non-emergency situations**, created to provide a means to report unsafe practices or conditions on the **Logan apron** without fear of retaliation. Calling the hotline will allow you to leave an anonymous message (the call goes directly to voicemail). Messages will be evaluated by Massport for further action.

EMERGENCY CONDITIONS SHOULD BE REPORTED IMMEDIATELY TO THE APPROPRIATE MASSPORT DEPARTMENT

Massport Fire-Rescue: 617-567-2020

Massport State Police: 617-568-7300

Massport Operations Department: 617-561-1919

Each item logged on the hotline is discussed at a monthly Airport Safety Alliance meeting. The alliance is composed of representatives from Massport, the Federal Aviation Administration and the Airlines serving Logan For more information, please contact Tom Comeau at 617-561-3418 or via e-mail at tcomeau@massport.com.

SAFETY FIRST at Logan International Airport.
The life you save could be your own.

FREE LUNCH

LEARN FROM THE PROS

TRY THE LATEST TOOLS

WIN PRIZES

FREE SAMPLES

SEE A SAFETY PROBLEM?

REPORT IT ANONYMOUSLY

RAMP SAFETY HOTLINE

617-568-3600

LOGAN SAFETY FAIR

For anyone working airside, or landside with tools, GSE, baggage or other equipment: come try the newest work safety tools, equipment and techniques. Free to all airline, tenant and Massport employees.

SEPTEMBER 15, 2010
11:00 TO 15:00
AMERICAN EAGLE HANGAR

The 2010 SAFETY FAIR is sponsored by the Airport Safety Alliance and JetBlue and hosted by American Eagle.

Questions: Contact Brian Dinneen, Massport Safety Manager at 617-568-7427 or bdinneen@massport.com.

jetBlue AIRWAYS | massport | FAAST | AmericanAirlines American Eagle

Capital Programs and Environmental Affairs

EnviroNews

A Massport Tenant Newsletter

Volume 36, Issue 3

October 2010

Inside this issue:

EnviroNews is a newsletter published quarterly for Massport Tenants. Your comments and suggestions are welcome—please contact Tricia Haederle (phaederle@massport.com) at 617.568.5963.

Reminder: Tenant Environmental Audits Due

Massport reminds its tenants to review the environmental provisions of their lease or operating agreements. If required, tenants must submit environmental compliance audits annually, usually on their lease commencement date. Audits must be performed and documented by an experienced professional. Any deficiencies identified during the audit must be addressed by the tenant in an appropriate timeframe, and at the tenant's expense.

Independent of this tenant requirement, Massport's Environmental Management Unit (EMU) has recently updated its tenant audit program, through which EMU staff will conduct a complementary environmental audit of each tenant's leased premises. This is consistent with Massport's Environmental Management Policy, to monitor tenant environmental compliance, provide training, and communicate regulatory requirements. Massport environmental audits are meant to be educational, and not confrontational. Note that an audit conducted by EMU staff does not take the place of or exempt tenants from conducting their own independent audit, nor does it supersede tenants' obligation to comply with all applicable laws, rules and regulations.

During an EMU audit, tenants can expect a review of their chemical storage and handling, recycling, stormwater pollution prevention practices, fire protection, waste oil and/or hazardous waste management. After the visit, a written summary of findings will be provided. As with third party audits, deficiencies are required to be corrected by the tenant.

If you have any questions about the audit process, please contact Tricia Haederle, Massport's Assistant Director, Capital Programs & Environmental Management at 617-568-5963 or phaederle@massport.com.

What are some common tenant audit findings?

- Minimal or no recycling;
- Lack of employee training, on subjects such as the Right-to-Know Law;
- Improperly stored or labeled Hazardous Waste or Waste Oil containers & storage areas;
- Unregistered Hazardous Waste or Waste Oil Generator;
- Expired or discharged fire extinguishers

Universal Rules!

What's wrong with this picture?

Improper storage and labeling of Universal Wastes.

Unbroken, used (spent) fluorescent bulbs should be stored to prevent breakage, in fiber drums or boxes. The drums/boxes should be closed when not in use and stored in a ventilated area that is not continuously occupied.

The containers should be labeled with the words "UNIVERSAL WASTE", the type of universal waste (such as spent fluorescent bulbs, used thermometers, etc.) and marked with the date on which the first item was placed in the container (the accumulation start date).

Questions about what constitutes a Universal Waste or how to store?

See the Massachusetts DEP web page at www.mass.gov/dep/toxics/stypes/hgres.htm

Hazardous Waste Violations Lead to $150,000 Tenant Fine

A Massport tenant was recently issued a civil administrative penalty of $150,000 by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) for several violations of hazardous waste regulations. Note that Massport was not leasing space to the tenant at the time of the violations.

Several items leading to the fine were noted during a DEP inspection of the tenant's lease area, including failure to:

- Post signs with the words "HAZARDOUS WASTE" where hazardous wastes were stored.
- Post appropriate signs with the words "WASTE OIL" where waste oil was stored. It is important to note that the tenant <u>did</u> have signs demarcating the waste oil storage area, but they did not comply with the proper language, or the requirements that the signs have letters at least one inch high.
- Properly label and mark containers accumulating hazardous waste—the accumulation start dates were not provided.
- Notify the DEP that waste oil is generated on site or to register as a generator of waste oil.
- Use a licensed transporter to transport hazardous waste.
- Use an approved hazardous waste disposal facility.
- Use a hazardous waste manifest during shipping of hazardous materials.
- Notify DEP of a change in owner, operator and contact person generating hazardous waste.

In addition to the fines, the tenant was required to implement an Environmental Management System and conduct an environmental audit using a third party. If satisfactorily completed, DEP will waive $25,000 of the $150,000 fine.

Massport Awarded $5.9 Million to Reduce Emissions

The Federal Aviation Administration has awarded Massport a grant for approximately $5.9 million for the purchase of alternative fuel buses. The Voluntary Airport Low Emissions (VALE) grant will be used to cover the incremental cost of purchasing fifty compressed natural gas and hybrid diesel buses, as compared to diesel buses.

In operating alternative fuel buses, Massport expects that it will reduce the following greenhouse gas emissions over the lifecycle of the buses, as compared to diesel buses:

- 1,843 tons of carbon monoxide
- 43 tons of nitrogen oxides
- 24 tons of volatile organic compounds

The buses will arrive beginning in 2011, and will serve the new Consolidated Rental Car Facility as well as Massport shuttle routes.

The FAA VALE program provides financing for air quality improvements at airports in designated air quality nonattainment and maintenance areas. Eligible projects include gate electrification, refueling and recharging stations, as well as low emission vehicles, such as tugs and other airfield equipment. Tenants are eligible for these grants through Massport. Read more about the program at www.faa.gov/airports/environmental/vale.

If you are interested in submitting a grant application, please contact Tricia Haederle at 617-568-5963 or phaederle@massport.com.

VALE CLEAN TECHNOLOGY Voluntary Airport Low Emission Program

Did You Know?

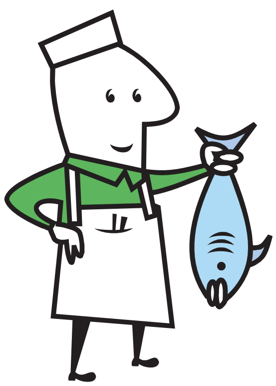
Fluorescent light ballasts manufactured before 1979 likely contain polychlorinated biphenyls (PCBs). After that date, manufacturers were required to label ballasts "No PCBs" if they didn't contain the chemicals. If there is no label, or if you are unsure of its age, treat these ballasts as if they contain PCBs, and recycle or dispose of as hazardous waste.

Wonder if your light bulb contains mercury? Look for the letters Hg, the elemental symbol for mercury, printed on the bulb. This is a sure indicator that it contains mercury, and has to be recycled.

"Green Tip" fluorescent light bulbs still contain mercury and can't be thrown in the trash in Massachusetts. Yes, these bulbs have a lower mercury content (as compared to traditional fluorescent bulbs), and may be managed differently under federal regulations, but under Massachusetts regulations, these bulbs must be managed as Universal Waste.

5 milligrams of mercury is the average amount a compact fluorescent light bulb contains. That is a volume about the size of the tip of a ball point pen. Source: www.gelighting.com

Why Care?
PCBs and mercury are released to the atmosphere when products are improperly disposed, or during incineration. As a result, these chemicals enter the food chain, and end up in the food we eat. In fact, some Massachusetts fish contain so much mercury and PCBs that they are dangerous to eat.



You can see if the water bodies in your town or your favorite fishing spots are affected at the Massachusetts Department of Health and Human Services web page at: **http://db.state.ma.us/dph/fishadvisory/**

AIRSIDE SAFETY ALLIANCE

OPEN MONTHLY MEETINGS

Logan Media Room
1000 hours

2010 meeting dates

Tuesday, October 19

Tuesday, November 16

Tuesday, December 21

Airside Safety Alliance meetings serve as a platform for discussing safety concerns reported to the Airport Safety Hotline, as well as distributing the latest on safety programs and initiatives.

These meetings are open to Massport and its Tenants. Massport Aviation Operations, Fire Rescue, Safety and Environmental Management will be on hand to answer questions and review incidents.

Report unsafe conditions anonymously

AIRPORT SAFETY HOTLINE

617-568-3600

FAAST FAA SAFETY TEAM

BOSTON AIRSIDE SAFETY WORKING GROUP LOGAN INT'L AIRPORT

massport

Capital Programs and Environmental Affairs

ENVIRONEWS

A Massport Tenant Newsletter

Volume 36, Issue 4

December 2010/
January 2011

INSIDE THIS ISSUE:

EnviroNews is a newsletter published quarterly for Massport Tenants. Your comments and suggestions are welcome—please contact Tricia Haederle (phaederle@massport.com) at 617.568.5963.

KNOW YOUR RESPONSIBILITIES: SPILL REPORTING AND RESPONSE

Massport's Environmental Management Unit reminds everyone that employees, tenants and contractors at Logan Airport are obligated to report all spills of oil, jet fuel, lavatory waste or any oil/hazardous material that they encounter, regardless if they caused the release, and regardless of quantity.

To report a spill, place a call to Massport Fire Alarm (617-567-2020). This quickly mobilizes appropriate resources including Fire Rescue, Environmental Management, Aviation Operations and Massport's spill response contractor. Tenants are encouraged to remind all employees of the importance of early notification and action, which can reduce the cost to clean up a spill, and reduce the magnitude of impact to the environment.

TAKE NOTE!

ALL OIL, HAZARDOUS MATERIAL & LAVATORY WASTE SPILLS AT LOGAN AIRPORT REGARDLESS OF QUANTITY MUST BE REPORTED IMMEDIATELY TO MASSPORT FIRE ALARM 617-567-2020

POROUS ASPHALT IMPROVES STORMWATER QUALITY AT LOGAN AIRPORT

On December 1, the newly relocated cell phone lot was opened to the public at Logan Airport. In addition offering an alternative to driving around the terminal roadways for those waiting to pick up passengers (and thus cutting vehicle emissions), another benefit of this lot goes largely unnoticed: porous pavement allows precipitation to infiltrate into the ground instead of discharging to a storm drain via overland sheet flow. Outwardly, the pavement's appearance is no different than any other asphalt, but it's internal structure provides a route for the stormwater to percolate through to the ground beneath.

"The porous pavement used in the new cell phone lot looks like regular asphalt, but was mixed without some of the particles used in traditional impermeable asphalt," said Sam Sleiman, Massport's Director of Capital Programs and Environmental Affairs. "This allows water to penetrate through the pavement."

Recharging groundwater directly in this manner has several advantages. First, water that would normally enter into the airport's storm drain system (and ultimately discharge

(Continued on page 5)

New Permit Required for All Aboveground Storage Tanks

Even though Above Ground Storage Tanks (ASTs) with a capacity of less than 10,000-gallons are no longer regulated under Massachusetts Storage Tank Regulations, they are still regulated under Massachusetts Fire Regulations governing flammable and combustible liquid storage, and require permitting. Therefore, effective immediately, Massport tenants are required to complete a Massport/Massachusetts Department of Fire Services (DFS) Application & Permit Form for **all** ASTs, used for storage of flammable and combustible liquids on Massport property, regardless of capacity. Please note that this also includes glycol tanks, and mobile tanks. Since Massport Fire Rescue has jurisdiction over ASTs on Massport property, permits must be obtained through them. Permits must be renewed annually, and renewal is the responsibility of the tank owner.

Tenants with ASTs have already been contacted by Massport's Environmental Management Unit to begin the permitting process, however, tenants can obtain a blank permit application form from Massport Fire Rescue (617-561-3500) or from Erik Bankey in the Massport Environmental Management Unit (617-568-3514). Tenant owners of ASTs greater than 10,000 gallons capacity must also obtain an annual permit from the DFS. Note that DFS will not issue its permit until the tank owner has been issued the permit by Massport Fire Rescue. Tenants should submit completed forms to Massport Environmental Management Unit; the signed permit will be returned to the tenant who must post it in a conspicuous location at the building listed on the permit.

