Technical Appendices

The following technical appendices include supporting documentation for chapters of the 2022 Environmental Status and Planning Report:

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E. Environmental Justice Supporting Documentation

This appendix provides detailed information in support of Chapter 2, *Sustainability, Outreach, and Environmental Justice,* pertaining to environmental justice (EJ).

E.1 Community Organizations Supported by Massport

The following is a list of community organizations funded by Massport to date, as referenced in Chapter 2, *Sustainability, Outreach, and Environmental Justice,* Section 2.2.1.

- Allied War Veterans Council of South Boston
- Apollinaire Theatre Company
- Artists for Humanity
- Babe Ruth League of South Boston
- Bedford Babe Ruth
- Boston Children's Chorus
- Boys & Girls Club of Worcester
- Casa Myrna
- Charlestown Boys & Girls Club
- Charlestown Community Center
- Charlestown Cooperative Nursery School
- Charlestown Lacrosse and Learning Center
- Chelsea Boys & Girls Club
- Chelsea Collaborative
- Chelsea Department of Public Works
- Children's Smile Coalition
- Children's Trust Fund
- City of Revere
- City of Worcester Neighborhood Summer Park Steward Program
- Codman Square Health Center
- Community Action Programs Inter-City, Inc. (CAPIC)
- Community Against Substance Abuse (CASA)
- Community Boat Building
- Condon Community Center
- Cottage Park Yacht Club
- CSF of Bedford
- Curley Recreation Center
- Dorchester Boys & Girls Club
- DotHouse Health Inc
- E. Inc.
- East Boston Central Catholic School
- East Boston Chamber of Commerce
- East Boston Community Development Corporation (CDC)
- East Boston Main Streets
- East Boston Social Centers
- East Boston YMCA
- FamilyAid Boston
- For Kids Only Afterschool
- Fort Point Arts Community
- Friends of Christopher Columbus Park
- Friends of Metro Boston, Inc.
- Labouré Center
- Lexington Education Foundation
- Logan Airport Association
- Martin Pino Community Center
- Maverick Landing Community Services
- McDonough Sailing Center
- Medicine Wheel Productions
- Monument Square Neighborhood Association
- North End Against Drugs, Inc.
- Paraclete Foundation
- Phoenix Academy
- Piers Park Sailing Center
- Revere Beach Partnership
- Revere High School Cheerleading Parents Club
- Revere on the Move
- Revere Parks & Recreation
- Revere Pop Warner
- Revere SUDI office
- Revere Youth Baseball & Softball
- Salesian Boys & Girls Club
- SeaCoast High School
- Seven Hills Foundation
- South Boston Boys & Girls Club
- South Boston Chamber of Commerce
- South Boston Community Health Center
- South Boston Neighborhood Development Corporation
- South Boston Neighborhood House
- South Boston Pop Warner Football & Cheerleading
- South Boston Youth Soccer
- Stretch Walsh Community Center
- Swift Waters After School Program
- The Cary Memorial Library Foundation
- The Dimock Center
- The Fishing Academy
- The Friends of the Chelsea Public Library
- The Museum of African American History
- The North End Community Health Center
- The Sports Museum
- Tynan Community Center
- UMASS Boston / Camp Shriver
- USS Constitution Museum

- Gate of Heaven CYO
- Gavin Foundation
- Girls Scouts of Central & Western Massachusetts
- Greendale YMCA/ YMCA of Central Massachusetts
- GreenRoots
- Hanscom Spouses Club
- HarborCOV
- Harborside Community Center
- Hull Lifesaving Museum
- Inner-City Scholarship Fund
- John F. Kennedy Family Service Center, Inc.
- Julie's Family Learning Program
- Vinton Street Hope Initiative
- We Are Boston
- West Broadway Task Force
- Winthrop Chamber of Commerce
- Winthrop Fireworks
- Winthrop High School
- Winthrop High School Girls Softball
- Winthrop Little League
- Winthrop Parks & Recreation
- Winthrop Youth Hockey Association
- Winthrop Youth Softball
- Worcester Tree Initiative
- Youth Enrichment Services (YES)

The following provides a list of organizations, programs, and causes that have received East Boston Foundation contributions to date, as referenced in Chapter 2, Section 2.2.1.

- A Change of Attitude
- Alliance East
- America Scores
- Atlantic Works
- BASE Baseball Program
- Bennington Street Planter
- Boston Area Natural Networks
- Boston Creative Action
- Boston History Collaborative
- Boston Police ESL Program
- Brooke Charter School Playground
- Chelsea Creek Action Group
- Collaboration for Active Communities
- Columbus Day Parade Committee
- Community Education Center
- Courageous Generation Seniors
- Crossroads Family Shelter
- Cultural Connections
- Curtis Guild School
- Don Orione Senior Program
- East Boston Adult Education
- East Boston APAC
- East Boston Artists Group
- East Boston Athletic Board
- East Boston Central Catholic School
- East Boston Chamber of Commerce
- East Boston Community Activity Day
- East Boston Cultural Exchange
- East Boston Ecumenical Community Council
- East Boston Flames Cheerleaders
- East Boston Girls Softball
- East Boston Youth Hockey
- Eastie Pride Day
- Eastie Week
- Excel Academy
- Freedoms Foundation
- Friends of Belle Isle Marsh
- Friends of East Boston Court
- Friends of East Boston Library Friends of East Boston Veterans Memorial
- Friends of the Golden Stairs Park
- Golden Age Seniors Bus Trips
- Harbor Arts
- Harbor City School
- Harborside Community Center
- Heritage Apartment Seniors Bus Trips
- Italia Unita Feast
- James Otis Elementary Schoolyard Initiative
- Jeffries Point Neighborhood Association
- Kennedy Schoolyard Renovation
- Kiwanis
- Little Folks
- Martin Pino Community Center
- Metro Lacrosse
- Montmorenci Avenue Block Party
- Nantucket Lightship
- New England Gallery of Latin American Art
- New England Scores
- NOAH
- North Shore Recreation
- North Suffolk Mental Health
- Paris Street Community Center

- East Boston Healthy Boston Coalition
- East Boston High School
- East Boston Little League
- East Boston Main Streets
- East Boston Museum
- East Boston Pop Warner Football
- East Boston Resident Action Council
- East Boston Seniors
- East Boston Social Center
- East Boston Veterans Council
- East Boston YMCA
- East Boston Youth Group
- Piers Park Sailing
- Sacred Heart Feast
- Sacred Heart Kids Club
- Salesians Boys and Girls Club
- Salvadorian Cultural Festival
- Savio Prep
- Senior Citizen Bus Trips
- St. Mary's Star of the Sea School
- Swift Waters Afterschool
- The Trust for Public Land/Lopresti Park
- Victory Gardens
- Zumix

E.2 Environmental Justice and Community Outreach

Table E-2 Provides a list of Massport-wide EJ and community outreach initiatives and ESPR-specific initiatives.

Table E-1 Environmental Justice and Community Outreach

Date	Meeting/Outreach Type
Prior to the Filing of the ESPR	
6/26/2023	Public Information Session – Technical Analyses Methodologies and Forecasts[1]
11/28/2023	MEPA Comment Review Meeting
12/12/2023	MEPA and Advocacy Group Meeting
1/17/2024	Public Information Session – Preliminary Findings[1]
3/19/2024	MEPA Meeting
Following the Filing of the ESPR	
6/26/24	Public Post-filing Meeting
Massport-wide, Ongoing	
Regular Meetings with the Massport Community Advisory Committee (CAC)	
Regular Meetings with City of Boston Officials	
Regular Meetings with the Winthrop Town Council	
Regular Meetings with the Harborview Neighborhood Association	
Regular Meetings with the Jeffries Point Neighborhood Association	
Regular Meetings with the Orient Heights Neighborhood Council	
Regular Meetings with the Piers Park Advisory Committee (PierPAC)	

1 Indicates a copy of this presentation is included in the following section.

E.2.1 Public Information Sessions Presentations

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Logan Airport
2022 Environmental Status and Planning Report
Public Information Session

June 26th, 2023

Logan Airport 2022 ESPR - Information Session

Agenda

- Welcome and Introductions
- Information Session Purpose
- Overview of ESPR and EDR Process
- ESPR Contents
- Technical Analyses Methodology
  - Forecasting
  - Activity Levels
  - Noise Abatement
  - Air Quality and Emissions Reductions
  - Ground Access
- Future Meetings and Questions

Presenters

Massport

- Anthony Guerriero
- Brad Washburn

MEPA/EEA

- Jennifer Hughes

Consultant Team

- Carol Lurie – Project Manager

2

Purpose of Today's Public Information Session

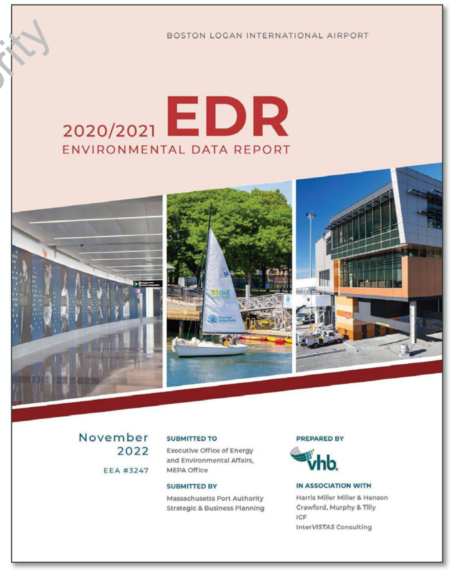
- Share an overview of the ESPR contents and key technical analyses
- Provide an overview of the methodology for the analysis that goes into the ESPR
  - Future forecast of passenger levels and aircraft operations
  - Noise
  - Air quality and greenhouse gas
  - Ground transportation to and from Logan Airport
- Provide opportunity for community to learn about the ESPR and EDR process
- Enhance outreach to community in line with Massport goals

Massport has been preparing comprehensive annual environmental filings for Logan Airport since the early 1980s

- **Represents the longest detailed tracking of environmental impacts of any US airport**
- The reports analyze the ***cumulative effects*** of Logan Airport operations and activities
- Massport's **Environmental Status & Planning Reports (ESPR)** and **Environmental Data Reports (EDR)** are the only detailed facility annual environmental reports required by the Secretary of Energy & Environmental Affairs (EEA) for Massachusetts
- ESPRs are prepared every 5 years with interim annual EDRs
  - Last EDR reported on 2020/2021
  - ESPR will be prepared for 2022
- Circulation includes over 300 agencies, elected officials, community groups, and individuals
- Since 2010, the full documents are posted on the Massport website

Scope for 2022 ESPR

- Appendix C of the *2020/2021 EDR* presented a Proposed Scope for the *2022 ESPR*
- The EEA Secretary's Certificate on the *2020/2021 EDR* augments the Proposed Scope for the 2022 *ESPR*
- As directed by the Secretary, Massport will hold public information sessions on the 2022 ESPR to provide the public with information on:
  - Activity levels/forecasting
  - Airport planning activities
  - Regional transportation
  - Ground transportation
  - Aircraft noise
  - Air quality



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Logan Airport ESPR will report on 2022 and likely future conditions

ESPRs/EDRs are designed to facilitate long-range tracking and comparison of operations and environmental impacts.

2022 ESPR Contents

Overview of Executive Summary (Translated)

Massport's Net Zero commitment and Sustainability

Airport Planning Activities

Logan Airport's Role in the Regional Transportation System

Environmental Compliance and Management/Water Quality

Environmentally Beneficial Measures and Project Mitigation Tracking

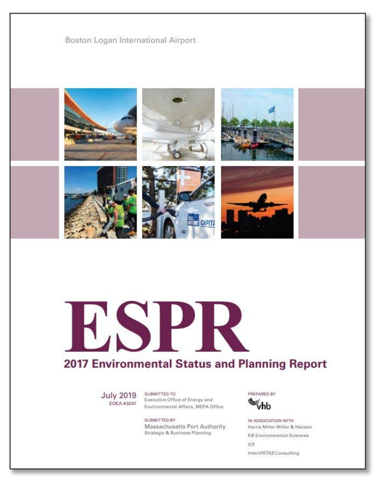
Forecast Dependent Topics

Current and Future Passengers and Aircraft Operations

Ground Access to and from Logan Airport

Noise Environment and Abatement Measures

Air Quality/GHG Emissions and Reduction Strategies



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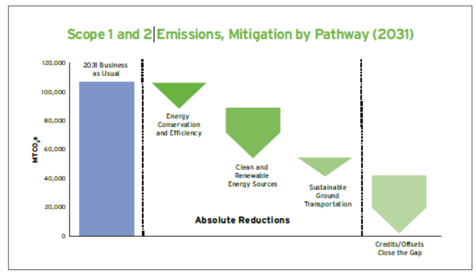
Massport's Net Zero GHG Commitment and Extensive Sustainability and Resiliency Programs

- Net Zero GHG Emissions commitment by 2031 for **Massport-controlled** activities
- Support for airlines and tenants to reduce their GHG emissions
- Airports Council International - Airport Carbon Accreditation Program Certification application
- Massport's Sustainable and Resiliency Standards
- Sustainability rating certified facilities and infrastructure
- Climate change and resiliency planning – critical assets enhanced
- Commitment to community parks and open space

airport carbon accreditation



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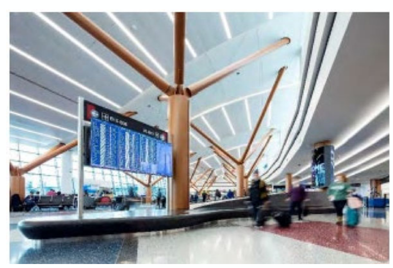
Airport Planning

Describes recently completed, ongoing and upcoming projects

- Ground transportation and parking projects
- Terminal area, airside area, and service area projects and planning concepts
- Airport buffer areas and open space projects
- Energy, resiliency, and sustainability planning