Contact Erik Bankey at the number above or at ebankey@massport.com for more information.

ALL above ground storage tanks on Massport property now require permits, regardless of size. Tanks containing deicing fluid and mobile tanks are also included in this requirement.

Tier 2 Reports are Due March 1

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 establishes requirements for Federal, State and local governments and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. This law aids communities in meeting their responsibilities in regard to potential chemical emergencies. The Right-to-Know provisions increase knowledge and access to information on the presence of hazardous chemicals in communities and releases of these chemicals into the environment.

Among the key provisions of EPCRA, Sections 311 and 312 require annual submission of chemical inventory data (known as Tier II reports) by facilities to state and local planning officials for incorporation into ongoing emergency planning. Section 313 requires facilities to quantify and submit annual releases of certain chemicals for incorporation into a national data base known as the Toxics Release Inventory (TRI). The primary purpose of the TRI reporting requirement is to assist in research and development of regulations, guidelines and standards relating to routine discharges of chemical materials.

Tier II reports are due electronically on March 1. Instructions on how to submit the inventories can be found on EPA's website at http://www.epa.gov/region1/enforcement/epcra/index.html. Note that EPA is also sponsoring a series of free EPCRA compliance assistance workshops around New England in February. A schedule for these events can be found on the above EPA web page.

Source: USEPA

Eliminating FOD is Everyone's Business

FOD PREVENTION TIPS

CLEAN AS YOU GO—KEEP YOUR WORKSPACE CLEAN

SECURE LOOSE BELONGINGS

TRACK TOOLS, LATEX GLOVES, HAIR NETS, WATER BOTTLES, NEWSPAPERS AND PLASTIC BAGS AROUND YOUR WORK SPACE

SEE FOD? PICK IT UP

DISPOSE OF FOD IN DESIGNATED AIRFIELD BINS OR IN A CLOSED CONTAINER

FOD or Foreign Object Debris, is the term given to any object on an airfield that has the potential to come loose and cause damage, potentially resulting in severe or fatal injuries to personnel and damaging equipment. Damage can include cutting aircraft tires, ingestion into engines or lodging in mechanisms affecting flight operations. Injuries can occur when jet blast propels FOD through the airport environment at high velocities.

FOD creates other problems: it gets washed into the Logan storm sewer system...nearly 70 cubic yards of debris are collected on a weekly basis—that's enough to fill about 100 five gallon buckets.

FOD comes from many sources, such as personnel, airport infrastructure (pavement, lights, and signs), the environment (wildlife, snow, ice) and equipment operating on the airfield (aircraft, airport operations vehicles, maintenance equipment, fueling trucks, other aircraft servicing equipment, and construction equipment). FOD can collect both on and below ground support equipment stored or staged on the airport apron. Jet blast can then blow FOD onto personnel or an aircraft. FOD may also be more prevalent in winter conditions, as pavement infrastructure may be influenced by weathering (freeze and thaw cycles) and begin to crack or break apart.

FOD creates other problems: it gets washed into the Logan storm sewer system. FOD that makes it through the system is collected at stormwater outfalls; nearly 70 cubic yards of debris such as cups, packing peanuts, food wrappers, are collected on a weekly basis—that's enough to fill about 100 five gallon buckets.

Sources: FAA Advisory Circular 150/5210-24, Airport Foreign Object Debris (FOD) Management & Massport

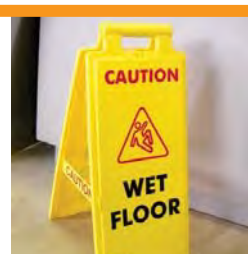
Winter Safety Reminder

RECOGNIZE SLIP & TRIP HAZARDS

- **Weather Induced Conditions**
- **De-Icing Fluid on Surfaces or Shoes**
- **Spills and Melted Snow/Ice**
- **Poor Lighting**
- **Clutter and Obstacles in Walkways**
- **Loose Mats and Carpet**

BE AWARE OF YOUR ENVIRONMENT

- **Take your time and pay attention to where you are going**
- **Walk on designated and cleared paths**
- **Watch your footing and use handrails**
- **Don't carry too much; you can lose your balance or block your view**
- **Anticipate slippery conditions**



Regulatory Round Up

EPA Improves Guidance for Compact Fluorescent Light Bulb Cleanup

In December 2010, the U.S. Environmental Protection Agency (EPA) updated its guidance on how to properly clean up a broken compact fluorescent lamp (CFL). Included with the guidance is a new consumer brochure with CFL recycling and cleanup tips. EPA encourages Americans to use CFLs for residential lighting to save energy and prevent greenhouse gas emissions that lead to global climate change.

CFLs contain a small amount of mercury sealed within the glass tubing. When a CFL breaks, some of the mercury is released as vapor and may pose potential health risks. The guidance and brochure will provide simple, user friendly directions to help prevent and reduce exposure to people from mercury pollution.

More information on the clean up guidance:
http://www.epa.gov/cflcleanup
More information on CFLs:
www.epa.gov/cfl

Source: USEPA

Commonwealth of Massachusetts Sets Statewide Greenhouse Gas Emissions Limit for 2020

In compliance with the Global Warming Solutions Act (GWSA) signed by Governor Patrick in 2008, Energy and Environmental Affairs (EEA) Secretary Ian Bowles is pleased to announce he has set the statewide greenhouse gas (GHG) emissions limit for 2020 and released the Massachusetts Clean Energy and Climate Plan for 2020 which details how the Commonwealth will comply with the limit. Secretary Bowles set the 2020 limit 25 percent below 1990 levels, the maximum authorized by the GWSA. Building on existing measures that will get Massachusetts much of the way toward the 25 percent limit, the EEA plan comprises a targeted portfolio of additional policies that promise overall cost savings and clean energy jobs, while allowing the Bay State to reach the most ambitious target for GHG reduction of any state in the country.

A complete copy of the Massachusetts Clean Energy and Climate Plan for 2020 can be downloaded from the Executive Office of Energy and Environmental Affairs home page, accessible through www.mass.gov.

Source: MassDEP Bureau of Waste Prevention

MADEP Bans Disposal of Drywall Effective July 1, 2011

The Massachusetts Department of Environmental Protection (MADEP) has banned the disposal of clean gypsum wallboard (drywall) through an amendment to 310 CMR 19.000, the Commonwealth of Massachusetts' Solid Waste Management Regulations. Clean is defined as wallboard that is not coated with paint, joint compound, adhesives, nails or other materials.

During new construction, gypsum wallboard installers generate scrap material. Approximately 15% -20% of new gypsum wallboard is disposed of as scrap. It is estimated that approximately 40,000 tons to 50,000 tons of new gypsum wallboard scrap material is generated annually in Massachusetts.

Since 2001, MassDEP has successfully worked with the construction and demolition (C&D) industry to develop a recycling and reuse infrastructure that can divert this material from disposal. In 2006, Massachusetts became the first state to ban from disposal certain components of the C&D waste stream, specifically asphalt pavement, brick, concrete, metal and wood. There is now a sustainable recycling infrastructure that has a current capacity to recycle approximately 80,000 tons of gypsum wallboard waste material into new gypsum wallboard, with the potential to increase capacity.

Contractors and haulers will have the option to either continue to send mixed C&D to solid waste facilities (i.e. construction and demolition debris processors or transfer stations) that will separate the clean gypsum wallboard material or separate the clean gypsum wallboard scrap material and send it directly to a gypsum recycling facility. Loads with a cumulative total of 20% or less asphalt pavement, brick, concrete, metal, wood and gypsum wallboard will not be considered failed loads. In addition, pieces of clean gypsum wallboard with dimensions of two square feet or less are exempt from the disposal ban.

For more information on the upcoming disposal ban, background information and locations of disposal facilities in Massachusetts, visit the MADEP website at:

http://www.mass.gov/dep/recycle/laws/regulati.htm#bans

Source: MADEP

MADEP Snow Disposal Guidance

The Massachusetts Department of Environmental Protection (MADEP) has developed guidelines is to help businesses dispose of snow appropriately. Snow that is contaminated with road salt, sand, litter, and other pollutants threatens public health and the environment. As snow melts, pollutants are transported into surface water or through the soil where they may eventually reach the groundwater, contaminating water supplies impacting aquatic life. Sand washed into water bodies can create sand bars or fill in wetlands and ponds, causing flooding. The following are highlights from the MADEP guidelines. Please see the MADEP website at http://www.mass.gov/dep/water/laws/snowdisp.htm for the complete guidance:

MADEP recommends that you avoid dumping snow into any water body, including the ocean. Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment and litter released from melting snow also may be quickly transported through the system into surface water. Debris should be cleared from the site prior to using the site for snow disposal, and debris should be removed from the site at the end of the season (no later than May 15).

Under extraordinary conditions, when all land-based snow disposal options are exhausted, disposal of snow may be allowed in certain water bodies under certain conditions. In these dire situations, notify your local Conservation Commission and the appropriate MassDEP Regional Service Center before disposing of snow in a waterbody:

Northeast Regional Office, Wilmington, 978-694-3200/Southeast Regional Office, Lakeville, 508-946-2714 or Central Regional Office, Worcester, 508-792-7683

Source: MADEP

Porous Pavement (Cont'd)

(Continued from page 1)

to Boston Harbor) directly recharges the groundwater. This replenishes groundwater base flow and provides more water for the root zones of plants. Recharging stormwater close to its point of origin is advantageous as it mimics the natural drainage patterns in the absence of development.

Second, any debris or contaminants that may be entrained in the runoff, such as oil and grease, can be trapped within the pores of the pavement, or can adhere to the soil where biodegradation, adsorption or other natural processes can work to reduce their concentrations. To remove debris entrained n the pavement and to maintain its porosity, it will need to be vacuum swept—an increased maintenance need over traditional pavement.

The size of the new Cell Phone Lot is about 20,000 square feet. The cost of paving it with porous pavement was approximately 1.5 times more expensive than traditional mix due to the composition of the mix itself (more liquid asphalt and additives), and the additional base layers required.

POROUS PAVEMENT BENEFITS

FLOOD CONTROL

WATER QUALITY TREATMENT

GROUNDWATER RECHARGE

REDUCED SAND/SALT USE DUE TO LOW OR NO ICE DEVELOPMENT

MAINTAINS TRACTION WHEN WET

REDUCED ROADWAY NOISE

REDUCED INFRASTRUCTURE (CATCH BASINS, CURBING, ETC.)

SOURCE: UNH Stormwater Center, www.unh.edu/erg/cstev/

SEE A SPILL?
REPORT IT.

REPORTING COSTS NOTHING
INACTION CAN COST A FORTUNE

Report ALL fuel, oil, hazardous materials or lavatory waste spills within 2 hours of discovery at Logan Airport to Massport Fire Alarm 617-567-2020

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2010 Peak Period Pricing Monitoring Report

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BOSTON-LOGAN INTERNATIONAL AIRPORT MONITORING REPORT ON SCHEDULED AND NON-SCHEDULED FLIGHT ACTIVITY

Peak Period Surcharge Regulation
740 CMR 27:00: Massachusetts Port Authority

Report Number:	**008**
Monitoring Period:	**Feb. 2011 – Sept. 2011**
Report Issue Date:	**May 2011**

<u>Note</u>: This report reflects the Boston-Logan Airport flight activity monitoring under 740 CMR 27.03 Peak Period Surcharge Regulation on Aircraft Operations at Boston-Logan International Airport.

<u>Findings</u>: This report includes projected activity data for the Spring and Summer season, from February 2011 through September 2011. Current and projected near-term flight levels at Boston Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights/hour. **As a result, average VFR delays are projected to be minimal and well below the 15 minutes threshold through September 2011.**

In the event demand conditions at the airport change significantly from the current projection, Massport will issue updates to this report.

<u>Attachments</u>

Table 1: Summary Overview of Peak Period Surcharge Program

Table 2: Summary Overview of Forecast Methodology

Table 3: Aircraft Operations at Logan Airport Projected through September 2011

Table 4: Projected Hourly Operations, Average Weekday of August 2011

Table 5: Forecast Logan Average Weekday Operations, February 2011 through September 2011

<u>Massport Contact:</u>

Mr. Flavio Leo
Deputy Director, Aviation Planning and Strategy
617-568-3528
fleo@massport.com

Table 1: Summary Overview of Peak Period Surcharge Program

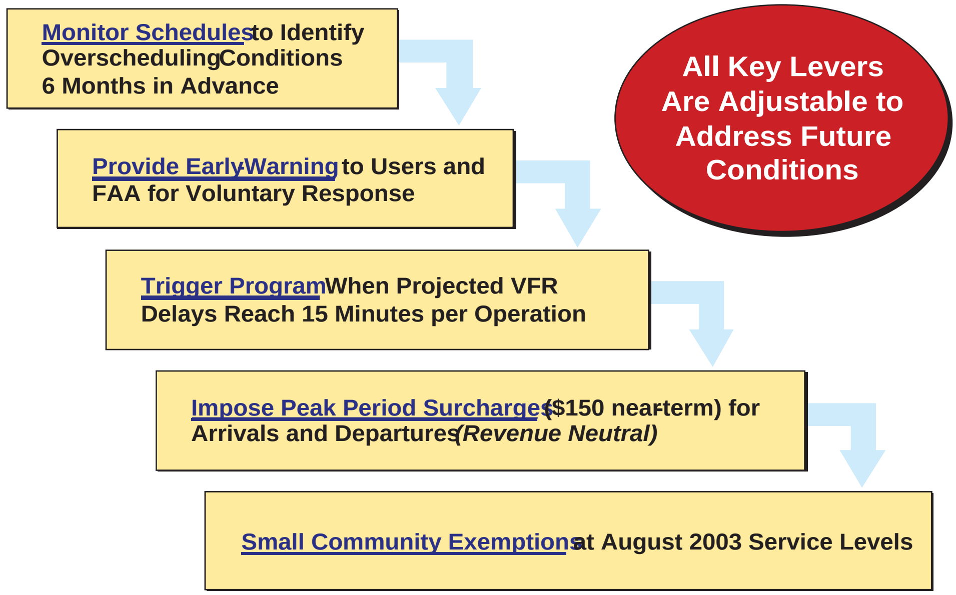
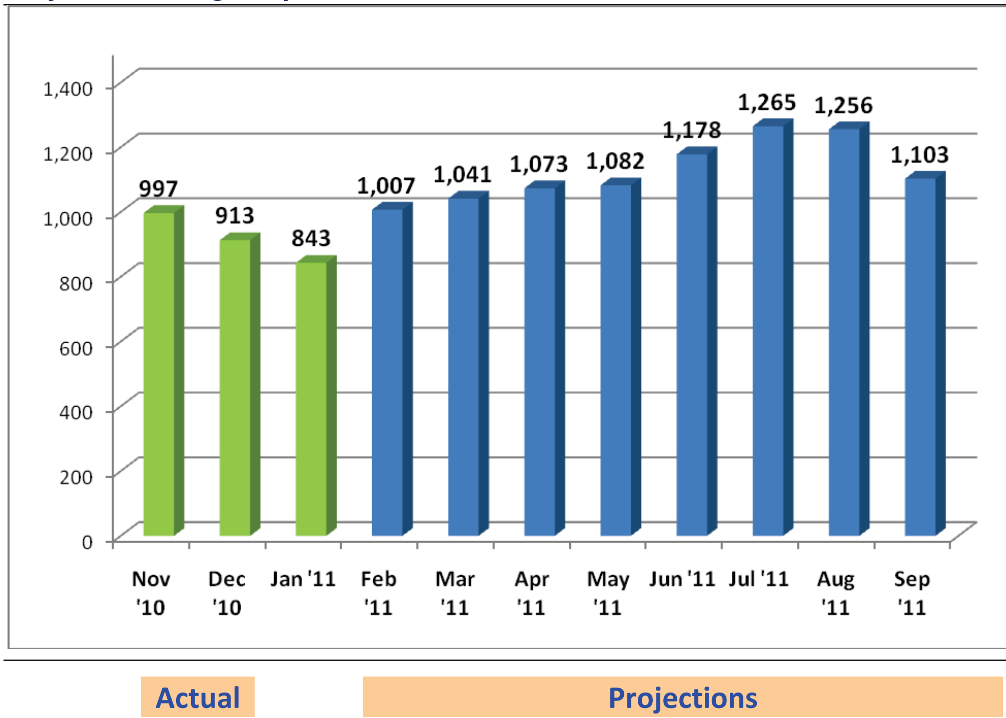


Table 2: Summary Overview of Forecast Methodology

- Scheduled passenger airline flights represent more than 93 percent of total aircraft operations. Passenger airline activity for the Spring and Summer periods were projected based on published advance airline schedules
- Forecasts of monthly activity for other segments (GA, Cargo, Charter) are based on the past three months of actual flight volume and historic patterns of monthly seasonality
- Day-of-week and time of day distributions for non-scheduled segments are based on analysis of Logan radar data
- Projections for each segment were combined to produce the forecast pattern of hourly flight activity for an average weekday, Saturday, and Sunday for the period from February through September

Table 3: Aircraft Operations at Logan Airport, *Average Weekday Operations Projected Through September 2011*



Note: Actual Operations are based on Massport data/air carrier reports and reflect flight cancellations due to weather and other operational impacts.

Table 4: Projected Hourly Operations, *Average Weekday, August, 2011*

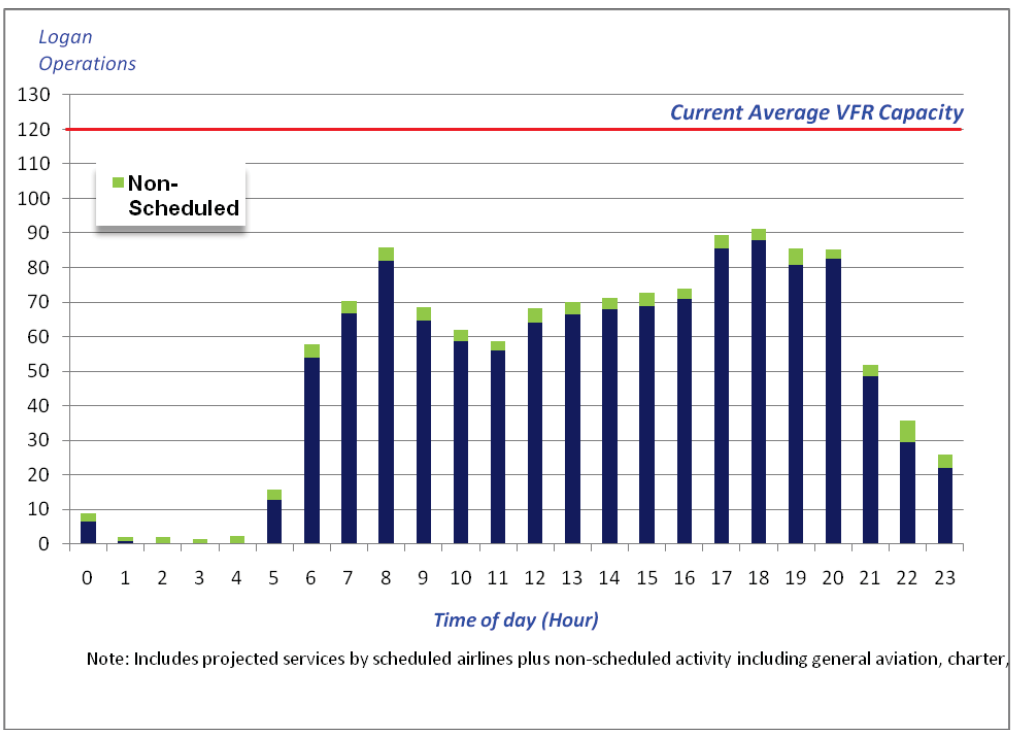


Table 5: Forecast Logan Average Weekday Operations, *Feb. 2011– Sep. 2011*

	Forecast Daily Operations							
Hr Range	Feb '11	Mar '11	Apr '11	May '11	Jun '11	Jul '11	Aug '11	Sep '11
0	8	7	6	9	12	9	9	9
1	3	2	2	2	3	2	2	1
2	2	2	2	2	2	2	2	2
3	1	1	1	1	2	2	1	2
4	2	2	2	2	2	2	2	2
5	15	14	15	15	16	16	16	12
6	50	51	51	49	62	58	58	53
7	66	69	64	61	61	71	70	61
8	68	65	72	74	77	87	86	77
9	64	65	71	72	68	69	69	69
10	54	55	56	49	55	61	62	51
11	49	59	53	55	54	59	59	52
12	46	50	47	54	59	69	68	53
13	55	54	61	70	72	69	70	68
14	52	55	57	50	63	72	71	63
15	52	49	55	63	72	74	73	57
16	74	74	76	70	74	75	74	70
17	79	77	81	88	94	90	89	85
18	78	81	81	82	86	93	91	87
19	63	67	74	72	77	84	85	80
20	47	55	50	52	66	87	85	55
21	30	32	37	31	43	52	52	39
22	28	28	30	41	38	36	36	32
23	22	27	27	17	19	26	26	22
Total	**1,007**	**1,041**	**1,073**	**1,082**	**1,178**	**1,265**	**1,256**	**1,103**

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Demonstration of Reduced Airport Congestion through Pushback Rate Control

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DEMONSTRATION OF REDUCED AIRPORT CONGESTION THROUGH PUSHBACK RATE CONTROL

This report is based on the paper submitted to the
Ninth USA/EUROPE Air Traffic Management R & D Seminar

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Abstract

Airport surface congestion results in significant increases in taxi times, fuel burn and emissions at major airports. This paper presents the field tests of a control strategy to airport congestion control at Boston Logan International Airport. The approach determines a suggested rate to meter pushbacks from the gate, in order to prevent the airport surface from entering congested states and reduce the time that flights spend with engines on while taxiing to the runway. The field trials demonstrated that significant benefits were achievable through such a strategy: during eight four-hour tests conducted during August and September 2010, fuel use was reduced by an estimated 12,000-15,000 kg (3,900-4,900 US gallons), while aircraft gate pushback times were increased by an average of only 4.3 minutes.

1 Introduction

Aircraft taxiing on the surface contribute significantly to the fuel burn and emissions at airports. The quantities of fuel burned, as well as different pollutants such as Carbon Dioxide, Hydrocarbons, Nitrogen Oxides, Sulfur Oxides and Particulate Matter, are proportional to the taxi times of aircraft, as well as other factors such as the throttle settings, number of engines that are powered, and pilot and airline decisions regarding engine shutdowns during delays.

Airport surface congestion at major airports in the United States is responsible for increased taxi-out times, fuel burn and emissions [1]. Similar trends have been noted in Europe, where it is estimated that aircraft spend 10-30% of their flight time taxiing, and that a short/medium range A320 expends as much as 5-10% of its fuel on the ground [2]. Domestic flights in the United States emit about 6 million metric tonnes of CO_2, 45,000 tonnes of CO, 8,000 tonnes of NOx, and 4,000 tonnes of HC taxiing out for takeoff; almost half of these emissions are at the 20 most congested airports in the country. The purpose of the Pushback Rate Control Demonstration at Boston Logan International Airport (BOS) was to show that a significant portion of these impacts could be reduced through measures to limit surface congestion.

A simple airport congestion control strategy would be a state-dependent pushback policy aimed at reducing congestion on the ground. The *N-control* strategy is one such approach, and was first considered in the Departure Planner project [3]. Several variants of this policy have been studied in prior literature [4, 5, 6, 7]. The policy, as studied in these papers, is effectively a simple threshold heuristic: if the total number of departing aircraft on the ground exceeds a certain threshold, further pushbacks are stopped until the number of aircraft on the ground drops below the threshold. By contrast, the *pushback rate control* strategy presented in this paper does not stop pushbacks once the surface is in a congested state, instead it regulates the rate at which aircraft pushback from their gates during high departure demand periods so that the airport does not reach undesirably high congested states.

1.1 Motivation: Departure throughput analysis

The main motivation for our proposed approach to reduce taxi times is an observation of the performance of the departure throughput of airports. As more aircraft pushback from their gates onto the taxiway system, the throughput of the departure runway initially increases because more aircraft are available in the departure queue, but as this number, denoted as N, exceeds a threshold, the departure runway capacity becomes the limiting factor, and there is no additional increase in throughput. We denote this threshold as N^*. This behavior can be further parameterized by the number of arrivals. The dependence of the departure throughput with the number of aircraft taxiing out and the arrival rate is illustrated for a runway configuration in Figure 1 using 2007 data from FAA's Aviation System Performance Metrics (ASPM) database. Beyond the threshold N^*, any additional aircraft that pushback simply increase their taxi-out times [8]. The value of N^* depends on the airport, arrival demand, runway configuration, and meteorological conditions. During periods of high demand, the pushback rate control protocol regulates pushbacks from the gates so that the number of aircraft taxiing out stays close to a specified value, N_{ctrl}, where $N_{\text{ctrl}} > N^*$, thereby ensuring that the airport does not reach highly-congested states. While the choice of N_{ctrl} must be large enough to maintain runway utilization, too large a value will be overly conservative, and result in a loss of benefits from the control strategy.