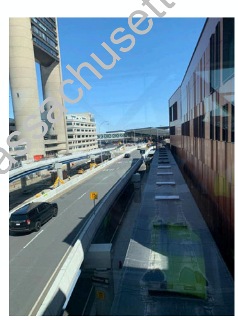


Photo Credit – David Doane

Photo Credit – Boston Globe

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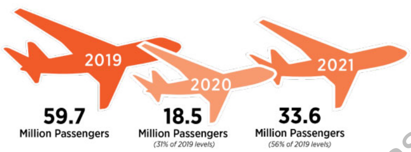
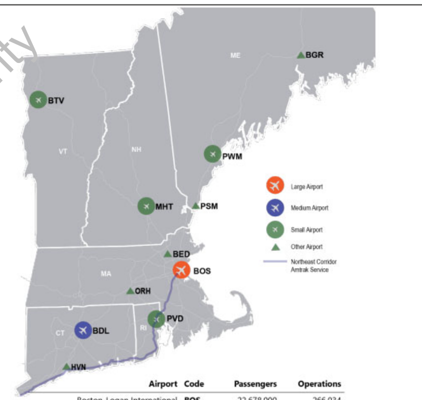
Regional Transportation System

- Massport's airports' roles in the regional transportation network
- Overview of regional airports' activities and plans
- Amtrak service
- Collaborative regional efforts

Regional Air Passenger Trends





Airport	Code	Passengers	Operations
Boston-Logan International	BOS	22,678,000	266,034
Bradley International	BDL	4,620,000	72,807
Rhode Island T.F. Green International	PVD	2,334,000	56,246
Portland International Jetport	PWM	1,704,000	53,741
Manchester-Boston Regional	MHT	959,000	45,993
Burlington International	BTV	598,000	89,122
Bangor International	BGR	498,000	42,939
Portsmouth International	PSM	145,000	63,103
Tweed New Haven Regional	HVN	57,000	40,031
Worcester Regional	ORH	28,000	20,919
Hanscom Field	BED	16,000	124,566

Regional Airport Network

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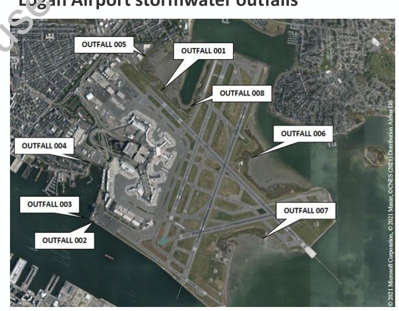
Water Quality/Environmental Compliance

- Reports on compliance with water quality requirements according to the National Pollutant Discharge Permit for the airport/stormwater outfalls and Airport Rescue and Fire Fighting Facility
- Provides status update on tank management plan
- Tracks Massport's and tenants' compliance with the Massachusetts Contingency Plan for site remediation from fuel handling and other activities

Logan Airport stormwater outfalls

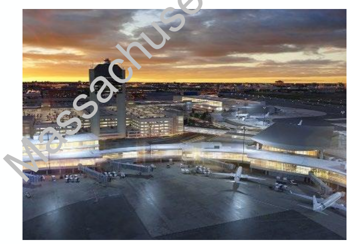


Harborwalk clean up

10

Environmentally Beneficial Measures and Project Mitigation Tracking

- Describes environmentally beneficial measures implemented by Massport
- Summarizes status of projects with ongoing mitigation (Section 61 commitments)



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ESPR Technical Studies Methodology

FAA model

Technical Data Inputs
- Historical trends
- National economy
- Airport's Role in local region
- Passenger demand
- Aircraft/engine technology

2022 and Future Planning Activity Level/ Forecasts
- Arriving and departing passengers by time of day and terminal
- Aircraft operations by type, stage length, and day/night
- Cargo poundage

Noise
- Day-night noise contour
- Comparison to historical noise contours
- Comparison of noise model results to measured levels

Air Quality and Emissions Reductions
- Air quality and GHG emissions inventory by scope and source

Ground Access
- Indicators of traffic by time of day and terminal

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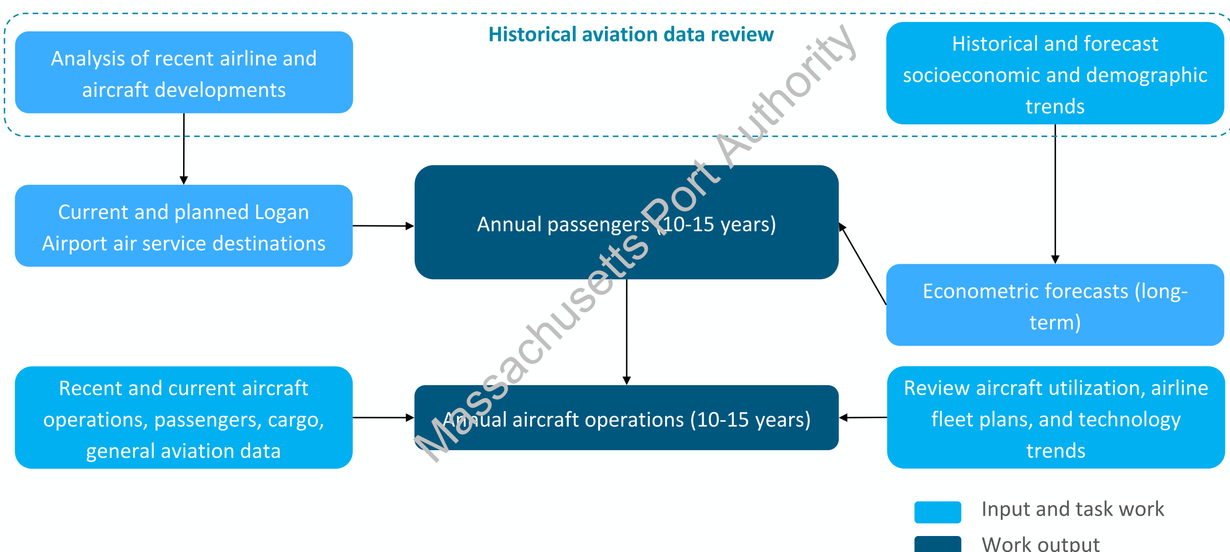
ESPR Forecast

Forecast of passengers, aircraft operations, and cargo volumes updated from prior forecasts for Logan, considering most recent data and trends

- Overall approach: "best practice” industry forecasting techniques analyzing:
  - 10+ years of historical patterns of passenger traffic at Logan Airport
  - Recent trends and “shocks” at Logan Airport and in the industry
  - The outlook for future aviation demand based on national and regional economic factors
  - Role of Logan Airport in the regional transportation system
- Industry data sources including:
  - Massport data on airline and passenger activity
  - US DOT data on passengers, flights, routes, aircraft
  - Flight schedule databases
- Developing detailed forecasts:
  - International and domestic passenger and aircraft operations
  - Daily flight schedules
  - Terminal usage by passengers
  - Aircraft likely to be in the future fleet at Logan Airport

ESPR Forecast Methodology



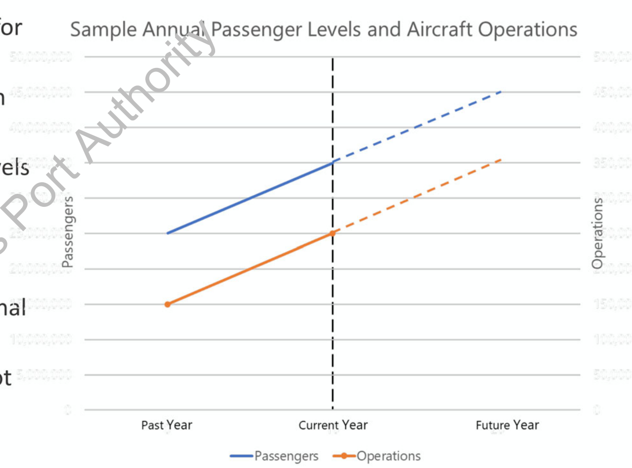
Forecasting Trends Analysis

Uses a blend of near-term trends and insights with long-term economic factors

- Recent trends in the airline seats available at Logan Airport and development plans reported by the major airlines
- Information and air service insights provided by Massport
- General airline industry conditions, such as airline profits, staffing levels, etc.
- Potential economic indicators such as regional and national GDP, personal income, population, airline ticket prices, and fuel prices
- Review of FAA Terminal Area forecasts and Aerospace forecasts
- Long-term trends in aircraft fleet development
- Review of benchmark industry forecasts

Planning Activity Levels Account for Forecast Variability

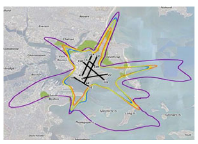
- Long range forecasts are uncertain making it difficult for planning airport facilities
- Planning activity levels ("PALs") helps determine when demand may trigger the need for additional facilities
- PALs are not tied to specific years as actual activity levels may occur earlier or later than the forecast predicts
- Allows airport management to accelerate/ decelerate capital projects based on when demand occurs
- Facilities are built when there is a demand for additional space or gates
    - Constructing facilities and terminals/gates will not induce demand



Detailed Forecasts of Daily Activity Provide the Inputs for Technical Analyses

- Typical detailed forecasts for daily passengers and aircraft operations are:
  - *Average day of the peak month* (ADPM) – an industry standard metric which represents a generally busy day of the year
  - *Average annual day* (AAD) – represents activity during the average day of the year
- Daily flight schedule information will be derived from the annual forecast, based on expected service changes, and fleet evolution by Logan Airport air carriers

Analysis	Detail	Detailed forecast information required as input to analysis
Noise	AAD	Aircraft operations by type, origin and destination, and day/night
Air quality	AAD	Aircraft operations by type
Ground access	ADPM	Arriving and departing local passengers by terminal and by time of day



Ground Access to and from Logan Airport

Technical Analyses

- Transportation modes to and from the airport
  - Rapid transit (MBTA)
  - Buses (Logan Express, private buses/coaches)
  - Taxis and limousines
  - RideApp (Uber, Lyft etc.)
  - Automobiles (Parking or dropping off/ picking up)
- Vehicle miles travelled (VMT)
- Average Annual Daily Traffic, Average Annual Weekly Traffic
- Short- and long-term parking

Forecasting inputs for Ground Access

- Total arriving and departing domestic and international passengers
- By time of day
- By terminal

Ground Access Methodology

Data Inputs
- Passenger levels (current and forecast)
- Mode choice (current and assumed)
- Terminal usage (current and forecast)
- Automated Traffic Monitoring System Volumes
  - Annual average daily traffic (AADT)
  - Annual average weekday daily traffic (AWDT)
  - Annual average weekend daily traffic (AWEDT)
- Future traffic volumes (based on forecast MAP)
- Roadway configuration and mileage (current and assumed)
- Parking garage/lot usage (current and assumed)

Analysis Tool
VISSIM Model
behavior-based, multi-modal traffic flow simulation software

Outputs
- Total traffic circulation by mode
- On-airport vehicle miles traveled
  - Morning peak hour
  - Evening peak hour
  - High 8-hour
  - Average weekday

Ground Access Management and Planning
- Passenger and employee HOV strategy
- Parking Management plan
- On-airport traffic management and facility planning

Noise Methodology

Technical Analyses

- Noise contours (Day-night average sound level contours in 5-decibel increments)
- Population counts within different contours
- Supplemental Metrics

Forecasting Inputs for Noise
- Total Aircraft operations by
  - Type
  - Origin and destination
  - Day/night schedule

FIGURE 6-20 Comparison of Historical and Forecast DNL 65 dB Contours – 1990, 2017, Future Planning Horizon | 2017 Environmental Status and Planning Report

1990 DNL Contour (INM)
2017 DNL Contour (AEDT 2d)
Future Planning Horizon DNL Contour (AEDT 2d)
Sound Insulation Areas

Noise Methodology

Data Inputs

- Total aircraft operations (current and forecast)
- Aircraft fleet mix (current and forecast)
- Runway use (current and assumed)
- Radar flight tracks (of current aircraft operations)
- Stage length (current and forecast)
- Day/night operations (current and forecast)

Analysis Tool
FAA Aviation Environmental Design Tool
[FAA noise and air/GHG emissions program]

Outputs

- Current Day-night noise contours
- Future Day-night noise contours
- Population impact assessment for current and future conditions
- Comparison of measured and modeled noise levels
- Supplemental Metrics
    - Cumulative Noise Index (CNI)
    - Dwell and Persistence
    - Time Above a threshold

Noise Abatement and Planning

- Residential Sound Insulation Program
- Airline Fleet Improvements
- Nighttime/Noise Rules
- Noise Complaint Line
- Noise Abatement Management Plan

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Air Quality and GHG Emissions Reductions

The Air Quality and Emissions Reductions chapters covers:

- Modeled emissions inventory for current operations
- Anticipated emissions inventory for the future planning horizon
- Greenhouse gas assessment
- Air quality emission reductions
- Air quality management goals
- Updates on other air quality efforts that apply to Massport
- Contribution to health studies

Forecasting Inputs for Air Quality and GHG

- Total Annual Aircraft operations by
    - Aircraft and engine type

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Air Quality/GHG Methodology

Data Inputs

- Annual Aircraft volumes by aircraft and engine type (current and forecast)
- Aircraft taxi and delay (from FAA)
- Ground Service Equipment (current and assumed)
- Motor Vehicles volumes, VMT and curb usage (current and future modeled)
- Energy usage - electricity, fossil fuels storage and handling, renewable, sustainable fuels (current and assumed)
- Stationary and other sources (current and assumed)

Analysis Tools

- Aviation Environmental Design Tool (AEDT)
- MOtor Vehicle Emissions Simulator (MOVES) for roadway mobile sources

Outputs

- Emissions Inventory
  - Carbon monoxide
  - Oxides of Nitrogen
  - Volatile organic compounds
  - Particulate matter
  - Greenhouse gases (by Massport controlled - Scope 1 and 2, and Scope 3 – airlines/tenants/passenger access)

Air Quality Improvement and GHG Emissions Reduction

- Massport's Net Zero roadmap
- Alternative fuel program (aircraft and vehicles)
- Expanded HOV program
- Renewable energy plan
- Central heating plant conversion

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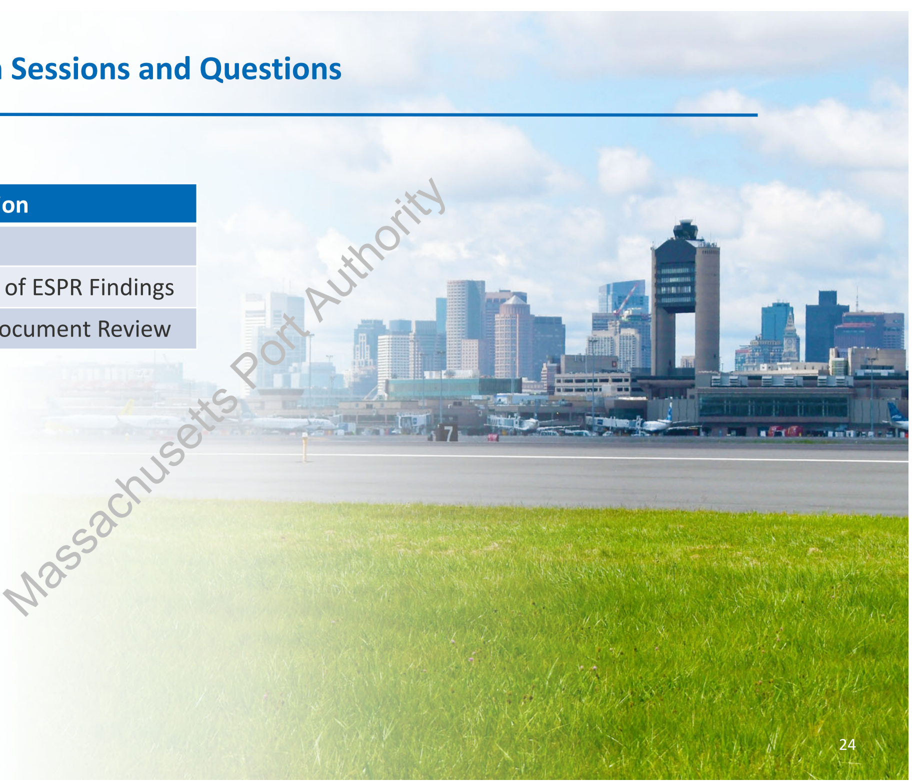
Upcoming Public Information Sessions and Questions

Timing	Meeting Description
June 26, 2023	ESPR Overview
Fall/Winter 2023	Pre-Filing Preview of ESPR Findings
Spring 2024	Post-Filing ESPR Document Review

Questions ?



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Logan Airport
2022 Environmental Status and Planning Report
Public Information Session

January 17, 2024

Logan Airport 2022 ESPR Pre-File Public Information Session

Agenda

- Welcome and Introductions
- Purpose and Overview of the 2022 ESPR
- Status Update on ESPR Chapters
  - Activity Levels/Forecast
  - Airport Planning
  - Regional Transportation
  - Ground Access
  - Noise Abatement
  - Air Quality and GHG Emissions Reductions
  - Environmental Compliance/Water Quality
  - Project Mitigation
  - Community Benefits, Sustainability, and Resiliency
- Report Format and Readability
- Future Meetings and Questions

Presenters

Massport

- Anthony Guerriero
- Brad Washburn
- Flavio Leo

MEPA/EEA

- Jennifer Hughes

Consultant Team

- Carol Lurie

EDRs/ESPRs are an important planning and reporting process for Massport

- **EDRs** provide an **annual** update on activity and environmental conditions at the Airport compared to the prior reporting year
- **ESPRs** provide annual updates and **long-range analysis** of projected operations, passengers, and cumulative impacts
- Massport's EDRs and ESPRs describe and analyze operating and environmental conditions.
  - EDRs and ESPRs **do not propose any projects** but provide a **planning context** for airport-wide activities to complement the individual project-specific MEPA or NEPA filings.
  - MEPA Certificates issued for EDRs and ESPRs are not statutory EIRs and are not intended to substitute notification requirements or activities assessments for projects subject to MEPA.
- The MEPA process **evaluates projects** and identifies potential adverse environmental impacts.

Massport is the only state agency that prepares ESPRs/EDRs

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3

Structure of the 2022 ESPR

1. Introduction and Executive Summary
2. **Community Benefits & Outreach, Sustainability and Resiliency**
3. Activity Levels/Forecasts
4. Airport Planning
5. Regional Transportation
6. Ground Access
7. Noise Abatement
8. Air Quality and GHG Emissions Reductions
9. Environmental Compliance/Water Quality
10. Project Mitigation
11. Appendices: A and B – Responses to Comments
12. Appendices: C – K – Supporting Technical Information

In response to the 2020/2021 EDR, the 2022 ESPR includes a new chapter which discusses community benefits, sustainability and resiliency as well as outreach to environmental justice communities

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4

Community Benefits & Outreach, Sustainability, and Resiliency

5

Massport has a long history of Community Engagement

- For over 50 years, Massport has had an entire department dedicated to engagement: Community Relations and Government Affairs
- Massport Community Advisory Committee (Massport CAC), established in 2014, represents the interests of 35 communities; this Committee replaced the former Logan CAC
- Massport regularly holds:
  - Project-specific briefing sessions, including technical overviews and public involvement sessions
  - Meetings with interested parties and key community stakeholders and groups

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Massport Community Commitments and Initiatives

In addition to MEPA project specific mitigation (Section 61), Massport's engagement with impacted communities has resulted in:

- Massport has invested in an extensive 38 acre open space program. Green space initiatives:
  a) Piers Park I
  b) Airport Edge Buffers Program
  c) Maintenance and Operation of Bremen Street Park
  d) Mary Ellen Welch Greenway extension
  e) Piers Park II
  f) Thomas J. Butler Memorial Park
  g) Bremen Street Dog Park
  h) South Boston Maritime Park
- East Boston, South Boston, and Winthrop Foundations and Chelsea Development Agreement
- Updated Residential Sound Insulation Program

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Massport Community Giving

- Provide annual funding to the **East Boston Neighborhood Health Center** for Pediatric Asthma and COPD Prevention and Treatment Programs in East Boston and Winthrop
- **Massport's Scholarship Program** provides $50,000 per year for scholarships to students in neighboring communities as well as support for local high school scholarships.
- **Massport's Charitable Contribution Program** distributes over $250,000 in funding to local organizations for programs in areas like youth & education, arts & culture, social service, environment and athletics.
- **Massport's Community Summer Jobs Program** provides grant funds to local community organizations to support youth summer employment.
  - Funded $650,000 in grants to support 280 summer youth employment positions in 2023.
- The **Cathy Leonard-McLean Community Room** is available for community and civic organizations for neighboring community groups to use

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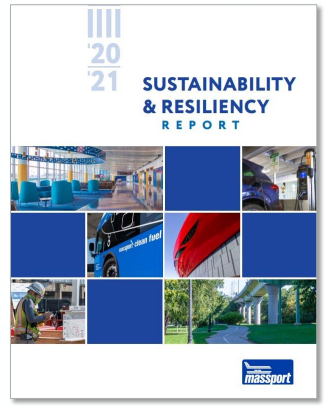
Massport is a national leader in sustainability and resiliency

- Net Zero GHG Emissions commitment by 2031 for **Massport-controlled** activities
- Support for airlines and tenants to reduce their GHG emissions
- Airports Council International - Airport Carbon Accreditation Program Certification application
- Massport's Sustainable and Resiliency Standards
- Sustainability rating certified facilities and infrastructure
- Climate change and resiliency planning – critical assets enhanced
- Commitment to community parks and open space development and management

Sustainability and Resiliency Report

- Logan Sustainability Management Plan (SMP) Completed in 2015, FAA funded
- Expanded in 2019 to other Massport assets
- Update to the SMP coming in 2024



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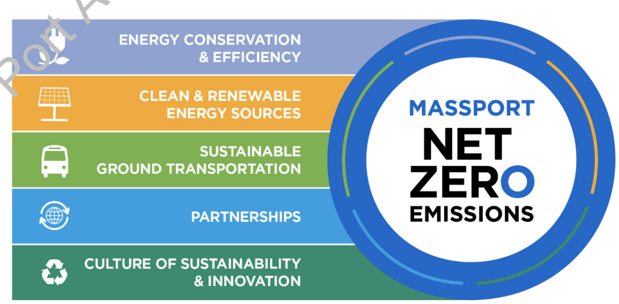
Massport has an ambitious GHG reduction goal

Massport will strive to achieve net zero greenhouse gas emissions, for those activities under its control, by 2031, Massport's 75th anniversary

- Net Zero Roadmap identified five pathways towards implementation and prioritized future projects
- In March 2023, Massport committed to invest $500 million in emissions reduction Projects
- Discussion of net zero GHG, sustainability and resiliency initiatives are compiled into new Chapter 2

Net Zero Roadmap



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Enhanced Outreach

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Massport has added new opportunities for community engagement*

	Meeting	Date
✓	Public Information Session 1- ESPR Overview / Forecasting Methodology*	June 26, 2023
✓	MEPA Briefing on ESPR *	November 28, 2023
✓	MEPA-hosted meeting with Community Groups on ESPR*	December21, 2023
	ESPR Public Information Session 2 – ESPR Status update*	**January 17, 2024**
	File with MEPA	April 2024
	Public Information Session 3 - During comment period	Late April-Early May 2024
	Continued community engagement	Ongoing

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Massport will update 2022 ESPR format and future ESPRs/EDRs based on MEPA and community feedback

New features:

- Overall shorter document
- Refreshed format and writing style for readability
- Technical materials moved to appendices
- Older project mitigation reporting, historical data, and dense data tables in appendices
- Navigation guides, numbered sections, and chapter color coding added
- Key terminology tables for reference
- Callout boxes for key points and icons on key topics
- Updated chapter structure and enhanced graphics
- Prior ESPR/EDR information incorporated by reference with web links for access
- **New Chapter!**

  Chapter 2: Community Benefits & Outreach, Sustainability and Resiliency

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Activity Levels and Forecasts

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Logan Airport 2022 Activity Levels are still below 2019 Levels

- Logan Airport and the aviation industry continued to recover from the impacts of the global COVID-19 pandemic

Summary of activity levels in 2022

Passengers

36.1 Million
passengers in 2022

59% higher than 2021

15% lower than 2019

16th busiest U.S airport
by passenger count in 2022

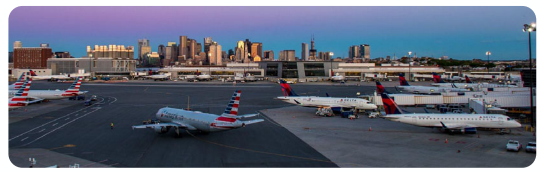
132
Average number of passengers per operation

Operations

378,613
operations in 2022

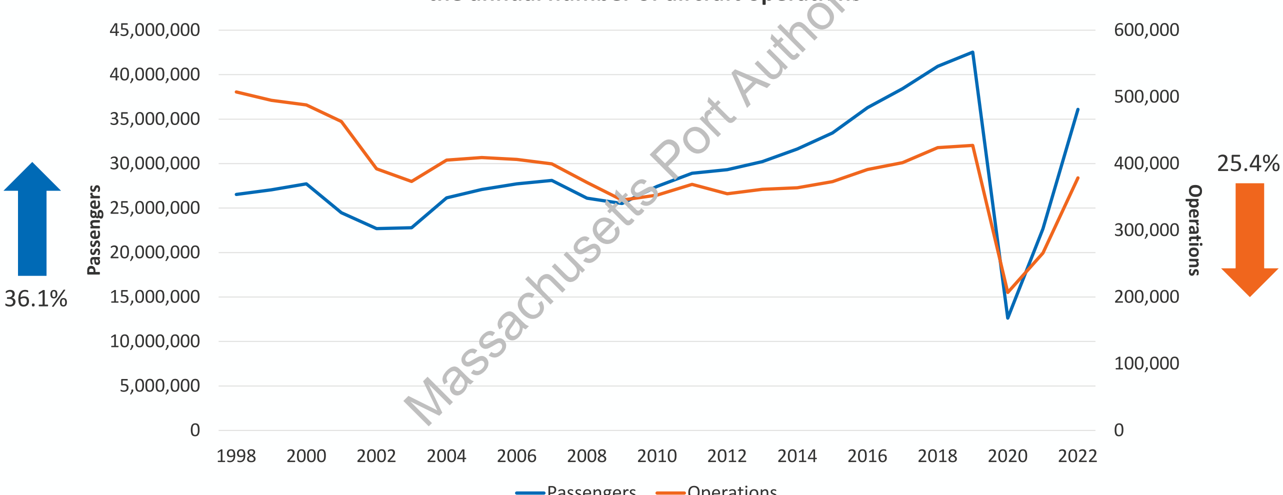
31% higher than 2021

11% lower than 2019

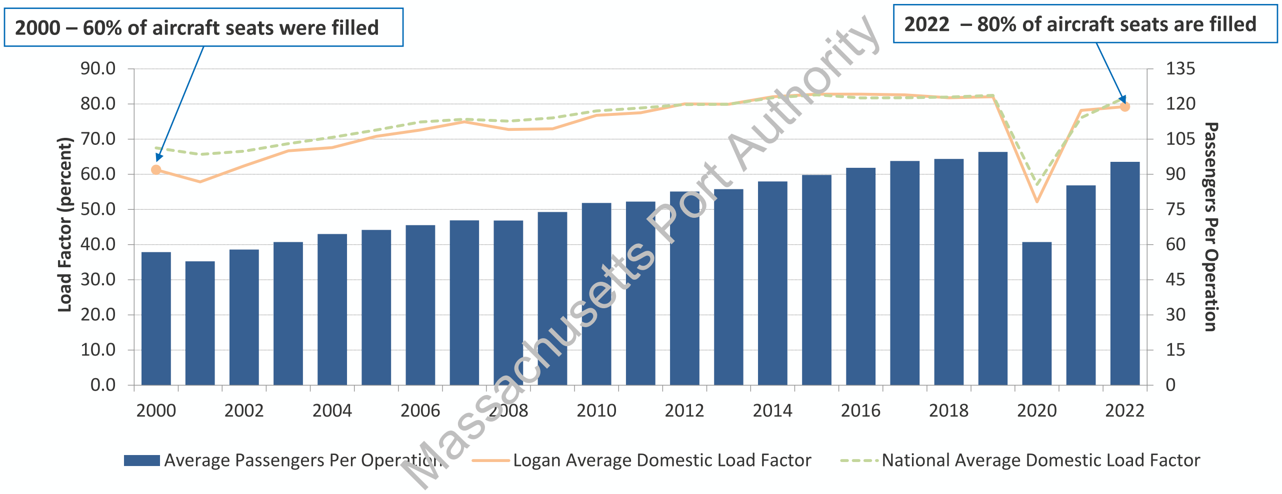


Over the long-term, passengers have increased while flights have decreased

Between 1998 and 2022, there was a 36.1% rise in the annual passenger count accompanied by a 25.4% decrease in the annual number of aircraft operations