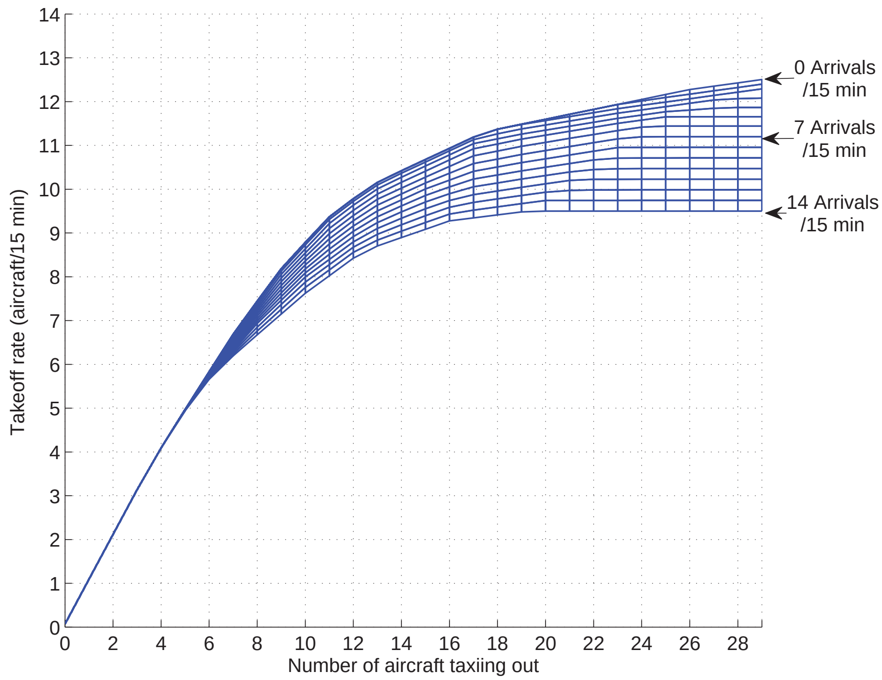


Figure 1: Regression of the departure throughput as a function of the number of aircraft taxiing out, parameterized by the arrival rate for 22L, 27 | 22L, 22R configuration, under VMC [9].

2 Design of the pushback rate control protocol

The main design consideration in developing the pushback rate control protocol was to incorporate effective control techniques into current operational procedures with minimal controller workload and procedural modifications. After discussions with the BOS facility, it was decided that suggesting a rate of pushbacks (to the BOS Gate controller) for each 15-min period was an effective strategy that was amenable to current procedures.

The two important parameters that need to be estimated in order to determine a robust control strategy are the N^* threshold and the departure throughput of the airport for different values of N. These parameters can potentially vary depending on meteorological conditions, runway configuration and arrival demand (as seen in Figure 1), but also on the fleet mix and the data sources we use.

2.1 Runway configurations

BOS experiences Visual Meteorological Conditions (VMC) most of the time (over 83% of the time in 2007). It has a complicated runway layout consisting of six runways, five of which intersect with at least one other runway, as shown in Figure 2. As a result, there are numerous possible runway configurations: in 2007, 61 different configurations were reported. The most frequently-used configurations under VMC are 22L, 27 | 22L, 22R; 4L, 4R | 4L, 4R, 9; and 27, 32 | 33L, where the notation ‘R1, R2 | R3, R4’ denotes arrivals on runways R1 and R2, and departures on R3 and R4. The above configurations accounted for about 70% of times under VMC.

We note that, of these frequently used configurations, 27, 32 | 33L involves taxiing out aircraft across active runways. Due to construction on taxiway “November” between runways 15L and 22R throughout the

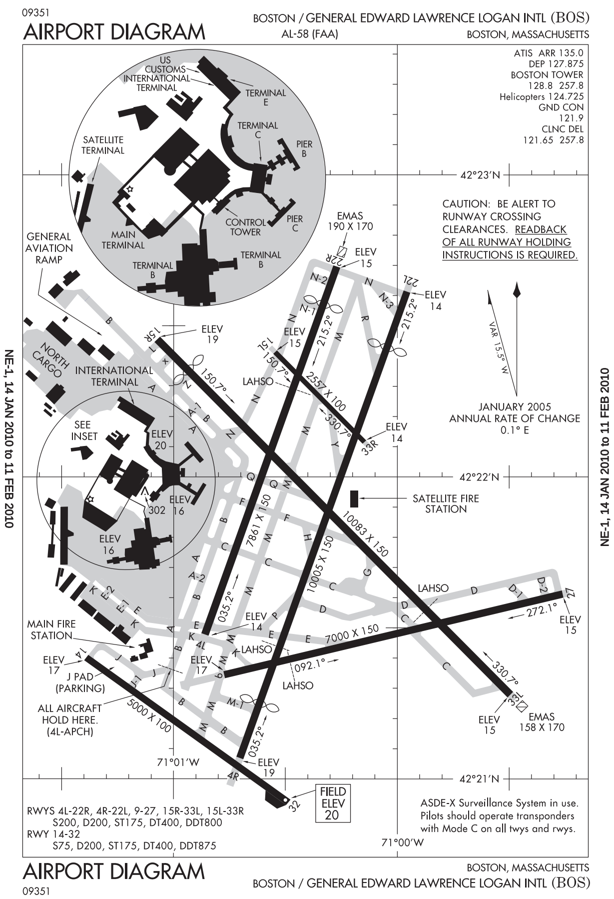


Figure 2: BOS airport diagram, showing alignment of runways.

duration of the demo, departures headed to 22R used 15L to cross runway 22R onto taxiway "Mike". This resulted in active runway crossings in the 27, 22L | 22L, 22R configuration as well.

During our observations prior to the field tests as well as during the demo periods, we found that under Instrument Meteorological Conditions (IMC), arrivals into BOS are typically metered at the rate of 8 aircraft per 15 minutes by the TRACON. This results in a rather small departure demand, and there was rarely congestion under IMC at Boston during the evening departure push. For this reason, we focus on configurations most frequently used during VMC operations for the control policy design.

2.2 Fleet mix

Qualitative observations at BOS suggest that the departure throughput is significantly affected by the number of propeller-powered aircraft (props) in the departure fleet mix. In order to determine the effect of props, we analyze the tradeoff between takeoff and landing rates at BOS, parameterized by the number of props during periods of high departure demand.

Figure 3 shows that under Visual Meteorological Conditions (VMC), the number of props has a significant impact on the departure throughput, resulting in an increase at a rate of nearly one per 15 minutes for

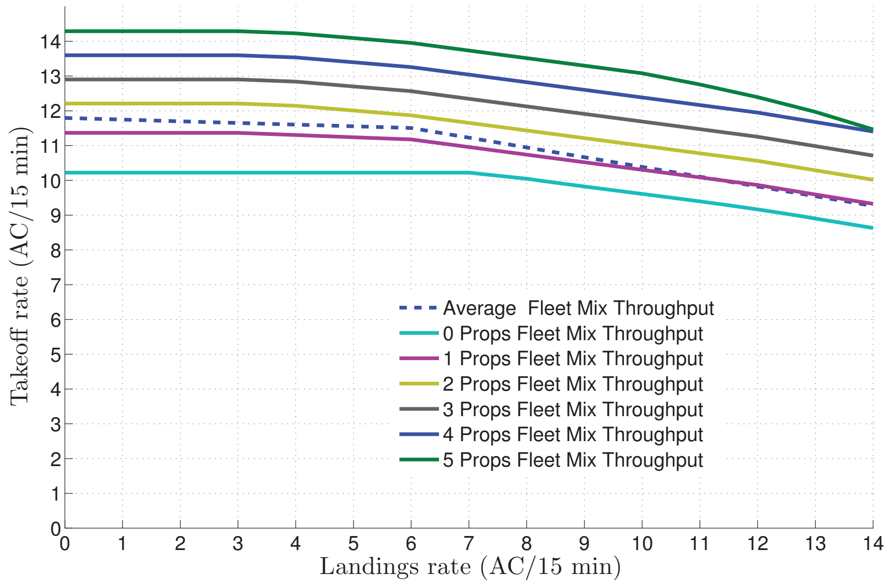


Figure 3: Regression of the takeoff rate as a function of the landing rate, parameterized by the number of props in a 15-minute interval for 22L, 27 | 22L, 22R configuration, under VMC [9].

each additional prop departure. This observation is consistent with procedures at BOS, since air traffic controllers fan out props in between jet departures, and therefore the departure of a prop does not interfere very much with jet departures. The main implication of this observation for the control strategy design at BOS was that props could be exempt from both the pushback control as well as the counts of aircraft taxiing out (N). Similar analysis also shows that heavy departures at BOS do not have a significant impact on departure throughput, in spite of the increased wake-vortex separation that is required behind heavy weight category aircraft. This can be explained by the observation that air traffic controllers at BOS use the high wake vortex separation requirement between a heavy and a subsequent departure to conduct runway crossings, thereby mitigating the adverse impact of heavy weight category departures [9].

Motivated by this finding, we can determine the dependence of the jet (i.e., non-prop) departure throughput as a function of the number of jet aircraft taxiing out, parameterized by the number of arrivals, as illustrated in Figure 4. This figure illustrates that during periods in which arrival demand is high, the jet departure throughput saturates when the number of jets taxiing out exceeds 17 (based on ASPM data).

2.3 Data sources

It is important to note that Figure 1, Figure 3 and Figure 4 are determined using ASPM data. Pushback times in ASPM are determined from the brake release times reported through the ACARS system, and are prone to error because about 40% of the flights departing from BOS do not automatically report these times [10]. Another potential source of pushback and takeoff times is the Airport Surface Detection Equipment Model X (or ASDE-X) system, which combines data from airport surface radars, multilateration sensors, ADS-B, and aircraft transponders [11]. While the ASDE-X data is likely to be more accurate than the ASPM data, it is still noisy, due to factors such as late transponder capture (the ASDE-X tracks only begin after the pilot has turned on the transponder, which may be before or after the actual pushback time), aborted takeoffs (which have multiple departure times recorded), flights cancelled after pushback, etc. A comparison of

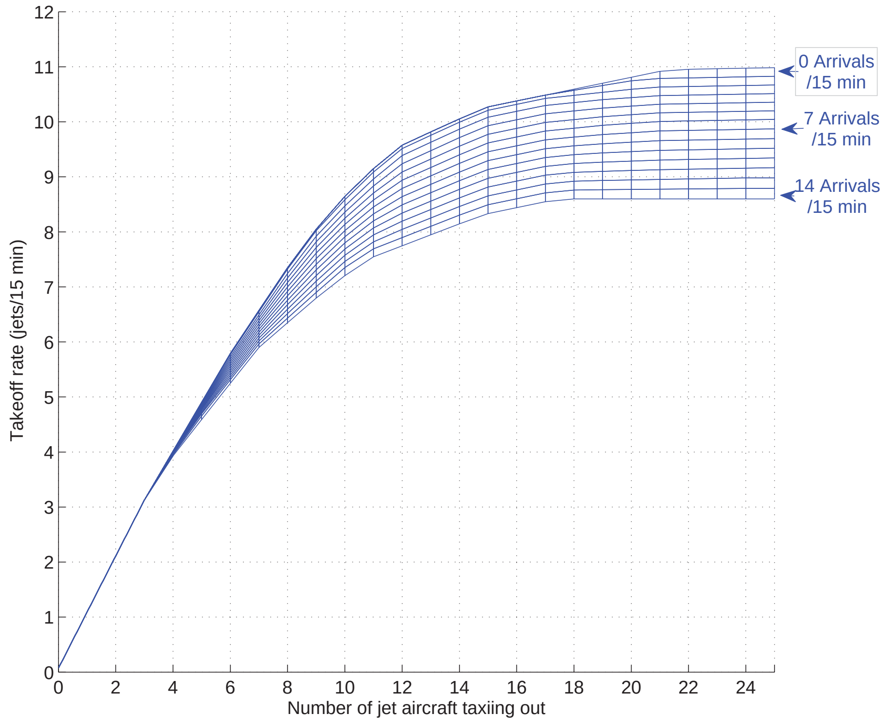


Figure 4: Regression of the jet takeoff rate as a function of the number of departing jets on the ground, parameterized by the number of arrivals for 22L, 27 | 22L, 22R configuration, under VMC [9].

both ASDE-X and ASPM records with live observations made in the tower on August 26, 2010 revealed that the average difference in the number of pushbacks per 15-minutes as recorded by ASDE-X and visual means is 0.42, while it is -3.25 for ASPM and visual observations, showing that the ASPM records differ considerably from ASDE-X and live observations. The above comparison motivates the recalibration of airport performance curves and parameters using ASDE-X data in addition to ASPM data. This is because ASPM data is not available in real-time and will therefore not be available for use in real-time deployments, and the ASDE-X data is in much closer agreement to the visual observations than ASPM.

We therefore conduct similar analysis to that shown in Figure 4, using ASDE-X data. The results are shown in Figure 5. We note that the qualitative behavior of the system is similar to what was seen with ASPM data, namely, the jet throughput of the departure runway initially increases because more jet aircraft are available in the departure queue, but as this number exceeds a threshold, the departure runway capacity becomes the limiting factor, and there is no additional increase in throughput. By statistically analyzing three months of ASDE-X data from Boston Logan airport using the methodology outlined in [9], we determine that the average number of active jet departures on the ground at which the surface saturates is 12 jet aircraft for the 22L, 27 | 22L, 22R configuration, during periods of moderate arrival demand. This value is close to that deduced from Figure 5, using visual means.

2.4 Estimates of N^*

Table 1 shows the values of N^* for the three main runway configurations under VMC, that were used during the field tests based on the ASDE-X data analysis. For each runway configuration, we use plots similar to Figure 5 to determine the expected throughput. For example, if the runway configuration is 22L, 27 | 22L,

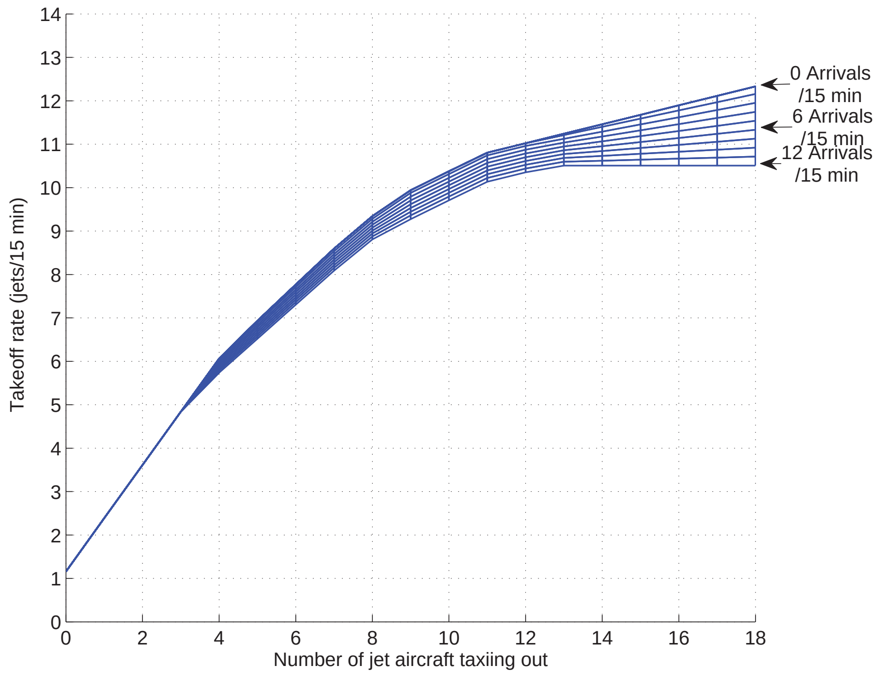


Figure 5: Regression of the takeoff rate as a function of the number of jets taxiing out, parameterized by the number of arrivals, using ASDE-X data, for the 22L, 27 | 22L, 22R configuration.

22R, 11 jets are taxiing out, and the expected arrival rate is 9 aircraft in the next 15 minutes, the expected departure throughput is 10 aircraft in the next 15 minutes.

Table 1: Values of N^* estimated from the analysis of ASDE-X data.

Configuration	N^*
22L, 27 | 22L, 22R	12
27, 32 | 33L	12
4L, 4R | 4L, 4R, 9	15

3 Implementation of pushback rate control

The pushback rate was determined so as to keep the number of jets taxiing out near a suitable value (N_{ctrl}), where N_{ctrl} is greater than N^*, in order to mitigate risks such as under-utilizing the runway, facing many gate conflicts, or being unable to meet target departure times. Off-nominal events such as gate-use conflicts and target departure times were carefully monitored and addressed. Figure 6 shows a schematic of the decision process to determine the suggested pushback rate.

The determination of the pushback rate is conducted as follows. Prior to the start of each 15-minute period, we:

1. Observe the operating configuration, VMC/IMC, and the predicted number of arrivals in the next 15 minutes (from ETMS) and using these as inputs into the appropriate departure throughput saturation curves (such as Figure 5), determine the expected jet departure throughput.

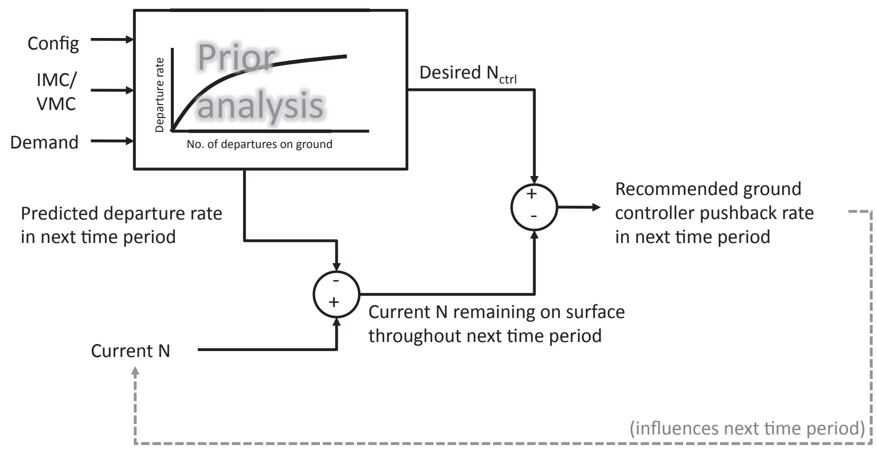


Figure 6: A schematic of the pushback rate calculation.

2. Using visual observations, count the number of departing jets currently active on the surface. We counted a departure as active once the pushback tug was attached to the aircraft and it was in the process of pushing back.

3. Calculate the difference between the current number of active jet departures and the expected jet departure throughput. This difference is the number of currently active jets that are expected to remain on the ground through the next 15 min.

4. The difference between N_{ctrl} and the result of the previous step provides us with the additional number of pushbacks to recommend in next 15 minutes.

5. Translate the suggested number of pushbacks in the next 15 minutes to an approximate pushback rate in a shorter time interval more appropriate for operational implementation (for example, 10 aircraft in the next 15 minutes would translate to a rate of "2 per 3 minutes.").

3.1 Communication of recommended pushback rates and gate-hold times

During the demo, we used color-coded cards to communicate suggested pushback rates to the air traffic controllers, thereby eliminating the need for verbal communications. We used one of eight 5 in $\times$ 7.5 in cards, with pushback rate suggestions that ranged from "1 per 3 minutes" (5 in 15 minutes) to "1 aircraft per minute" (15 in 15 minutes), in addition to "Stop" (zero rate) and "No restriction" cards, as shown in Figure 7 (left). The setup of the suggested rate card in the Boston Gate controllers position is shown in Figure 7 (right).

The standard format of the gate-hold instruction communicated by the Boston Gate controller to the pilots included both the current time, the length of the gate-hold, and the time at which the pilot could expect to be cleared. For example:
Boston Gate: "AAL123, please hold push for 3 min. Time is now 2332, expect clearance at 2335. Remain on my frequency, I will contact you."

In this manner, pilots were made aware of the expected gate-holds, and could inform the controller of constraints such as gate conflicts due to incoming aircraft. In addition, ground crews could be informed of the expected gate-hold time, so that they could be ready when push clearance was given. The post-analysis

Figure 7: (Left) Color-coded cards that were used to communicate the suggested pushback rates. (Right) Display of the color-coded card in the Boston Gate controller's position.

of the tapes of controller-pilot communications showed that the controllers cleared aircraft for push at the times they had initially stated (i.e., an aircraft told to expect to push at 2335 would be cleared at 2335), and that they also accurately implemented the push rates suggested by the cards.

3.2 Handling of off-nominal events

The implementation plan also called for careful monitoring of off-nominal events and system constraints. Of particular concern were gate conflicts (for example, an arriving aircraft is assigned a gate at which a departure is being held), and the ability to meet controlled departure times (Expected Departure Clearance Times or EDCTs) and other constraints from Traffic Management Initiatives. After discussions with the Tower and airlines prior to the field tests, the following decisions were made:

1. Flights with EDCTs would be handled as usual and released First-Come-First-Served. Long delays would continue to be absorbed in the standard holding areas. Flights with EDCTs did not count toward the count of active jets when they pushed back; they counted toward the 15-minute interval in which their departure time fell. An analysis of EDCTs from flight strips showed that the ability to meet the EDCTs was not impacted during the field tests.

2. Pushbacks would be expedited to allow arrivals to use the gate if needed. Simulations conducted prior to the field tests predicted that gate-conflicts would be relatively infrequent at BOS; there were only two reported cases of potential gate-conflicts during the field tests, and in both cases, the departures were immediately released from the gate-hold and allowed to pushback.

3.3 Determination of the time period for the field trials

The pushback rate control protocol was tested in select evening departure push periods (4-8PM) at BOS between August 23 and September 24, 2010. Figure 8 shows the average number of departures on the ground in each 15-minute interval using ASPM data. There are two main departure pushes each day. The evening departure push differs from the morning one because of the larger arrival demand in the evenings.

The morning departure push presents different challenges, such as a large number of flights with controlled departure times, and a large number of tow-ins for the first flights of the day.

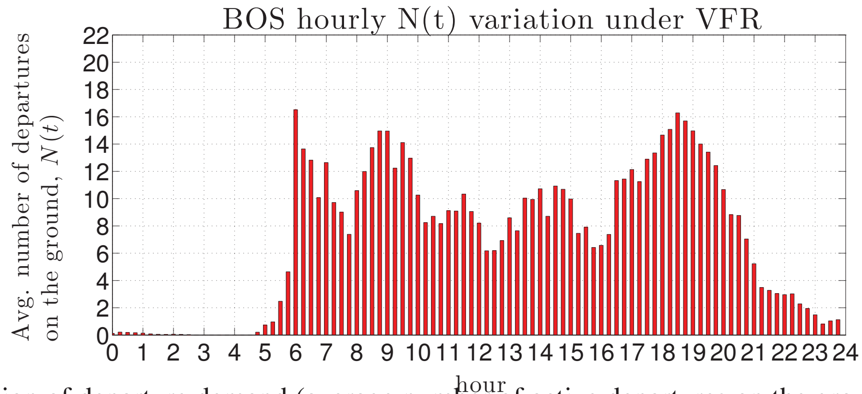


Figure 8: Variation of departure demand (average number of active departures on the ground) as a function of the time of day.

4 Results of field tests

Although the pushback rate control strategy was tested at BOS during 16 demo periods, there was very little metering when the airport operated in its most efficient configuration (4L, 4R | 4L, 4R, 9), and in only eight of the demo periods was there enough congestion for gate-holds to be experienced. There was insufficient congestion for recommending restricted pushback rates on August 23, September 16, 19, 23, and 24. In addition, on September 3 and 12, there were no gate-holds (although departure demand was high, traffic did not build up, and no aircraft needed to be held at the gate). For the same reason, only one aircraft received a gate-hold of 2 min on September 17. The airport operated in the 4L, 4R | 4L, 4R, 9 configuration on all three of these days. In total, metering was in effect during the field tests for over 37 hours, with about 24 hours of test periods with significant gate-holds.

4.1 Data analysis examples

In this section, we examine three days with significant gate-holds (August 26, September 2 and 10) in order to describe the basic features of the pushback rate control strategy.

Figure 9 shows taxi-out times from one of the test periods, September 2. Each green bar in Figure 9 represents the actual taxi-out time of a flight (measured using ASDE-X as the duration between the time when the transponder was turned on and the wheels-off time). The red bar represents the gate-hold time of the flight (shown as a negative number). In practice, there is a delay between the time the tug pushes them from the gate and the time their transponder is turned on, but statistical analysis showed that this delay was random, similar distributed for flights with and without gate-holds, and typically about 4 minutes. We note in Figure 9 that as flights start incurring gate-holds (corresponding to flights departing at around 1900 hours), there is a corresponding decrease in the active taxi-out times, i.e., the green lines. Visually, we notice that as the length of the gate-hold (red bar) increases, the length of the taxi-out time (green bar) proportionately decreases. There are still a few flights with large taxi-out times, but these typically correspond to flights with EDCTs. These delays were handled as in normal operations (i.e., their gate-hold times were not increased),

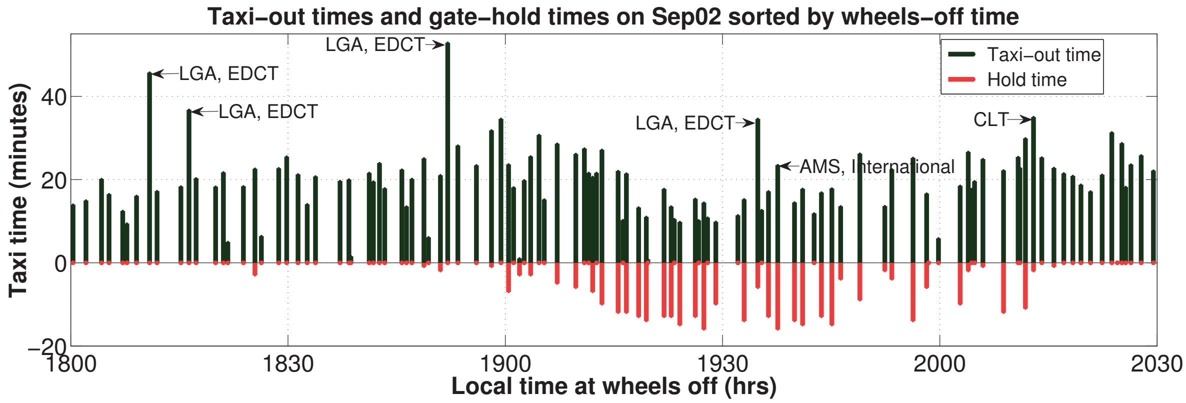


Figure 9: Taxi-out and gate-hold times from the field test on September 2, 2010.

as was agreed with the tower and airlines. Finally, there are also a few flights with no gate-holds and very short taxi-out times, typically corresponding to props.