More passengers are being accommodated on fewer flights



Load factor – Percentage of available seat capacity filled by passengers

Domestic load factors are anticipated to be close to 84% in the future planning horizon

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ESPR forecast methodology uses a blend of near-term trends and insights with long-term economic factors

Industry best practices forecasting methods consider

- 10+ years of historical passenger traffic patterns
- Recent trends and "shocks" at the Airport and in the industry
- Future aviation demand based on national and regional economic factors
- Logan Airport's role in the regional transportation system
- Airline and passenger activity data
- US Department of Transportation data on passengers, flights, routes, aircraft
- Flight schedules filed by the airlines
- International and domestic passenger and aircraft operations data
- Passenger terminal usage
- Future aircraft types likely to be in the fleet

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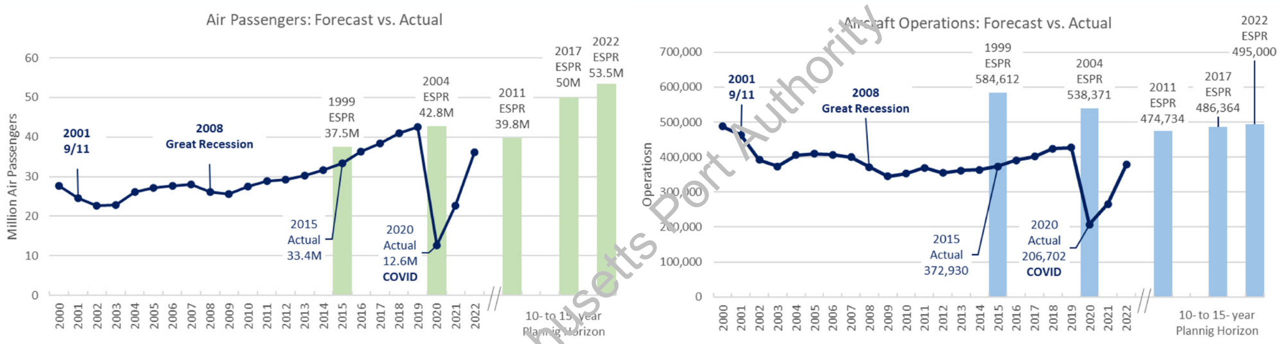
Forecast are updated every 5 years and tend to track closely with actual activity levels



Future Planning Horizon

Passengers 53.5 million **Operations 495,000**

Very long-range forecasts are uncertain, therefore ESPR focuses on a more realistic 10- to 15- year timeframe

All forecast assumptions are revisited in each ESPR

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Airport Planning

As passenger activity recovers, Massport restores service and restarts select postponed projects

Deferred Projects or Services due to COVID	Status
Parking Garage in front of Terminal E	Permitted for 5,000 spaces. Project design and sizing of parking currently being evaluated and designed
Construction of 1,000 parking spaces at Framingham Logan Express	In design, anticipated to break ground in 2024 or early 2025
New Logan Express suburban locations	Added Quincy location and new employee site at Wonderland; New, expanded North Shore Logan Express in 2024
Terminal E Improvement Phase 1	Terminal E Phase 1 opened in October 2023 – 4 new gates
New urban Logan Express service	Current focus is on Wonderland employee parking, better service on SL1, SL3, and Back Bay Logan Express
Logan Express service from Peabody, Woburn, and Back Bay	Services fully restored in 2022, Peabody Logan Express at new North Shore location
Dedicated HOV bus lanes	HOV prioritization throughout Logan campus
Reduced headways from Braintree and Framingham Logan Express	Passenger capacity added to Braintree; New Quincy employee lot to help increase parking capacity at Braintree; pending expansion in Framingham

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ESPR highlights safety and efficiency Projects will be implemented (example projects)

Airside

- Runway 27 RSA Safety Improvements
- Signature Flight Support Relocation

Terminal Area

- Garage in front of Terminal E

Logan Airport Service Area

- North Service Area Optimization
- Green Bus Depot Operations Renovation
- Southwest Service Area Optimization
- Cargo Throughput Facility
- Terminal E, Phase 2

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Regional Transportation

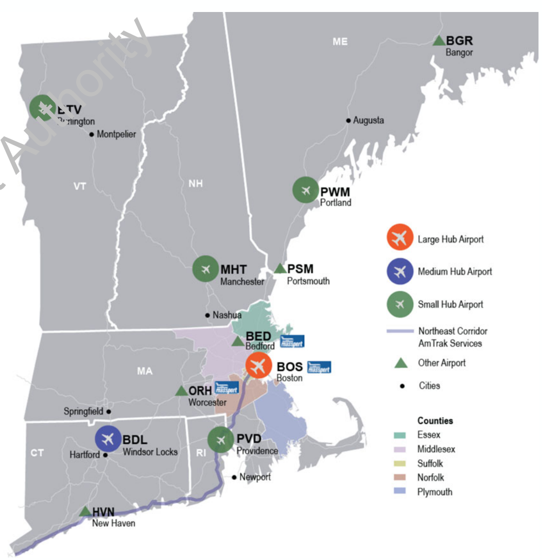
Regional Transportation 2022 Findings

Summary of New England Regional Passenger Activity in 2022:

- **51% higher** than 2021
- **14% lower** than 2019
- Regional airports accommodated **30% of total passengers**. Remaining 70% at Logan

Summary of New England Regional Operations in 2022:

- Regional airports accommodated **622,400 operations** In 2022
- **2% higher** than 2019/21
- **Hanscom Field** was the **second busiest airport** by operations after Logan Airport

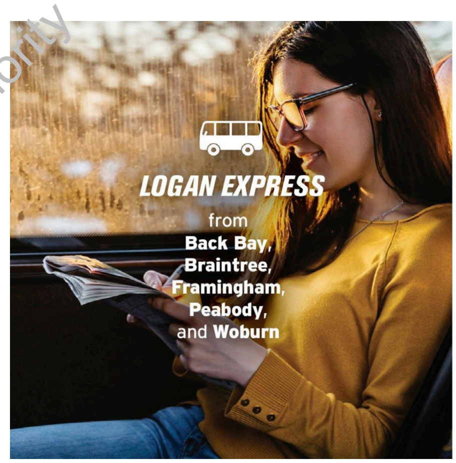


- General aviation traffic increased during the pandemic due to charter and private business jet activity but tapered off in 2022
- Worcester accommodated more than 200,000 passengers in 2023

Ground Access

In 2022 Ground Access mode share continued to show impacts from the pandemic

- Average weekday on-Airport vehicle miles traveled (VMT) was **164,625 average daily miles** traveled, **27.5% lower than in 2019**
- All types of ground transportation services increased ridership in 2022, a return to pre-pandemic usage levels
- *2022 Air Passenger Ground Access Survey* showed pandemic's impact on passenger travel choices [with more people using private automobiles]
- HOV mode share reached 38.4% exceeding Massport's goal of 35.5% HOV mode share by 2022.
- Post-pandemic, Logan Airport is expected to remain **a top U.S. airport for high-occupancy vehicle (HOV) and transit mode share**
- In 2022, Logan Airport continued to prioritize Long Term parking and comply with the Logan Airport Parking Freeze



Curbside Dwell Time Study in line with previous model assumptions

- As requested by the community, Massport conducted a curbside dwell time study to:
  - Better understand conditions at the curb (input to traffic model)
  - Inform emission calculations within the air quality analysis
- Terminal A curb was chosen as a pilot terminal due to ongoing construction at other terminals

Methodology

- Visual observations recorded how long various types of vehicles stayed at the curb throughout the average day
- Vehicle Types observed
  - Arrivals - taxis, airport shuttles, Silver Line and Logan Express buses, and personal vehicles
  - Departures – personal vehicles

Findings

- Observed dwell times are generally in line with those modeled
- Personal vehicle dwell times are longer during some times of the day, primarily outside of the peak travel times that are modeled (when fewer people are curbside)

Next Steps

- Massport plans to conduct dwell time studies for other terminal curbs as they are complete
- Findings will be used to inform the ESPR and EDR ground and air analyses
  - Updated dwell times are one of several components within modeling for on airport-emissions

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Noise Abatement

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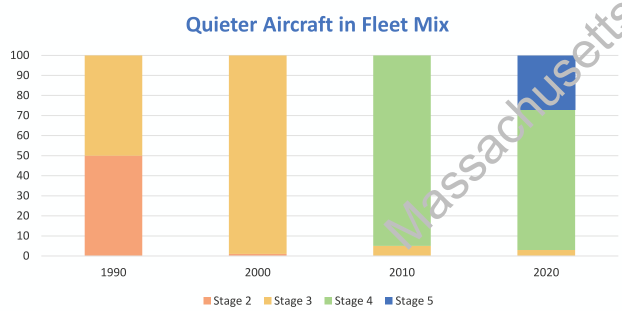
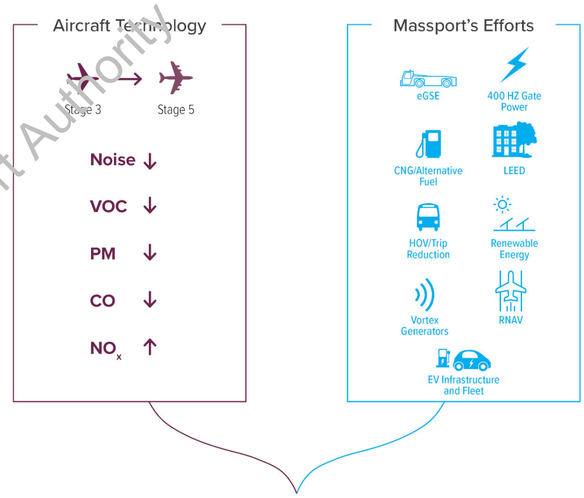
Technology improvements are resulting in reduced noise and air quality impacts

- Aircraft are getting quieter, moving from noisier Stage 2 aircraft to Stage 5 aircraft
- Aircraft and vehicle emissions are also getting cleaner
- Growing share of sustainable aviation fuel replacing jet fuel
- Vehicular emission factors have decreased due to improved engine efficiencies and growing share of EVs

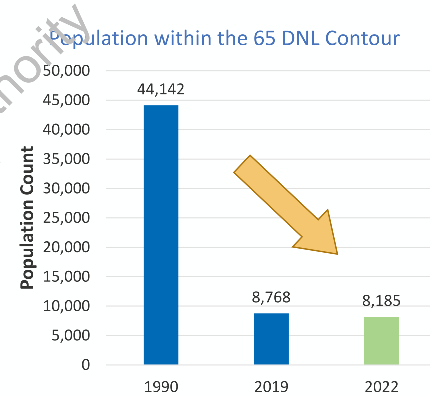




Aircraft engine technology has evolved over time

Population within DNL 65 dB contours remain well below historic peaks

- 2022 Day-Night level (DNL) noise contours are similar to and smaller than 2019 due to fewer aircraft operations and quieter aircraft fleets
- The 65 dB threshold is the standard used by the FAA
- 8,815 estimated population within the 2022 DNL 65 dB contour - **7% below 2019** level
- 2022 Nighttime aircraft operations were **14% of total operations**, with 83% occurring either before midnight or after 5:00 AM
  - Total nighttime flights was 26% less than in 2019



Massport recently upgraded its Noise Monitoring System

- Noise and Operations Monitoring System (NOMS) was upgraded **replacing 29 of 30 monitors**.
- Massport has invested over $170 million in sound insulation and sought additional funding for noise mitigation in 2022

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Modeled Noise Future Conditions

- The DNL 65 dB contour for the future planning horizon remains within areas included in Massport's Residential Sound Insulation Program
- The future planning horizon predicts 9,435 people exposed to noise levels of DNL 65 dB or greater, a 15.2% increase from 2022, but **still well below historic peaks**
- Aircraft in the future forecast fleet are expected to have **quieter and more efficient engines** than older aircraft in the current fleet
- The future forecast DNL contours are a **conservative estimate of future noise levels**, with actual noise levels expected to be lower due to advancements in aircraft technology
- Nighttime operations are expected to increase from 2022 to the future planning horizon, but remain below 2019 levels.
  - In the future planning horizon, nighttime flights will represent 14% of total operations