The impact of the metering can be further visualized by using ASDE-X data, as can be seen in the Figure 10, which shows snapshots of the airport surface at two instants of time, the first before the metering started, and the second during the metering. We notice the significant decrease in taxiway congestion, in particular the long line of aircraft between the ramp area and the departure runway, due to the activation of the pushback rate control strategy.

Figure 10: Snapshots of the airport surface, (left) before metering, and (right) during metering of pushbacks. Departing aircraft are shown in green, and arrivals in red. We note that the line of 15 departures between the ramp area and the departure runway prior to commencement of pushback rate control reduces to 8 departures during metering. The white area on the taxiway near the top of the images indicates the closed portion of taxiway "November".

Looking at another day of trials with a different runway configuration, Figure 11 shows taxi-out times from the test period of September 10. In this plot, the flights are sorted by pushback time. We note that as flights start incurring gate-holds, their taxi time stabilizes at around 20 minutes. This is especially evident during the primary departure push between 1830 and 1930 hours. The gate-hold times fluctuate from 1-2 minutes up to 9 minutes, but the taxi-times stabilize as the number of aircraft on the ground stabilizes to the

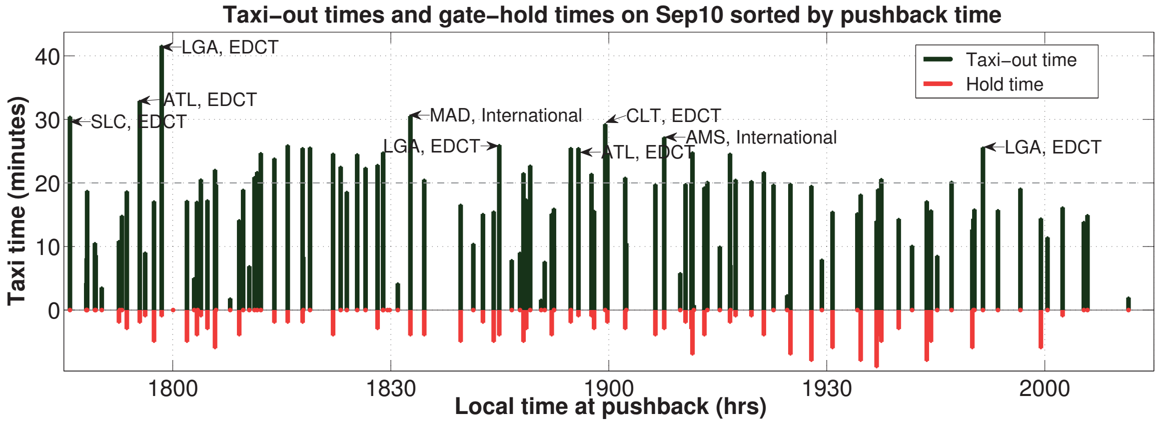


Figure 11: Taxi-out and gate-hold times from the field test on September 10, 2010.

specified N_{ctrl} value. Finally, the flights that pushback between 1930 and 2000 hours are at the end of the departure push and derive the most benefit from the metering strategy: they have longer gate holds, waiting for the queue to drain and then taxi to the runway facing a gradually diminishing queue.

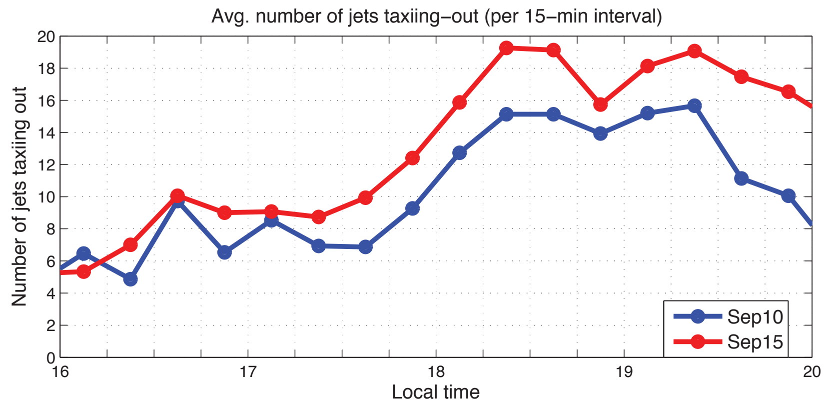
Figure 12 further illustrates the benefits of the pushback rate control protocol, by comparing operations from a day with pushback rate control (shown in blue) and a day without (shown in red), under similar demand and configuration. The upper plot shows the average number of jets taxiing-out, and the lower plot the corresponding average taxi-out time, per 15-minute interval. We note that after 1815 hours on September 10, the number of jets taxiing out stabilized at around 15. As a result, the taxi-out times stabilized at about 16 minutes. Pushback rate control smooths the rate of the pushbacks so as to bring the airport state to the specified state, N_{ctrl}, in a controlled manner. Both features of pushback rate control, namely, smoothing of demand and prevention of congestion can be observed by comparing the evenings of September 10 and September 15. We see that on September 15, in the absence of pushback rate control, as traffic started accumulating at 1745 hours, the average taxi-out time grew to over 20 minutes. During the main departure push (1830 to 1930), the average number of jets taxiing out stayed close to 20 and the average taxi-out time was about 25 minutes.

Similarly, Figure 13 compares the results of a characteristic pushback rate control day in runway configuration 27, 22L | 22L, 22R, August 26, to a similar day without pushback metering. We observe that for on August 26, the number of jets taxiing out during the departure push between 1830 and 1930 hours stabilized at 15 with an average taxi-out time of about 20 minutes. On August 17, when metering was not in effect, the number of aircraft reached 20 at the peak of the push and the average taxi-out times were higher than those of August 26.

4.2 Runway utilization

The overall objective of the field test was to maintain pressure on the departure runways, while limiting surface congestion. By maintaining runway utilization, it is reasonable to expect that gate-hold times translate to taxi-out time reduction, as suggested by Figure 9. We therefore also carefully analyze runway utilization (top) and departure queue sizes (bottom) during metering periods, as illustrated in Figure 14.

In estimating the runway utilization, we determine (using ASDE-X data) what percentage of each 15-min interval corresponded to a departure on takeoff roll, to aircraft crossing the runway, arrivals (that requested landing on the departure runway) on final approach, departure that is holding for takeoff clearance, etc. We



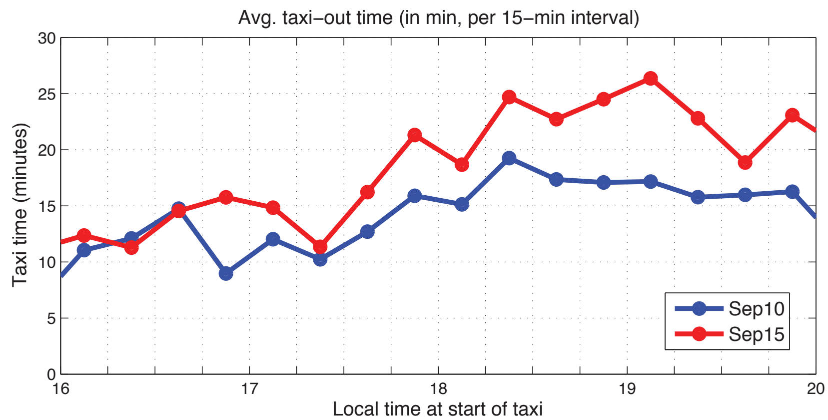


Figure 12: Surface congestion (top) and average taxi-out times (bottom) per 15-minutes, for (blue) a day with pushback rate control, and (red) a day with similar demand, same runway configuration and visual weather conditions, but without metering. Delay attributed to EDCTs has been removed from the taxi-out time averages.

note that between 1745 and 2000 hours, when gate-holds were experienced, the runway utilization was kept at or close to 100%, with a persistent departure queue as well.

Runway utilization was maintained consistently during the metering periods, with the exception of a three-minute interval on the third day of metering. On this instance, three flights were expected to be at the departure runway, ready for takeoff. Two of these flights received EDCTs as they taxied (and so were not able to takeoff at the originally predicted time), and the third flight was an international departure that had longer than expected pre-taxi procedures. Learning from this experience, we were diligent in ensuring that EDCTs were gathered as soon as they were available, preferably while the aircraft were still at the gate. In addition, we incorporated the longer taxi-out times of international departures into our predictions. As a result of these measures, we ensured that runway utilization was maintained over the remaining duration of the trial. It is worth noting that the runway was "starved" in this manner for only 3 minutes in over 37 hours of metering pushbacks, demonstrating the ability of the approach to adapt to the uncertainties in the system.

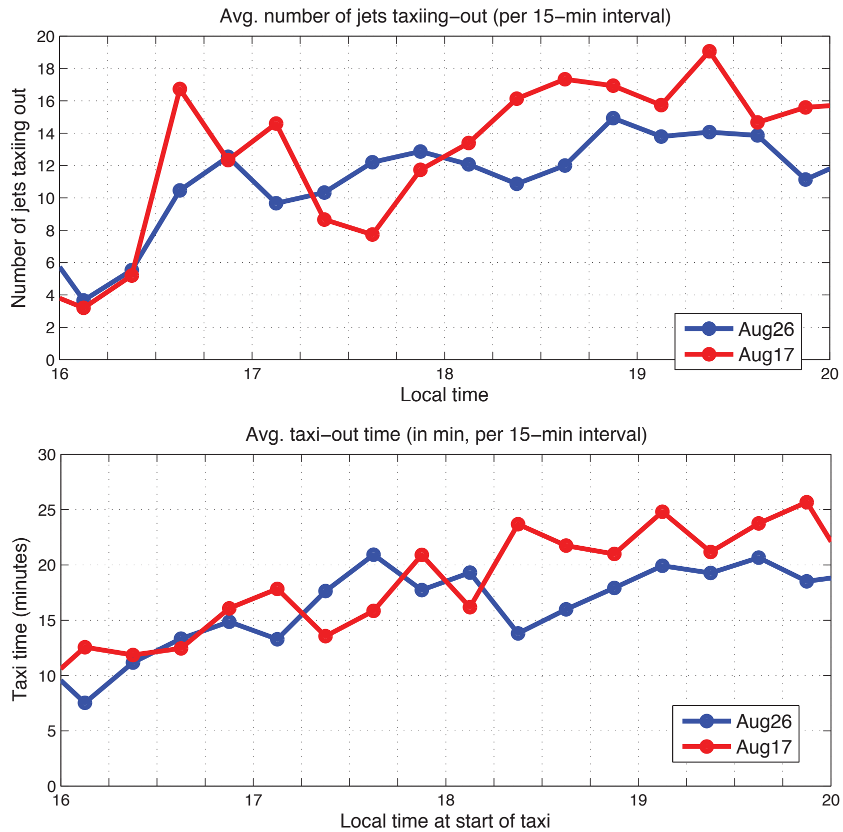


Figure 13: Ground congestion (top) and average taxi-out times (bottom) per 15-minutes, for (blue) a day with pushback rate control, and (red) a day with similar demand, same runway configuration and weather conditions, but without metering. Delay attributed to EDCTs has been removed from the taxi-out time averages.

5 Benefits analysis

Table 2 presents a summary of the gate-holds on the eight demo periods with sufficient congestion for metering pushbacks. As mentioned earlier, we had no significant congestion when the airport was operating in its most efficient configuration (4L, 4R | 4L, 4R, 9).

A total of 247 flights were held, with an average gate-hold of 4.3 min. During the most congested periods, up to 44% of flights experienced gate-holds. By maintaining runway utilization, we tradeoff taxi-out time for time spent at the gate with engines off, as illustrated in Figures 9 and 11.