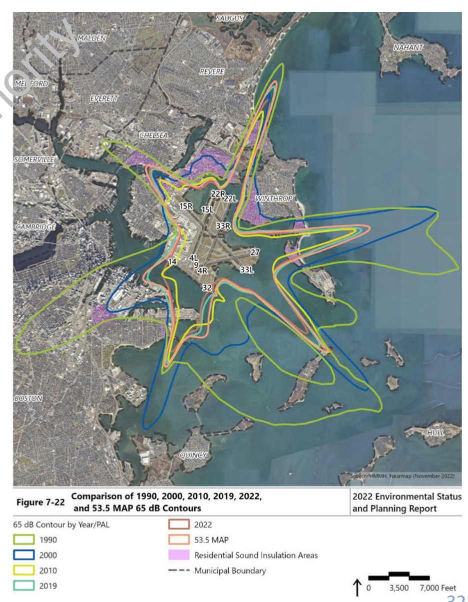

Figure 7-22 Comparison of 1990, 2000, 2010, 2019, 2022, and 53.5 MAP 65 dB Contours

2022 Environmental Status and Planning Report

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Air Quality and GHG Emissions Reductions

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Logan Airport and the Boston Metropolitan Area meet Federal Air Quality Requirements (i.e., NAAQS)

- Logan Airport is a part of the Boston Metropolitan Area as designated by the Clean Air Act (CAA)
- The CAA designates areas as either attainment, nonattainment, or attainment/maintenance in relation to the National Ambient Air Quality Standards (NAAQS)
- Boston Metropolitan Area meets all pollutant standards (attainment) as per NAAQS, except for Carbon Monoxide (CO)
  - The area is in a state of attainment/maintenance, meaning it is maintaining the standards without any measured exceedance since 1995

Air Quality Designation Status for the Boston Metropolitan Area

Pollutant	Designation
Ozone (8-hour, 2008 Standard)	Attainment
Ozone (8-hour, 2015 Standard)	Attainment
Carbon Monoxide (CO)	Attainment/Maintenance[1]
Nitrogen Dioxides (NO_2)	Attainment
Particulate Matter (PM_{10})	Attainment
Particulate Matter ($PM_{2.5}$)	Attainment
Sulfur Dioxide (SO_2)	Attainment
Lead (Pb)	Attainment

Source: U.S. Environmental Protection Agency (EPA), "Nonattainment Areas for Criteria Pollutants (Green Book)," accessed on August 30, 2023, https://www.epa.gov/green-book.

1 The Boston Metropolitan Area was redesignated to attainment/maintenance for CO on April 1, 1996. MassDEP released a Second 10-Year Limited Maintenance Plan in 2018, outlining strategies to keep CO levels below the NAAQS standards.

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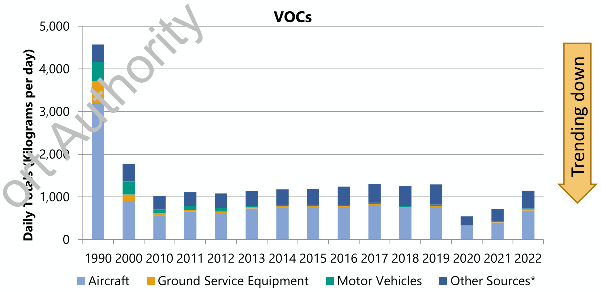
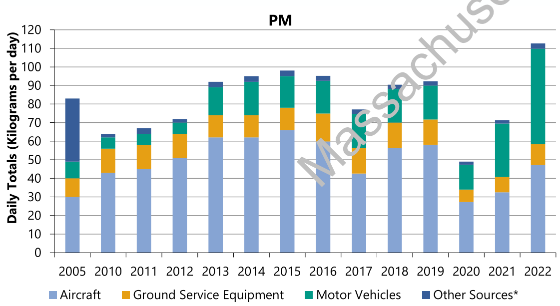
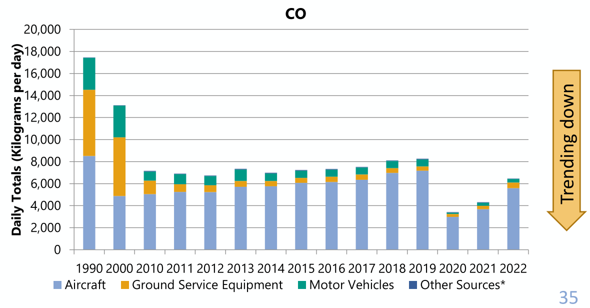
With new technology, reduction in VOCs and CO Emissions over the long run

- Criteria pollutants CO and VOCs are predicted to decrease in the future due to:
  - Changes in aircraft fleet mix and increased use of SAF
  - Conversion of fleet vehicles and GSE to EV or viable alternatives
  - Cleaner aircraft engine and motor vehicle technologies
- PM10/PM2.5 will also decrease over time, but model assumptions for motor vehicles reflect an increase for 2022







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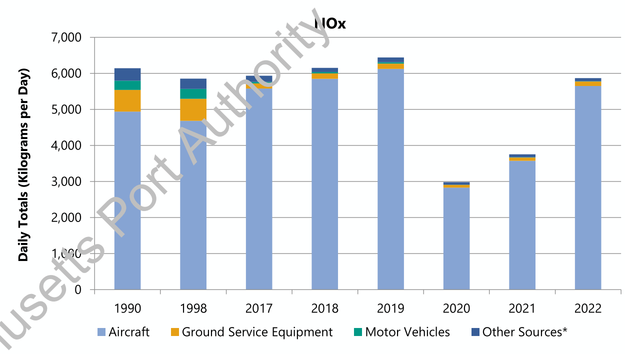
NOx has trended downward since 2019 due to reduced operations

- Most NOx emissions from aviation do not occur near the ground, and more than 90% occur above 3,000 feet.
- NOx will likely increase in the future due to:
  - Changing aircraft fleet and engine technology



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Logan Airport Scope 1 and 2 GHG emissions remain well below 2019 levels

- Reductions attributable to
  - Lower passenger and aircraft activity levels than 2019
  - Recategorized parking lots to Scope 3 in line with ACA reporting protocols
  - Substantial reduction in use of #2 Fuel (higher emission factor than other fuels)
  - Greater accuracy of monthly utilities data reporting

Logan Airport GHG emissions represent Less than 1 % of Massachusetts' emissions

- GHG emissions are anticipated to trend downwards due to:
  - Improved aircraft technology and increased use of SAF
  - Introduction of electric aircraft (in long-term)
  - Implementation of Massport's Net Zero GHG Roadmap

SCOPE	2019 MT of CO2e	2022 MT of CO2e	Percent difference
Scope 1 Emissions	51,360	31,415	-39%
Scope 2 Emissions	43,226	42,853	-1%
Scope 3 Emissions	713,539	511,452	-28%
Total Emissions	**808,125**	**585,720**	-28%
Percent of State Totals	**1%**	**<1%**	**<1%**

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Environmental Compliance and Management: Water Quality

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Environmental Compliance and Management

- Massport maintains a Spill Prevention Control and Countermeasure Plan (SPCC) for its facilities and require Tenants meeting certain thresholds to prepare their own SPCC for their facilities.
- Track Massport's and tenants' compliance with the Massachusetts Contingency Plan
- Provides status update on tank management plan
- Reports on compliance with water quality requirements according to state and federal regulations for the airport/stormwater outfalls and the Fire Rescue Fighting Facility

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Questions

For more information contact Brad Washburn at bwashburn@massport.com

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E.3 Environmental Justice and Public Health Existing Conditions Review Methodology Description

The following provides detailed methodology for the ESPR environmental justice (EJ) and public health existing conditions review:

- The Executive Office of Energy and Environmental Affairs' (EEA's) EJ Maps Viewer (EJ Maps Viewer) and Massachusetts Department of Public Health (DPH) Environmental Justice Tool (DPH EJ Tool) Vulnerable Health EJ Criteria by census tract data are added to an ArcGIS Pro project file for ease of reference and expanded capabilities.
    - This public health existing conditions review establishes a 1-mile radius from the Logan Airport boundary as the (Designated Geographic Area) DGA.
    - The EJ block groups, languages spoken, low birth weight by census tract, and elevated blood lead levels by census tract data layers were each intersected with the DGA layer. The ArcGIS Pro attribute tables were then exported to Excel.
- The EJScreen tool was used to establish the 13 EJ Indexes (indicators) by producing a Community Report.
    - To export the report, the DGA layer was brought into EJScreen as a zipped shapefile. Establishing a boundary in EJScreen produces a pop-up that then pulls percentile data relevant to the area within the boundary.
    - The Community Report was then downloaded as a PDF for that area.

E.3.1 Data Availability Limitations

Logan Airport's EDRs and ESPRs are status reporting and planning documents filed annually and every five years, respectively, and differ from traditional MEPA project filings. The EDRs and ESPRs report on cumulative impact conditions pertaining to Airport ground access, noise, air quality and water quality. Unlike an individual project, Logan Airport's activities and operations, and their related potential impacts, vary from year to year based on factors both within and outside of Massport's direct control, like airline service offerings or regional economic activity among others.

Most of the data provided by the DPH EJ Tool identify potential sources of burden, but do not provide these data at the granularity of the census tract level, except for the two Vulnerable Health EJ Criteria by census tract layers. For example, Vulnerable Health EJ Criteria by community data are at the municipality level, which is not easily delineated or extrapolated to the census tract or block group level. Thus, these data only provide a more qualitative representation and high-level view of a community's current conditions. Additionally, most of the air quality potential sources of pollution data are at the regional level and often similar to airport sources, and as a result, Logan Airport's impacts are not distinguishable from other transportation and pollution sources.

Most of the EJScreen data are proximity-based, and therefore provide possible existing burdens, but do not provide easily quantifiable metrics of burden. The degree or intensity of the burden created by a source of an environmental impact is not defined; just the distance from that source area to the community under assessment.

Additionally, noise burdens and annoyance factors, which are often a primary topic of community complaint, are not captured in either of these tools. However, Massport provides detailed noise impact assessment for each reporting year in the EDRs and ESPRs.

E.3.2 Environmental Justice Population – Detailed Findings

Error! Reference source not found. shows a summary of the EJ criteria for each block group; **bold font** and highlighted cells indicate the metrics that exceed MEPA EJ criteria thresholds.

Table E-2 Environmental Justice Block Group Summary

Block Group	Census Tract	Municipality	Total Population	Minority Population (%)	Median Household Income	Households with English Isolation	Languages Spoken
2.00	408.01	Boston	765	82.7	$31,151	8.3	Spanish (10.5%) and Chinese (9.2%)
1.00	501.01	Boston	1,643	76.6	$82,583	23.7	Spanish (34.5%)
2.00	501.01	Boston	1,389	76.4	$22,910	37.5	Spanish (34.5%)
3.00	501.01	Boston	1,885	71.9	$71,053	22.6	Spanish (34.5%)
1.00	502	Boston	2,140	72.9	$67,564	13.2	Spanish (49.1%)
2.00	502	Boston	1,238	64.5	$76,635	24.0	Spanish (49.1%)
3.00	502	Boston	788	71.3	$54,911	53.7	Spanish (49.1%)
4.00	502	Boston	1,031	78.6	$63,438	53.4	Spanish (49.1%)
1.00	503	Boston	1,475	55.2	$66,250	9.9	Spanish (24.3%)
2.00	503	Boston	777	79.0	$44,464	24.3	Spanish (24.3%)
3.00	503	Boston	1,006	57.6	$12,013	24.6	Spanish (24.3%)
1.00	504	Boston	603	73.0	$65,441	3.3	Spanish (36.5%)
2.00	504	Boston	1,769	47.6	$80,268	20.0	Spanish (36.5%)
1.00	505	Boston	2,174	57.1	$86,750	20.8	Spanish (45.7%)
1.00	506	Boston	1,162	68.7	$73,750	38.6	Spanish (60.0%)
2.00	506	Boston	912	63.0	$106,071	19.1	Spanish (60.0%)
1.00	507	Boston	1,766	72.5	$61,339	33.9	Spanish (49.8%)
2.00	507	Boston	1,341	71.9	$52,491	58.5	Spanish (49.8%)
3.00	507	Boston	1,413	71.3	$81,897	62.1	Spanish (49.8%)