5.1 Translating gate-hold times to taxi-out time reduction

Intuitively, it is reasonable to use the gate-hold times as a surrogate for the taxi-out time reduction, since runway utilization was maintained during the demonstration of the control strategy. We confirm this hypothesis through a simple "what-if" simulation of operations with and without metering. The simulation shows that the total taxi-out time savings equaled the total gate-hold time, and that the taxi time saving of each flight was equal, in expectation, to its gate holding time. The total taxi-out time reduction can therefore be

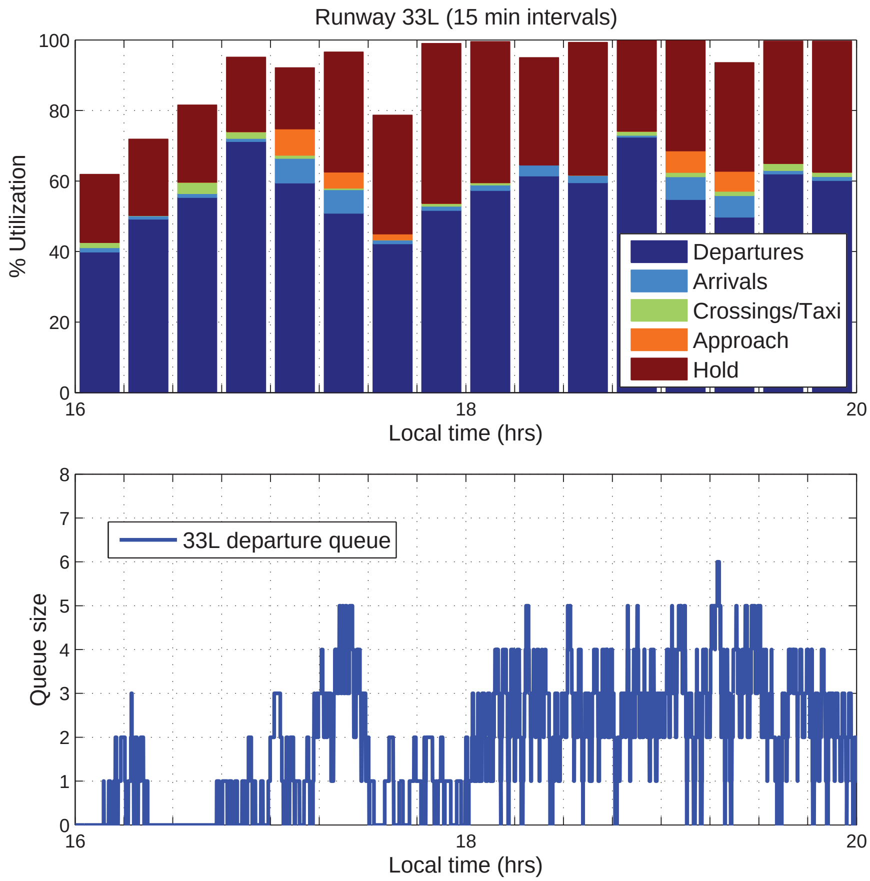


Figure 14: Runway utilization plots (top) and queue sizes (bottom) for the primary departure runway (33L) during the field test on September 10, 2010. These metrics are evaluated through the analysis of ASDE-X data.

approximated by the total gate-hold time, or 1077 minutes (18 hours).

In reality, there are also second-order benefits due to the faster travel times and the nonlinear effects of shorter departure queues due to reduced congestion, but these effects are neglected in the preliminary analysis.

5.2 Fuel burn savings

Supported by the analysis presented in Section 5.1, we conduct a preliminary benefits analysis of the field tests by using the gate-hold times as a first-order estimate of taxi-out time savings. This assumption is also supported by the taxi-out time data from the tests, such as the plot shown in Figure 9. Using the tail number of the gate-held flights, we determine the aircraft and engine type and hence its ICAO taxi fuel burn index [12]. The multiplicative product of the fuel burn rate index, the number of engines, and the gate-hold time gives us an estimate of the fuel burn savings from the metering. We can also account for the use of Auxiliary Power Units (APUs) at the gate by using the appropriate fuel burn rates [13]. This analysis (not accounting for benefits from reduced congestion) indicates that the total taxi-time savings were about 17.9 hours, which resulted in fuel savings of 12,000-15,000 kg, or 3,900-4,900 US gallons (depending on whether APUs were

Table 2: Summary of gatehold times for the eight demo periods with significant metering and gate-holds.

	Date	Period	Configuration	No. of gate-holds	Average gatehold (min)	Total gatehold (min)
1	8/26	4.45-8PM	27,22L | 22L,22R	63	4.06	256
2	8/29	4.45-8PM	27,32 | 33L	34	3.24	110
3	8/30	5-8PM	27,32 | 33L	8	4.75	38
4	9/02	4.45-8PM	27,22L | 22L,22R	45	8.33	375
5	9/06	5-8PM	27,22L | 22L,22R	19	2.21	42
6	9/07	5-7.45PM	27,22L | 22L,22R	11	2.09	23
7	9/09	5-8PM	27,32 | 33L	11	2.18	24
8	9/10	5-8PM	27,32 | 33L	56	3.7	207
Total				247	4.35	1075

on or off at the gate). This translates to average fuel savings per gate-held flight of between 50-60 kg or 16-20 US gallons, which suggests that there are significant benefits to be gained from implementing control strategies during periods of congestion. It is worth noting that the per-flight benefits of the pushback rate control strategy are of the same order-of-magnitude as those of Continuous Descent Approaches in the presence of congestion [14], but do not require the same degree of automation, or modifications to arrival procedures.

5.3 Fairness of the pushback rate control strategy

Equity is an important factor in evaluating potential congestion management or metering strategies. The pushback rate control approach, as implemented in these field tests, invoked a First-Come-First-Serve policy in clearing flights for pushback. As such, we would expect that there would be no bias toward any airline with regard to gate-holds incurred, and that the number of flights of a particular airline that were held would be commensurate with the contribution of that airline to the total departure traffic during metering periods. We confirm this hypothesis through a comparison of gate-hold share and total departure traffic share for different airlines, as shown in Figure 15. Each data-point in the figure corresponds to one airline, and we note that all the points lie close to the 45-degree line, thereby showing no bias toward any particular airline.

We note, however, that while the number of gate-holds that an airline receives is proportional to the number of its flights, the actual fuel burn benefit also depends on its fleet mix. Figure 16 shows that while the taxi-out time reductions are similar to the gate-holds, some airlines (for example, Airlines 3, 4, 5, 19 and 20) benefit from a greater proportion of fuel savings. These airlines are typically ones with several heavy jet departures during the evening push.

6 Observations and lessons learned

We learned many important lessons from the field tests of the pushback rate control strategy at BOS, and also confirmed several hypotheses through the analysis of surveillance data and qualitative observations. Firstly, as one would expect, the proposed control approach is an aggregate one, and requires a minimum level of traffic to be effective. This hypothesis is further borne by the observation that there was very little metering in the most efficient configuration (4L, 4R | 4L, 4R, 9). The field tests also showed that the proposed technique is capable of handling target departure times (e.g., EDCTs), but that it is preferable to get EDCTs while still at gate. While many factors drive airport throughput, the field tests showed that the pushback rate control

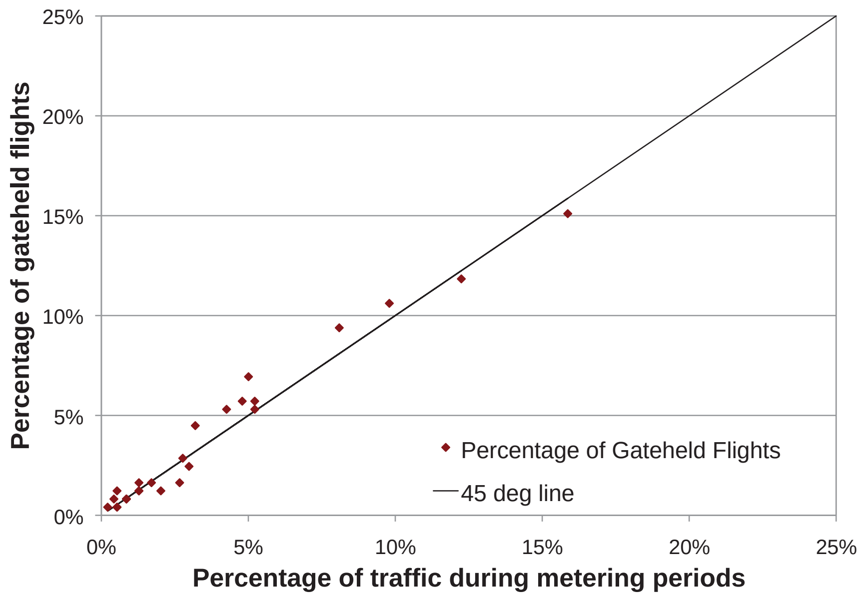


Figure 15: Comparison of gate-hold share and total departure traffic share for different airlines.

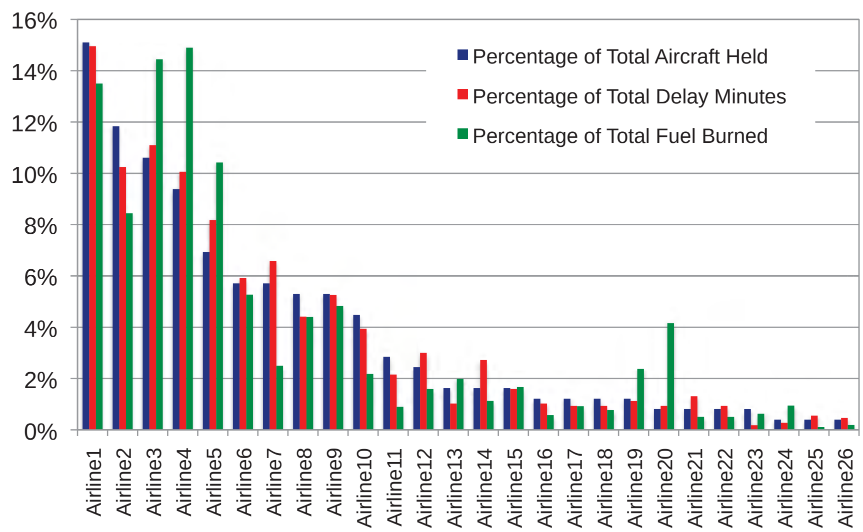


Figure 16: Percentage of gate-held flights, taxi-out time reduction and fuel burn savings incurred by each airline.

approach could adapt to variability. In particular, the approach was robust to several perturbations to runway throughput, caused by heavy weight category landings on departure runway, controllers choice of runway crossing strategies, birds on runway, etc. We also observed that when presented with a suggested pushback rate, controllers had different strategies to implement the suggested rate. For example, for a suggested rate of 2 aircraft per 3 minutes, some controllers would release a flight every 1.5 minutes, while others would release two flights in quick succession every three minutes. We also noted the need to consider factors such as ground crew constraints, gate-use conflicts, and different taxi procedures for international flights. By accounting for these factors, the pushback rate control approach was shown to have significant benefits in terms of taxi-out times and fuel burn.

7 Summary

This paper presented the results of the demonstration of a pushback rate control strategy at Boston Logan International Airport. Sixteen demonstration periods between August 23 and September 24, 2010 were conducted in the initial field trial phase, resulting in over 37 hours of research time in the BOS tower. Results show that during eight demonstration periods (about 24 hours) of active metering of pushback rates, over 1077 minutes (nearly 18 hours) of gate holds were experienced during the demonstration period across 247 flights, at an average of 4.3 minutes of gate hold per flight (which correlated well to the observed decreases in taxi-out time). Preliminary fuel burn savings from gate-holds with engines off were estimated to be between 12,000-15,000 kg (depending on whether APUs were on or off at the gate).

Acknowledgments

We would like to acknowledge the cooperation and support of the following individuals who made the demo at BOS possible: Deborah James, Pat Hennessy, John Ingaharro, John Melecio, Michael Nelson and Chris Quigley at the BOS Facility; Vincent Cardillo, Flavio Leo and Robert Lynch at Massport; and George Ingram and other airline representatives at the ATA. Alex Nakahara provided assistance in computing the preliminary fuel burn savings from the gate-hold data, and Regina Clewlow, Alex Donaldson and Diana Michalek Pfeil helped with tower observations before and during the trials. We are also grateful to Lourdes Maurice (FAA) and Ian Waitz (MIT) for insightful feedback on the research, and James Kuchar, Jim Eggert and Daniel Herring of MIT Lincoln Laboratory for their support and help with the ASDE-X data.

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Reduced/Single Engine Taxiing at Logan Airport Memorandum

This appendix provides detailed information in support of *Chapter 7, Air Quality/ Emissions Reduction:*

- Memorandum from Edward C. Freni, Massport Director of Aviation, to the Boston Logan Airline Committee, Regarding Single/Reduced Engine Taxiing at Boston Logan, Dated January 4, 2011.
- Clewlow, Regina, Hamsa Balakrishnan, and Tom Reynolds. "A Survey of Airline Pilots Regarding Fuel Conservation Procedures for Taxi Operations." *International Airport Review.* Issue 3, June 2010.

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

To: Boston Logan Airline Committee (BAC)

From: Edward C. Freni
Director of Aviation

Date: January 4, 2011

RE: Single/Reduced Engine Taxiing at Boston Logan

As an important user of Boston-Logan International Airport ("Boston Logan"), your involvement in making Boston Logan the safest, most dependable and environmentally friendly airport is critical to us. Working together we have successfully implemented cutting edge safety technology including the Runway Status Lights and the ASDE-X radar and constructed new airside facilities including Runway 14/32, Taxiway Mike and other taxiway modifications. Our ability to implement these improvements at Logan is based in part on continuing to work on measures that minimize environmental impacts from various landside and airside operations.

One such important operational measure that has been identified is single/reduced engine taxiing. Based on previous outreach to the air carrier community serving Boston Logan, it is clear to Massport that single or reduced engine taxiing is being utilized when deemed appropriate by the pilot. While fuel savings is a significant benefit and the primary motivation for air carriers, reducing aircraft emissions is also an important additional benefit and the primary environmental goal for encouraging single engine taxiing. It is our hope that the current level of implementation will continue or be expanded consistent with your safety procedures and subject to pilot discretion and operational conditions.

To better understand how single/reduced engine taxiing is being used at Boston Logan and inform the pilot community, the Massachusetts Institute of Technology undertook a survey of pilots at Boston Logan. The survey, funded by the FAA and supported by Massport, has provided important insight on how single engine taxiing is applied in general and at Boston Logan in particular. The major findings of the survey are:

- Single engine taxiing is "quite prevalent in current operations".
- 95% responded that fuel conservation was important
- 70% of the respondents indicated that their airlines encourage the use of single engine taxiing
- Single engine taxiing is used more on arrivals than departures

- Boston Logan's Runways 33L and 27R are the top departure runways where single engine taxiing is used to get to the runway end. Runways 9 and 15R are the top departure runways where single engine taxiing is <u>not</u> used to get to the runway end (due to short taxiing distances)

- Identified operational practices to reduce taxi-out fuel burn included:

    - shutting down all engines during long delays,

    - shutting down or controlling the use of APUs,

    - minimizing thrust and controlling speed on taxiways

    - Delaying engine start until engine use is necessary.

Key reasons why single engine taxiing might not be used are primarily related to safety (e.g., bad weather, need for pilot to keep "heads up") or operational needs (e.g., anticipated short taxi time) or engine warm up/warm down requirements. For more detail findings of the survey enclosed please find a copy of an article published earlier this year in <u>International Airport Review</u> highlighting the survey.

I encourage you to share these findings and the attached article with your flight crews and want to thank you for the continued use of single or reduced engine taxiing procedures at Logan, subject, of course, to pilot judgment, engine performance considerations, operational conditions and, above all, safety. In the meantime if you have any questions or would like to discuss any aspect of this letter/survey, please feel free to contact me or Mr. Flavio Leo at 617-568-3528 at your earliest convenience.

A survey of airline pilots regarding fuel conservation procedures for taxi operations

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Aircraft taxi operations are a significant source of energy consumption and emissions at airports. In 2007, an estimated 4,000 tons of hydrocarbons, 8,000 tons of nitrogen oxides and 45,000 tons of carbon monoxide were emitted through taxi-out operations at U.S. airports1. These pollutants contribute to low-altitude emissions, directly impact local nonattainment of air pollution standards, and represent an endangerment to human health and welfare.

Given increasing fuel prices and concern about aviation-related environmental impacts, airlines have implemented a number of practices to reduce fuel burn during ground operations. Such strategies include minimising use of the auxiliary power unit, controlling speed on the taxiway system, and reducing surface congestion and delays by holding aircraft at the gate. Researchers from the Massachusetts Institute of Technology's International Centre for Air Transportation and the Partnership for AiR Transportation Noise and Emission Reduction conducted a survey of airline pilots at Boston Logan International Airport to assess their attitudes towards fuel conservation during taxi operations, and to document current fuel conservation practices, particularly singleengine taxi procedures.

This study found that the majority of pilots believe that fuel conservation is important; their motivation to conserve fuel is mainly driven by concerns about their airlines' economic viability, as well as the environ – mental impacts of aviation. The study also found that single-engine taxiing is quite prevalent in current operations, especially arrivals, and identified some of the practical challenges surrounding such procedures.

Survey of pilots at BOS

With the cooperation of the Massachusetts Port Authority, MIT researchers conducted a web- and paper-based survey of pilots at BOS between August and December 2009. Links to the web survey were sent via e-mail to station managers and chief pilots for all airlines at BOS. Print copies, along with prepaid return envelopes and a drop-off folder, were also placed in the crew lounges. Participation in the survey was voluntary and the responses were anonymous. Sixty-four survey responses were received, representing most major carriers and one low-cost carrier; however, there was significant representation from 2-3 airlines. Forty-three of the respondents were captains, and 19 were first officers. Thirteen pilots indicated that BOS was their base airport. Half the pilots flew through BOS an average of 5.4 times a week, while the other half only flew through BOS an average of seven times per year. (The overall average was 2.8 times per month.) The average flight experience among the respondents was 22 years, with an average of eight years on their current aircraft.

Because the survey was conducted using a convenience sample, there is potential bias in the survey results: for example, those who are more concerned with fuel conservation are potentially more likely to have completed our survey. Nevertheless, the survey yielded useful responses regarding current fuel saving practices, as well as pilots' experiences using single-engine taxi procedures.

General attitudes towards fuel conservation

More than 95% of pilots responding to the survey indicated that fuel conservation is important to them, with 80% indicating that it is very important, and 16% indicating that it is somewhat important. These results are higher than recent studies on conservation and the environment, including studies by the Pew Centre on Global Climate Change, Yale University, and George Mason University, which found that Americans' support for conservation ranges from 55% to 80%.

However, as mentioned, our results may be biased as a result of our survey method.

Pilots indicated that motivating factors for fuel conservation included general economic and financial concerns, concerns about their airline's profitability, and concerns about the environment and emissions. With fuel accounting for a significant portion of airline operating costs, it is understandable that pilots' interests in fuel conservation are largely driven by economic concerns.

Taxi-out fuel burn estimates

Pilots were asked to estimate the average taxi-out time at their base airports, what they would consider an excessive taxi-out time, and the estimated fuel burn (assuming that all the engines were being used). The results are shown in Table 1. Also included in the table are the average taxi-out times for 2009, as reported by the Aviation System Performance Metrics database (ASPM).

Based on the survey results, pilots estimated an average (normal) taxi time to be roughly 20 minutes, and excessive taxi times ranged between approximately 30 and 90 minutes. The additional fuel burn due to excessive taxi-out times, as estimated by pilots, ranged between 225 and 500 kg per flight, depending on the airport. Applying information on the types of aircraft flown by survey respondents (combining data from the JP Airline Fleet Database and ICAO Engine Emissions Databank2), the taxi-out fuel burn for this survey group was estimated to be about 550 kg per flight.

Pilots estimated an average (normal) taxi time to be roughly 20 minutes

Operational practices to reduce taxi-out fuel burn

Pilots were asked which fuel conservation strategies were encouraged by their airlines during taxi operations, besides single-engine taxi procedures (which were assessed in more depth in the survey). The most common strategies cited were:

- shutting down all engines during long delays
- shutting down, or controlling use of APUs
- minimising thrust and controlling speed on taxiways
- delaying engine start until engine use is necessary.

Pilots from international carriers noted that at most non-U.S. airports, delays are absorbed at the gate (instead of on the taxiway system) and that they often shut down all engines during gate holds. The majority of both U.S. and international pilots indicated that they shut down all engines during long delays, either at the gate or in airport holding areas. For example, at Boston Logan Airport, the local air traffic controllers often hold aircraft on certain taxiways, depending on the runway configuration being used.

Single-engine taxi procedures

One potential strategy to reduce aircraft surface emissions is the use of single-engine taxi operations; that is, when a single engine is shut down/left off during taxiing on a twinengine aircraft, or one to two engines are shut down/ left off on a four-engine aircraft. Prior research has indicated that single-engine taxiing can reduce surface emissions by up to 50%3, although the savings may be lower because of the need to have higher thrust from the engine that is being used, and the fuel needed for cross-bleed starts. The survey respondents thought that single-engine taxiing would result in a 37% reduction in fuel burn, on average.

A majority of survey respondents (70%) indicated that their airlines encourage them to use single-engine taxi procedures, with 40% indicating that they are strongly encouraged to use them, and 31% indicating that they are encouraged. When asked further about the frequency of single-engine taxi use, it was found that these procedures were widely used on arrivals (52% of pilots reported using them more than 75% of the time), while they were infrequently used on departures (54% of pilots reported using them less than 10% of the time).

Operational challenges associated with single-engine taxiing

Although single-engine taxiing may appear to be a simple and effective method to reduce fuel burn during surface operations, there are a number of perceived problems associated with the procedure. The four main challenges identified by respondents were:

- excessive thrust and associated issues
- maneuverability problems, particularly related to tight taxiway turns and weather
- problems starting the second engine
- distractions and workload issues.

Given that there are maneuverability concerns associated with single-engine taxi procedures, we asked pilots if there are certain conditions under which single-engine taxi procedures were not used. As expected, many pilots indicated that they would not use singleengine taxi procedures with low visibility or tight taxiway turns (due to problems turning into the operating engine). However, nearly half of the pilots surveyed indicated that they would use single-engine taxiing on wet taxiways.

Cold starts did not appear to be a significant factor affecting use of single-engine taxi procedures. A majority of pilots (67%) indicated that if they were departing in the morning after their aircraft had been sitting idle overnight, it would not affect their decision to use single-engine taxiing.

Survey respondents were asked to list any other conditions when they would not use single-engine taxi procedures. The most frequent responses were:

- ice or snow
- high gross weight
- short taxi-times, uncertainty of departure time and position in the takeoff queue, and changes in runway assignments
- hot days on asphalt surfaces.

Engine shutdown procedures

Based on their airline and equipment flown, a majority of pilots (80%) shut down or leave off a specific engine when utilising single engine taxi procedures. Although many pilots cited ‘procedure’ or ‘habit’ as their primary reason for shutting down or leaving off a specific engine during single engine taxiing, it is also driven by which engines power essential aircraft systems such as hydraulics and brakes.

Other key considerations include which side the cargo doors are on, aircraft cooling, and the taxiway configuration at the airport (e.g. how many right or left turns will the aircraft need to make during taxi-out or taxi-in).

On departures, pilots wait until an average of 4.6 minutes before takeoff before starting the last engine, and 3.1 minutes after landing to shut down an engine.

Runway configuration issues

One of the key reasons that pilots might not use single-engine taxi procedures is that they might anticipate a short taxi-out or taxi-in time. Most pilots indicated that in order to consider using single-engine taxiing for arrivals, the expected taxi-in time would have to exceed 10 minutes (on average); for departures, they would need to expect their taxi time to exceed 20 minutes. For example, at Boston Logan Airport, pilots indicated that they do not typically use single-engine taxi-out procedures to runways 9, 4L, and 15R, which are closest to the gates. The most common reason cited for not using single-engine taxiing at BOS was the proximity of the gate to the runway, and the resultant short taxi time. However, there were other reasons cited for not using the procedure, including:

- length of queue
- complex layout
- busy taxiway areas.

Advanced queue management strategies and a willingness to wait

Researchers at MIT are currently investigating advanced queue management strategies that would minimise surface fuel burn and emissions. Such strategies might hold aircraft at the gate or in holding areas in order to minimise taxi time, while also aiming to minimise delay. When pilots were asked whether they would be willing to wait at the gate if their position in a takeoff queue could be guaranteed, 61% indicated that they would definitely be willing to wait, and an additional 16% indicated that they would probably be willing to wait.

On departures, pilots wait an average of 4.6 minutes before takeoff before starting the last engine

Conclusions

A majority of pilots responding to this survey believe fuel conservation is an important issue, and that this belief is primarily motivated by concerns about the cost of fuel, company profitability, and the impact of aviation on the environment. A majority of airlines appear to encourage single-engine taxi procedures, as well as a variety of other fuel conservation measures.

The survey found that a majority of pilots used single-engine taxi procedures on arrival at airports, while a fewer number of them used single-engine taxi on departures. Key reasons cited for not using these procedures were either safety-related, or associated with practical reasons (such as short taxi distances for some runways at BOS). Single-engine taxi procedures differed between aircraft in terms of which engines were left off, and for how long. Even though this survey was based on a convenience sample, it provided some useful insights regarding airline pilots' attitudes to fuel consumption, as well as information on the use of fuel conservation measures such as single-engine taxiing.

This research was conducted under the auspices of the Partnership for AiR Transportation Noise and Emissions Reduction. PARTNER is a nineuniversity research organisation, and an FAA/ NASA/Transport Canada-sponsored Centre of Excellence. PARTNER fosters breakthrough technological, operational policy, and workforce advances for the betterment of mobility, economy, national security, and the environment. Also participating was the International Centre for Air Transportation, which works to improve the safety, efficiency and capacity of domestic and international air transportation and its infra – structure. Both organisations are headquartered at the Massachusetts Institute of Technology.

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About the Authors

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Regina Clewlow is a PhD student in the Engineering Systems Division at MIT and a PARTNER research assistant. She has worked on PARTNER projects 21 (airport surface movement optimisation) and 31 (impacts of cap-and-trade policies in the aviation sector). Her other research interests include examining competition and cooperation between high-speed rail and aviation, and the environmental impacts of high-speed transportation. She holds a BS and ME from Cornell University.

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