Table E-2 Environmental Justice Block Group Summary

Block Group	Census Tract	Municipality	Total Population	Minority Population (%)	Median Household Income	Households with English Isolation	Languages Spoken
1.00	509.01	Boston	1,421	82.6	$76,591	36.4	Spanish (51.0%)
2.00	509.01	Boston	1,860	68.2	$81,250	18.3	Spanish (51.0%)
3.00	509.01	Boston	961	73.8	$37,333	43.4	Spanish (51.0%)
1.00	510	Boston	2,134	55.2	$66,845	15.9	Spanish (19.6%)
2.00	510	Boston	1,055	56.2	$21,438	15.5	Spanish (19.6%)
3.00	510	Boston	1,128	56.8	$84,784	8.0	Spanish (19.6%)
1.00	511.01	Boston	1,803	62.1	$67,930	26.4	Spanish (24.6%)
2.00	511.01	Boston	1,831	68.2	$48,707	28.9	Spanish (24.6%)
3.00	511.01	Boston	1,727	53.0	$121,875	0.0	Spanish (24.6%)
4.00	511.01	Boston	1,099	39.6	$77,870	4.5	Spanish (24.6%)
1.00	512	Boston	833	37.5	$150,313	25.7	Spanish (23.0%)
2.00	512	Boston	1,703	50.0	$69,103	8.5	Spanish (23.0%)
3.00	512	Boston	918	29.8	$90,917	7.3	Spanish (23.0%)
1.00	606.04	Boston	1,814	24.8	$243,719	0.7	-
2.00	606.04	Boston	989	24.7	$176,000	0.0	-
-	701.01[1]	Boston	-	-	-	-	Chinese (9.8%)
1.00	701.04	Boston	890	30.1	$129,792	5.4	-
2.00	701.04	Boston	610	31.5	$196,250	0.0	-
-	1601.01[1]	Chelsea	-	-	-	-	Spanish (49.8%)
1.00	1601.02	Chelsea	798	79.6	$59,201	25.7	-
2.00	1601.02	Chelsea	1,613	95.6	$63,469	39.3	-
3.00	1601.02	Chelsea	864	89.7	$81,313	7.4	-
4.00	1601.02	Chelsea	548	88.7	$25,451	34.1	-
1.00	1601.03	Chelsea	1,599	92.0	-	40.5	-
2.00	1601.03	Chelsea	1,081	93.3	$69,713	67.9	-
3.00	1601.03	Chelsea	994	75.8	$65,865	14.1	-
4.00	1601.03	Chelsea	972	75.2	$198,000	32.3	-
1.00	1602	Chelsea	1,393	92.7	$61,679	45.7	Spanish (60.8%)
2.00	1602	Chelsea	1,063	93.9	$40,450	59.0	Spanish (60.8%)
3.00	1602	Chelsea	852	90.7	$58,688	48.8	Spanish (60.8%)
4.00	1602	Chelsea	846	82.6	$51,827	21.6	Spanish (60.8%)

Table E-2 Environmental Justice Block Group Summary

Block Group	Census Tract	Municipality	Total Population	Minority Population (%)	Median Household Income	Households with English Isolation	Languages Spoken
1.00	1603	Chelsea	728	48.9	$78,427	20.5	Spanish (9.3%)
3.00	1605.02	Chelsea	1,616	80.0	$60,479	14.5	Spanish (28.6%)
5.00	1605.02	Chelsea	905	78.5	$67,818	24.2	Spanish (28.6%)
2.00	1706.01	Revere	1,719	61.4	$117,436	2.6	Spanish (16.3%)
1.00	1707.01	Revere	1,181	55.9	$34,420	7.4	Spanish (24.5%)
1.00	1708	Revere	1,974	52.5	$65,455	19.7	Spanish (13.7%)
2.00	1708	Revere	1,572	55.2	$53,420	4.6	Spanish (13.7%)
3.00	1708	Revere	1,184	53.1	$44,250	20.9	Spanish (13.7%)
4.00	1708	Revere	1,043	53.3	$76,974	22.8	Spanish (13.7%)
3.00	1801.01	Winthrop	766	19.2	$42,485	13.2	-
4.00	1801.01	Winthrop	2,320	28.6	$75,941	6.3	-
1.00	1802	Winthrop	1,429	26.2	$87,194	0.0	-
2.00	1802	Winthrop	749	18.3	$53,587	3.2	-
3.00	1802	Winthrop	695	20.9	$52,118	0.0	-
3.00	1805	Winthrop	1,244	30.9	$72,292	9.4	-
-	9801.01 [1]	Boston	-	-	-	-	Spanish (6.4%)
1.00	9813	Boston	79	31.6	$128,000	0.0	Spanish (20.2%)

1 These census tracts do not contain EJ block groups, but do include languages spoken by more than 5 percent of the population who do not speak English well or at all within the DGA.

E.4 Public Health Detailed

The following sections provide more detailed information on the public health existing conditions review than what was provided in Chapter 2, Section 2.5. The public health existing conditions review includes data from the DPH EJ Tool and EJScreen tool, per MEPA guidance.

E.4.1 Vulnerable Health EJ Criteria by Census Tract Detailed

Table E-3 provides data on the childhood blood lead and low birth weight Vulnerable Health EJ criteria, which are available by census tract. The table denotes whether the census tract contains an EJ block group or not, as well.

Table E-3 Vulnerable Health EJ Criteria by Census Tract

Census Tract	Municipality	EJ Block Group Within?	Meets Criteria (Greater than 110% of the Statewide Rate)?	
			Childhood Blood Lead	Low Birth Weight
303	Boston	No	No	Yes
305	Boston	No	No	No
408.01	Boston	Yes	No	No
501.01	Boston	Yes	Yes	Yes
502	Boston	Yes	Yes	No
504	Boston	Yes	Yes	No
505	Boston	Yes	Yes	No
506	Boston	Yes	Yes	No
507	Boston	Yes	No	No
509.01	Boston	Yes	Yes	Yes
510	Boston	Yes	No	Yes
511.01	Boston	Yes	No	No
512	Boston	Yes	Yes	Yes
606	Boston	No	No	Yes
701.01	Boston	No	No	Yes
1601.01	Chelsea	No	Yes	No
1602	Chelsea	Yes	Yes	Yes
1603	Chelsea	Yes	Yes	No
1605.02	Chelsea	Yes	Yes	Yes
1706.01	Revere	Yes	Yes	No
1708	Revere	Yes	No	No
1801.01	Winthrop	Yes	No	No
1802	Winthrop	Yes	Yes	No
1803.01	Winthrop	No	No	No
1804	Winthrop	No	Yes	No
1805	Winthrop	Yes	Yes	Yes
9801.01	Boston	No	No	No
9812.01	Boston	No	No	No
9812.02	Boston	No	No	No
9813	Boston	Yes	No	No

Table E-3 Vulnerable Health EJ Criteria by Census Tract

Census Tract	Municipality	EJ Block Group Within?	Meets Criteria (Greater than 110% of the Statewide Rate)?	
			Childhood Blood Lead	Low Birth Weight
9815.02	Boston	No	No	No
9816	Boston	No	No	No
9901.01	Winthrop	No	No	No

Source: DPH EJ Tool

Note: At the time of filing the 2022 ESPR, the DPH Vulnerable Health EJ Criteria were in the process of being updated to 2020 census tract boundaries. These are best available data at the time of filing, but may not directly align with EJ and EJScreen data that are based on 2020 boundaries.

E.4.2 Detailed List of Potential Sources of Pollution

Table E-4 provides data on potential sources of pollution as categorized by the DPH EJ Tool. The site lists are directly derived from the DPH EJ Tool, and therefore the names and particular spellings are the same as what is available in the database.

Table E-4 DPH EJ Tool Detailed List of Potential Sources of Pollution within the DGA

DPH Classification Category	Site Count and List
Large Quantity Toxic User	2: • Boston Ship Repair • Massachusetts Bay Brewing Company
Large Quantity Generators	42: • 150 Seaport Boulevard Project • Alamo Rent A Car LLC • Autozone Northeast Inc., DBA Autozone 3745 • Avis Budget CONRAC QTA 1 • Avis Rent A Car System Inc. • Avis Rent A Car System LLC • Boston Ship Repair • Boston Harbor Cruises • Boston Harbor Cruises • Boston Harbor Cruises • CVS 0140 • CVS 1265 • Delta Air Lines Inc. • Former Coastal Oil Of New England Inc. • East Boston Community Development Corporation • Enterprise Rent A Car • Enterprise Rent A Car Company Of Boston • Federal Express Corporation • CVS 619 • CVS Pharmacy 10517 • Ginkgo Bioworks • Glen Mor Fuel Oil Co. • Global Companies LLC

Table E-4 DPH EJ Tool Detailed List of Potential Sources of Pollution within the DGA

DPH Classification Category	Site Count and List
	• Gulf Oil Limited Partnership • Harbor Fuels • Hertz Corp 1798-01 • Hertz Corporation • HMS Scott Vessel • Hornblower Cruises And Events • HUSPP 250 Marginal LLC • Irving Oil Terminals Inc • Massport Authority Logbm-0147 • MBTA Silver Line Court House Station • M/V UBC Chile • Sapphiros Labs • Sunoco Partners Marketing & Terminals LP • Swissport Fueling Inc Dba BOSfuel Corp • Smartlabs 6 Tide • United Airlines Inc • U.S. Coast Guard • Vertex Pharmaceuticals Incorporated • Vertex Pharmaceuticals Incorporated
Air Operating Permits	5: • Boston Ship Repair • Gulf Oil Limited Partnership • Irving Oil Terminals Inc. • Massport Authority LOGBM-0147 • Sunoco Partners Marketing & Terminals LP
Hazardous Waste Recycler	0
Hazardous Waste Treatment, Storage/Disposal	10
MassDEP Tier Classified 21E Sites	27: • Amoco Petroleum Terminal - 3-0003550 • Dry Dock Area - 3-0030452 • Logan Airport - Former Building 6 - 3-0037749 • 1257 And 1263 Saratoga St - 3-0028293 • No Location Aid - 3-0029258 • Boston Fish Pier - 3-0031330 • Commercial Property - 3-0037901 • Gulf Oil Terminal - 3-0000163 • Wigglesworth Machinery Company - 3-0036436 • Intersection Of Highland And Suffolk STS - 3-0036450 • Commercial/Residential Property - 3-0035711 • Parking Lot Behind 276 Border Street - 3-0035829 • Commercial Property - 3-0035886 • Behind Moakley Courthouse - 3-0036865 • Boston Harbor At USCQ Base - Seneca - 3-0036396

Table E-4 DPH EJ Tool Detailed List of Potential Sources of Pollution within the DGA

DPH Classification Category	Site Count and List
	• New Shelby Auto Body and Repair - 3-0035990 • Bulk Terminal Tank #5 - 3-0034332 • Citgo Station - 3-0034875 • Logan International Airport - 3-0035047 • Silver Line Courthouse Station - 3-0037132 • East Pier, World Trade Center - 3-0037364 • 100 Salt Street - 3-0037464 • 2 Harbor Street - 3-0036957 • Boston Ship Repair - 3-0036959 • 143 Addison Street - 3-0037236 • 12-16 Revere Street - 3-0037239 • West End Of Parking Lot - 3-0037271 • Mario Umana Academy - 3-0036825
Tier II Facilities	52: • FedEx Express (BOSR) • Fidelity Real Estate Company • Fish Pier • Legal Sea Foods, LLC • Mass Bay Brewing Company, Inc • John Nagle Company • Jones Lang LaSalle Rowes Wharf • Logan International Airport • Channel Fish Co Inc • Charlestown Marina • BOS - Boston, MA - American Airlines • Delta Air Lines, Inc. - BOS • EAST BOSTON PRODUCT TERMINAL • Enterprise Rent-A-Car Company of Boston, LLC. • AT&T - USID41848 • Avis Budget Group, Inc. - CONRAC QTA # 1 - Boston-Logan International Airport • Avis Rent A Car System, LLC • BOSfuel Corporation/Swissport • BOSTON ALSF • Boston Area Operations - RAC - 1798-01 • Boston Harbor Shipyard & Marina • Boston Logan Int'l Airport - DTAG - RAC - Dollar 26510-02 • Boston Logan Int'l Airport - RAC - 1700-11 • Boston Logan Int'l Airport DTAG Thrifty RAC - 81001 • Boston Ship Repair, LLC. • Boston Yacht Haven • Biltrite Corporation • Commodity Forwarders Inc (BOS) • Irving Oil Terminals Inc. • Green Bus Depot

Table E-4 DPH EJ Tool Detailed List of Potential Sources of Pollution within the DGA

DPH Classification Category	Site Count and List
	• Harbor Fuels • Global Companies LLC f/k/a Global South Terminal • Global Companies LLC f/k/a Global South Terminal • Moakley Federal Courthouse • MOL Logistics (U.S.A.) Inc. Boston Branch • National Grid-Winthrop 22 • National Grid-Metcalf Square 96 • NSTAR Station 99 • Vertex Pharmaceuticals, Inc. • Vertex Pharmaceuticals, Inc. Bldg 1 • Vertex Pharmaceuticals, Inc. Bldg 2 • Verizon WINTHROP CO (VZ- MA577507) • United Airlines - Logan International Airport • US Coast Guard Base Boston • Verizon E BOSTON CO (MA577207) • NSTAR Station 488 • North Coast Seafoods • Paul Revere Transportation LLC Chelsea Garage • Porrazzo Rink • Suffolk Downs • Spaulding Rehabilitation Hospital • Signature Flight Support BOS
MassDEP Sites with Activity and Use Limitations (AULs)	81: • Vacant Lot - 3-0037349 • 100-110 Marginal Street - 3-0035962 • Clippership Wharf - 3-0033113 • No Location Aid - 3-0033143 • Former American Airlines - North Cargo - 3-0035030 • Former American Architectural Iron Co. - 3-0033527 • East Pointe Rehabilitation &Skilled Care - 3-0033774 • Boston EDIC - 3-0003124 • Terminal E - 3-0003179 • Robie Properties/Adj. To Logan Airport - 3-0010027 • Bellesteel Industries Inc. - 3-0003837 • Sumner Tunnel Ventilation Bldg - 3-0010550 • Corner Of Eastern Ave - 3-0010694 • Naval Shipyard Prcls 567 - 3-0003372 • Amerada Hess Corp - 3-0004332 • Massport Conley Terminal - 3-0004424 • Mobil Gasoline Station - 3-0004443 • Auto Dealership FMR - 3-0004611 • Butler Hanger FMR - 3-0004832 • Panam (FMR) Vandusen Tank Farm - 3-0004835 • Pier 4 Development Project - 3-0004064 • FMR Mobil Oil Corp Bulk Storage - 3-0001558

Table E-4 DPH EJ Tool Detailed List of Potential Sources of Pollution within the DGA

DPH Classification Category	Site Count and List
	• Chelsea Creek Headworks - 3-0002298 • Amoco Petroleum Terminal - 3-0003550 • Amoco Station v 2106 - 3-0000700 • American Airlines - 3-0000777 • Northeast Petroleum - 3-0000821 • Hertz Rent A Car - 3-0000956 • Butler Aviation Southeast - 3-0002690 • Harbor Gateway Industrial Park - 3-0002809 • Toyota Terminal - 3-0002835 • Texaco Inc S Boston Terminal 3 - 3-0000257 • Us Naval Fuel Depot FMR - 3-0000526 • MWRA Chelsea Creek Headworks - 3-0031365 • No Location Aid - 3-0014827 • No Location Aid - 3-0012741 • L Block Formerly Parcel 2 - 3-0019097 • Ft Banks Athletic Fields - 3-0017310 • No Location Aid - 3-0021897 • No Location Aid - 3-0017722 • Former Hodge Boiler Works - 3-0025307 • West Access Rd - 3-0013046 • Jeffries Point Lots 4438 To 4441 - 3-0017472 • American Architectural Iron Co. - 3-0016751 • Offsite Heating Oil Release - 3-0032323 • Willow/Suffolk/Congress/Highland - 3-0014181 • Massport Marine Terminal - 3-0026768 • No Location Aid - 3-0014027 • Logan Int'l Airport, Fire Training Fac. - 3-0028199 • FMR Perini Contractors Yard - 3-0014080 • Warehouse - 3-0022199 • Terminal - 3-0022200 • Old Rr Bed - 3-0022229 • No Location Aid - 3-0019346 • FMR 1000 Gallon UST - 3-0018331 • Global Tank Farm-Tank 25/Rte 1a - 3-0024602 • Porter And Cottage St - 3-0020180 • Logan Cargo Park - 3-0024813 • Ne Petroleum - 3-0013585 • Beachmont School - 3-0022311 • Coastal Oil WHSE - 3-0022385 • 6 Drydock Avenue - 3-0026301 • No Location Aid - 3-0016782 • Water Line Repairs/Sewer Line Repairs - 3-0026551 • Global South Term LLC Tank No 38 - 3-0023905 • No Location Aid - 3-0027313 • Fuel Deliv System Terms B And C - 3-0027353

Table E-4 DPH EJ Tool Detailed List of Potential Sources of Pollution within the DGA

DPH Classification Category	Site Count and List
	• 1257 And 1263 Saratoga St - 3-0028293 • Off Griffin Way Near Eastern Ave - 3-0012790 • No Location Aid - 3-0031132 • No Location Aid - 3-0031999 • Logan Airport, Southwest Service Area - 3-0032022 • Salesian School - 3-0028057 • No Location Aid - 3-0024948 • No Location Aid - 3-0014890 • Sunoco Logistics - 3-0031628 • No Location Aid - 3-0011673 • EDIC Meter Pit #4 - 3-0025471 • Willow/Suffolk/Congress/Highl - 3-0014339 • Former Robie Air Park - 3-0023493 • Proposed UAL GSE Facility - 3-0017652
MassDEP Groundwater Discharge Permits	0
Wastewater Treatment Plants	10 • Global South Terminal, LLC - MA0000825 • Atlantic Marine Boston, LLC - MA0040142 • New England Aquarium Corp. - MA0003123 • Tosco East Boston Terminal - MA0004006 • Union Wharf Condominium Trust - MAG250977 • Irving Oil Terminals, Inc. - MA0001929 • Gulf Oil - Chelsea - MA0001091 • Sterling Suffolk Racecourse LLC - MA0040282 • Massport Authority - Logan - MA0000787 • Massport - Logan Airport - MA0032751
Underground Storage Tanks	60 • Robert Wyatt Ent Inc. Dba Wyatt Mobil • Prescott Street Pumping Station • Localizer 4R LOC BOS • South Cargo Building 58 • Massport Authority Logan • Bolsters Citgo Energy To Go 2107 • Ventilation Building No. 5 • Former South Gate • Sterling Suffolk Racecourse LLC • Hilton Boston Logan Airport • Cumberland Farms 2003 • Chelsea Creek Headworks • Federal Aviation Administration • Fazio Enterprises Mobil • Hertz Corporation • Caruso Pump Station

Table E-4 DPH EJ Tool Detailed List of Potential Sources of Pollution within the DGA

DPH Classification Category	Site Count and List
	• Constitution Beach CSO Facility • Facilities II - Fuel Island • Logan Airport- Fire Rescue Headquarters • Facilities II - Auto Maintenance Shop • Shell Service Station 137748 • Pleasant Court Sewerage Pump Sta • Swissport Fueling Inc. DBA BOSfuel Corp. • United Airlines Inc. • Irving Oil Terminals Inc. • North Cargo Apron • North Outfall • MA Turnpike Authority Ops Control Center • Revere St Sewer Pumping Station • Green Valley Oil, LLC Station 30515 • United Airlines Inc. • North Cargo Apron • Cargo Building 58 • S&H Fuel Inc. DBA Stop & Fuel • Massport Authority Logan • Hess 21333 • ALSF-2/SSACR • South Cargo Ramp • Avis Rent A Car System Inc • Boston Harbor Ship Yard And Marina • Pleasant Park Yacht Club Inc. • Emergency Generator Terminal C - Pier C • Winthrop Golf Club • American Airlines Inc. • New Field Lighting Substation • South Cargo Building 57 • ALSF-2/SSACR • Pico Ave Sewage Pump Station • Fallon Properties LLC • Winthrop Department Of Public Works • Facility II - Fuel Island • Massport Conley Terminal Conbm-0004 • Logan Airport- Fire Rescue Headquarters • South Cargo Building 62 • Old Tower / Emergency Generator • Terminal C / Pier D / New Snow Melter # • West (South) Outfall • Logan Airport Citgo • Harbor Petroleum LLC • Ventilation Building #7
Toxic Release Inventory	21:

Table E-4 DPH EJ Tool Detailed List of Potential Sources of Pollution within the DGA

DPH Classification Category	Site Count and List
Toxic Release Inventory	• Gulf Oil LP, Chelsea Terminal (Toluene; 1,2,4-Trimethylbenzene; Benzo[g,h,i]perylene; Benzene; Naphthalene; Polycyclic aromatic compounds; Ethylbenzene; Lead; n-Hexane; Xylene (mixed isomers) • Irving Oil Terminals Inc. (1,2,4-Trimethylbenzene; Benzo[g,h,i]perylene; Toluene; Naphthalene; Xylene (mixed isomers); Benzene; Polycyclic aromatic compounds; n-Hexane; Ethylbenzene; Lead) • Boston Ship Repair LLC (Copper compounds)
Superfund Site Boundaries	0
Power Plants	2: • Massachusetts Bay Brewing Company • Spaulding Rehabilitation00000000000000000 Hospital

Source: DPH EJ Tool

E.4.3 EJScreen Environmental Justice Indexes

This section further explains the EJ Indexes that have a value within the DGA greater than the 80th percentile compared to the state and U.S. These EJ Indexes are defined by the EJScreen and indicate a potential existing burden or heightened risk of burden on EJ populations within the DGA, but are not specific to aviation activities and airport operations.

- **The Diesel Particulate Matter (PM)** indicator in EJScreen measures concentrations[1], and it is important to understand that the air toxics data presented in the EJScreen report provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations.

  The Diesel PM concentration in the DGA (0.492 µg/m^3) is higher than both the average concentrations in the state and in the USA (0.253 µg/m^3 and 0.261 µg/m^3). The DGA is proximate to major Boston metropolitan area roadways which are likely the local source of the majority of the Diesel PM.
- **Toxic Releases to Air** – This indicator is calculated from 2021 Risk-Screening Environmental Indicators (RSEI) Geographic Microdata results for the air pathway. The value represents RSEI-modeled toxicity-weighted concentrations of Toxic Release Inventory-listed (TRI-listed) chemicals in the air.2

  The DGA value is 3,200, which is higher than the state average (2,800) and lower than the national average (4,600).
- **Traffic Proximity** – This indicator consists of a count of vehicles (average annual daily traffic (AADT)) at major roads within 500 meters, divided by distance in meters as calculated from 2019 U.S. Department of Transportation traffic data. Indicators of residential proximity address exposures

1 Health Assessment Document For Diesel Engine Exhaust (Final 2002) https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=29060.

2 U.S. EPA, TRI-Listed Chemicals. March 2024. https://www.epa.gov/toxics-release-inventory-tri-program/tri-listed-chemicals.

relevant to the residences within a block group, but do not capture most exposures that occur away from the home, such as at work, at school or during a commute.

The DGA value for the Logan ESPR analysis is 1,200 daily traffic count/distance to road, which is greater than both the state average (630 daily traffic count/distance to road) and the national average (210 daily traffic count/distance to road).

- **Lead Paint** – This indicator provides the percentage of housing units built prior to 1960, as an indicator of potential lead paint exposure. Lead paint can be found in home environments as deteriorating lead-based paint (that was banned in 1978), microdust particulates mobilized during home renovations, or on other surfaces that could come into contact with food or otherwise be ingested.[3]

  The percentage of homes build pre-1960 within the DGA (65 percent) is higher than the state average (51 percent) and national averages (30 percent) but does not necessarily mean the lead exposure is greater than state and national exposure.

- **RMP Proximity** – The Risk Management Plan Rule implements Section 112(r) of the 1990 Clean Air Act amendments. The RMP Rule requires facilities that use extremely hazardous substances to develop an RMP. The existence of an RMP does not signify that a chemical accident has occurred. As with other proximity-based indicators, proximity alone may not represent an actual risk or possible exposure. RMP sites are included in EJScreen because of the potential adverse effects of an accidental release into the air.

  The state and national averages are 0.36 and 0.43 facilities/km distance, respectively, while the value in the DGA is higher at 0.56 facilities/km distance.

- **Hazardous Waste Proximity** – This indicator identifies the presence of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDFs) with permits issued by the appropriate regulatory agency. As with other proximity-based indicators, proximity alone may not represent actual risk or prior exposure.

  The state and national averages are 6.7 and 1.9 TSDFs/km distance, respectively, while the value in the DGA is 19 TSDFs/km distance.

- **Wastewater Discharge Indicator** – This indicator provides the Risk-Screening Environmental Indicators (RSEI) modeled toxic concentrations at stream segments within 500 meters, divided by distance in kilometers (km). As with all proximity-based indicators, proximity alone may not represent an actual risk or potential exposure.

  The output values from EJScreen identify the DGA's wastewater discharge proximity at (0.21 toxicity-weighted concentration/m distance) in comparison to the state average (0.2 toxicity-weighted concentration/m distance) and the national average of (22 toxicity-weighted concentration/m distance). The output values are inconsistent magnitudes and therefore exposure comparisons are difficult to determine.

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3 U.S. EPA, *Learn About Lead*. September 2022. https://www.epa.gov/lead/learn-about-lead.

E.4.4 EJScreen Community Report

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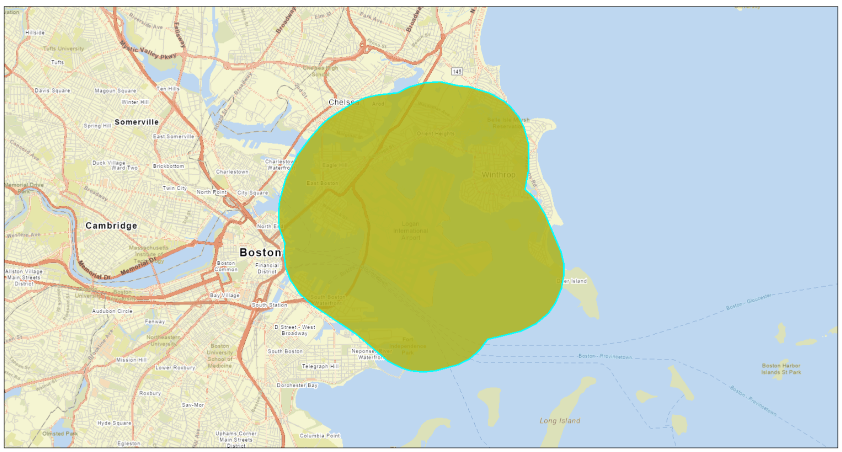
EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

Logan Airport, Boston, MA

the User Specified Area
Population: 79,838
Area in square miles: 15.41

A3 Landscape



March 27, 2024
Logan Airport
02_community benefits_ej
1:72,224
0 0.5 1 2 mi
0 1 2 4 km
Massport, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

COMMUNITY INFORMATION

Low income: 32 percent
People of color: 57 percent
Less than high school education: 21 percent
Limited English households: 18 percent
Unemployment: 9 percent
Persons with disabilities: 10 percent
Male: 51 percent
Female: 49 percent
67 years — Average life expectancy
$48,490 — Per capita income
Number of households: 29,835
Owner occupied: 34 percent

BREAKDOWN BY RACE

White: 43%
Black: 3%
American Indian: 0%
Asian: 4%
Hawaiian/Pacific Islander: 0%
Other race: 1%
Two or more races: 2%
Hispanic: 47%

BREAKDOWN BY AGE

LANGUAGES SPOKEN AT HOME

LANGUAGE	PERCENT
English	45%
Spanish	44%
French, Haitian, or Cajun	1%
Other Indo-European	5%

Chinese (including Mandarin, Cantonese)	2%
Vietnamese	1%
Arabic	1%
Other and Unspecified	1%
Total Non-English	55%

From Ages 1 to 4	**6%**
From Ages 1 to 18	**20%**
From Ages 18 and up	**80%**
From Ages 65 and up	**11%**

LIMITED ENGLISH SPEAKING BREAKDOWN

Speak Spanish	**81%**
Speak Other Indo-European Languages	**8%**
Speak Asian-Pacific Island Languages	**6%**
Speak Other Languages	**5%**

Notes: Numbers may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, American Community Survey (ACS) 2017 -2021. Life expectancy data comes from the Centers for Disease Control.

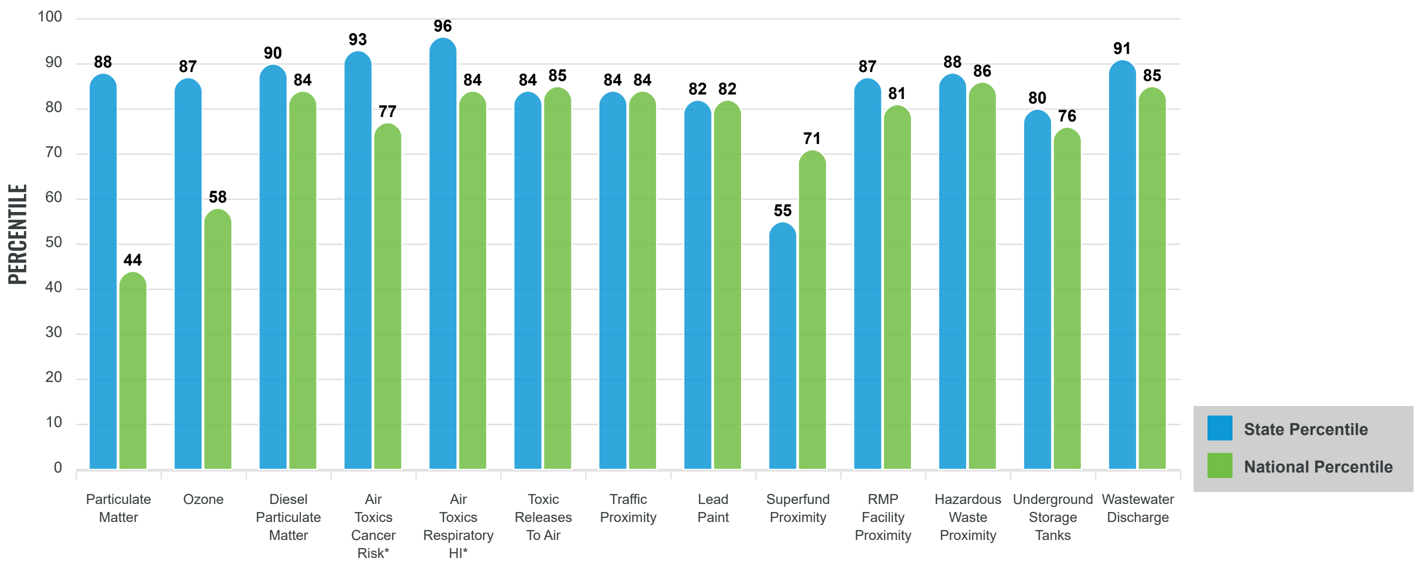
Environmental Justice & Supplemental Indexes

The environmental justice and supplemental indexes are a combination of environmental and socioeconomic information. There are thirteen EJ indexes and supplemental indexes in EJScreen reflecting the 13 environmental indicators. The indexes for a selected area are compared to those for all other locations in the state or nation. For more information and calculation details on the EJ and supplemental indexes, please visit the EJScreen website.

EJ INDEXES

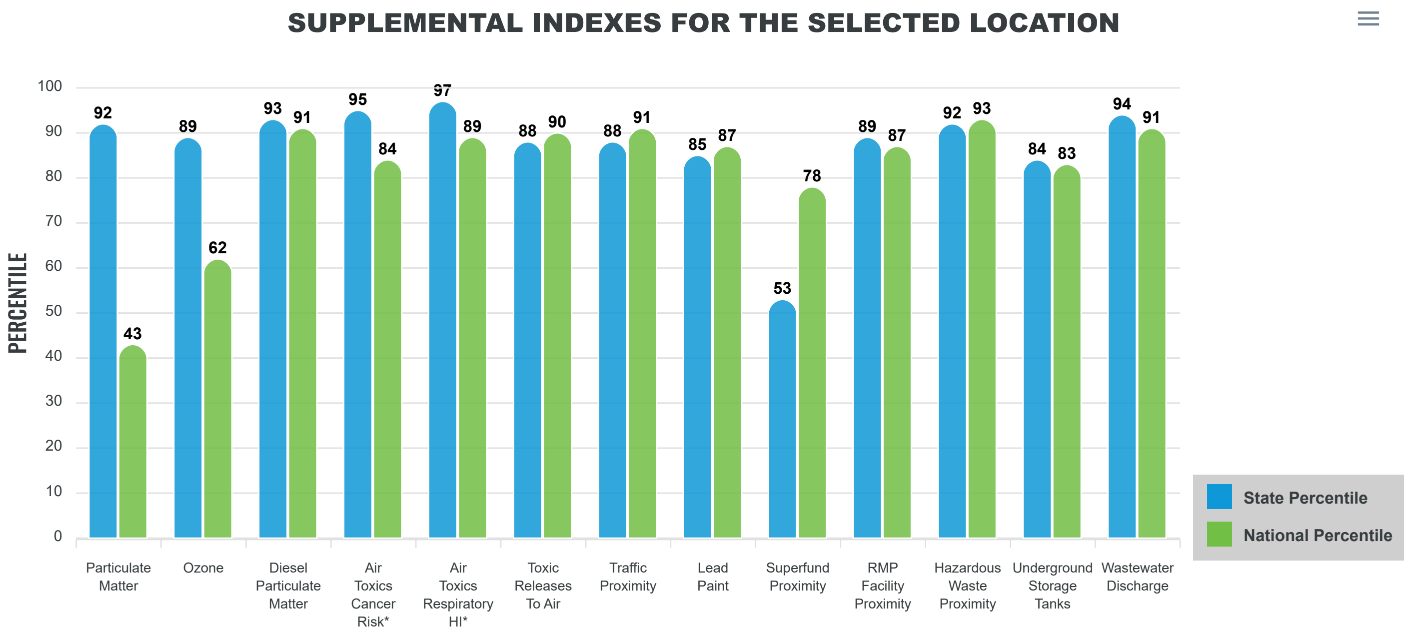
The EJ indexes help users screen for potential EJ concerns. To do this, the EJ index combines data on low income and people of color populations with a single environmental indicator.

EJ INDEXES FOR THE SELECTED LOCATION



SUPPLEMENTAL INDEXES

The supplemental indexes offer a different perspective on community-level vulnerability. They combine data on percent low-income, percent linguistically isolated, percent less than high school education, percent unemployed, and low life expectancy with a single environmental indicator.



These percentiles provide perspective on how the selected block group or buffer area compares to the entire state or nation.

Report for the User Specified Area

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
POLLUTION AND SOURCES					
Particulate Matter (µg/m^3)	7.11	6.62	74	8.08	22
Ozone (ppb)	59.4	58.3	73	61.6	35
Diesel Particulate Matter (µg/m^3)	0.492	0.253	90	0.261	90
Air Toxics Cancer Risk* (lifetime risk per million)	29	21	3	25	5
Air Toxics Respiratory HI*	0.39	0.26	49	0.31	31
Toxic Releases to Air	3,200	2,800	60	4,600	80
Traffic Proximity (daily traffic count/distance to road)	1,200	630	86	210	96
Lead Paint (% Pre-1960 Housing)	0.65	0.51	64	0.3	83
Superfund Proximity (site count/km distance)	0.066	0.18	23	0.13	53
RMP Facility Proximity (facility count/km distance)	0.56	0.36	81	0.43	78
Hazardous Waste Proximity (facility count/km distance)	19	6.7	90	1.9	99
Underground Storage Tanks (count/km^2)	4.1	3.4	71	3.9	73
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.21	0.2	96	22	85
SOCIOECONOMIC INDICATORS					
Demographic Index	45%	26%	81	35%	69
Supplemental Demographic Index	20%	12%	85	14%	80
People of Color	57%	30%	83	39%	70
Low Income	32%	22%	75	31%	58
Unemployment Rate	9%	5%	78	6%	77
Limited English Speaking Households	18%	6%	89	5%	92
Less Than High School Education	21%	9%	87	12%	82
Under Age 5	6%	5%	66	6%	60
Over Age 64	11%	17%	29	17%	31
Low Life Expectancy	17%	17%	48	20%	29

*Diesel particulate matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

Sites reporting to EPA within defined area:

Superfund 0
Hazardous Waste, Treatment, Storage, and Disposal Facilities 15

Other community features within defined area:

Schools 19
Hospitals 3

Water Dischargers	182
Air Pollution	54
Brownfields	4
Toxic Release Inventory	11
Places of Worship	7

Other environmental data:

Air Non-attainment	Yes
Impaired Waters	Yes

Selected location contains American Indian Reservation Lands*	No
Selected location contains a "Justice40 (CEJST)" disadvantaged community	Yes
Selected location contains an EPA IRA disadvantaged community	Yes

Report for the User Specified Area

EJScreen Environmental and Socioeconomic Indicators Data

HEALTH INDICATORS					
INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Low Life Expectancy	17%	17%	48	20%	29
Heart Disease	4.7	5.4	26	6.1	22
Asthma	10.9	10.8	59	10	75
Cancer	4.9	6.6	15	6.1	22
Persons with Disabilities	9.9%	11.9%	40	13.4%	31

CLIMATE INDICATORS					
INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Flood Risk	23%	12%	87	12%	88
Wildfire Risk	0%	0%	0	14%	0

CRITICAL SERVICE GAPS					
INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Broadband Internet	12%	10%	68	14%	54
Lack of Health Insurance	6%	3%	89	9%	43
Housing Burden	Yes	N/A	N/A	N/A	N/A
Transportation Access	Yes	N/A	N/A	N/A	N/A
Food Desert	Yes	N/A	N/A	N/A	N/A

Report for the User Specified Area

www.epa.gov/ejscreen

F. Activity Levels Supporting Documentation

This appendix provides detailed information and tables in support of Chapter 3, *Activity Levels and Forecasting*. The contents of this appendix are summarized below.

F.1 Activity Levels

F.1.1 Historical Air Passengers and Operations

Table F-1 Logan Airport Historical Air Passenger and Operations Data

Year	Operations	Air Passengers	Year	Operations	Air Passengers
1980	258,167	14,722,363	2002	392,079	22,696,141
1981	251,961	14,827,684	2003	373,304	22,791,169
1982	244,468	15,867,722	2004	405,258	26,142,516
1983	288,956	17,848,797	2005	409,066	27,087,905
1984	318,959	19,417,971	2006	406,119	27,725,443
1985	349,518	20,448,424	2007	399,537	28,102,455
1986	363,995	21,862,718	2008	371,604	26,102,651
1987	414,968	23,369,002	2009	345,306	25,512,086
1988	407,479	23,732,959	2010	352,643	27,428,962
1989	388,797	22,272,860	2011	368,987	28,907,938
1990	424,568	22,878,191	2012	354,869	29,235,643
1991	430,403	21,450,143	2013	361,339	30,218,631
1992	474,378	22,723,138	2014	363,797	31,634,445
1993	493,093	23,579,726	2015	372,930	33,449,580
1994	458,623	24,468,178	2016	391,222	36,288,042
1995	466,327	24,192,095	2017	401,371	38,412,419
1996	456,226	25,134,826	2018	424,024	40,941,925
1997	482,542	25,567,888	2019	427,176	42,522,411
1998	507,449	26,526,708	2020	206,702	12,618,128
1999	494,816	27,052,078	2021	266,034	22,678,499
2000	487,996	27,726,833	2022	378,613	36,090,716
2001	463,125	24,474,930			

Source: Massport and U.S. Department of Transportation, T-100 Database.

Table F-2 Logan Airport Changes in Domestic Passenger Operations by Carrier

Airline	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Scheduled Jet Carriers	**233,993**	**203,052**	**225,629**	**257,103**	**119,132**	**143,442**	**211,282**	**67,840**	**82.2%**
AirTran Airlines	3,090	13,672							
Alaska Airlines[1]		1,733	3,027	5,920	2,535	2,882	4,404	1,522	74.4%
Allegiant Air					184	1,063	1,154	91	
America West Airlines	5,116								
American Airlines[2]	30,821	21,313	56,623	50,150	24,634	27,917	40,356	12,439	80.5%
American Trans Air	1,448								
Continental Airlines	16,894	10,869							
Delta Air Lines[3]	52,954	28,980	30,705	37,496	18,552	27,343	41,917	14,574	111.8%
Frontier Airlines	1,052	1,094		1,211	674	1,006	1,145	139	94.5%
Hawaiian Airlines				425	132	380	422	42	99.3%
Independence Air									
JetBlue		49,981	79,364	104,571	46,789	54,122	83,400	29,278	79.8%
Midway Airlines	4,096								
Midwest Airlines	3,726	1,961							
Northwest Airlines	13,147								
People Express									
Southwest Airlines[4]		13,727	21,542	19,907	9,277	8,914	10,535	1,621	52.9%
Spirit Airlines		3,023	4,896	9,838	4,897	5,067	5,940	873	60.4%
Sun Country Airlines	723	313	1,414	288	121	358	414	56	143.8%
Trans World Airlines	6,280								
United Airlines[5]	28,092	16,314	24,632	27,297	11,337	14,390	21,595	7,205	79.1%
US Airways[6]	66,554	36,678							

Table F-2 Logan Airport Changes in Domestic Passenger Operations by Carrier

Airline	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Virgin America		3,394	3,426						
Regional/Commuter Carriers	**160,041**	**94,535**	**70,274**	**79,736**	**47,257**	**68,029**	**85,707**	**17,678**	**107.5%**
America West Express	1,267								
American Eagle	62,140	15,291	52	3,731	2,904	8,409	13,156	4,747	352.6%
Boutique Air				1,881	2,106	1,689	1,348	-341	71.7%
Cape Air	31,026	35,899	35,994	35,358	25,013	31,107	29,253	-1,854	82.7%
Continental Connection		1,809							
Continental Express		529							
Delta Connection	15,438	18,445	15,466	37,834	15,853	24,806	41,026	16,220	108.4%
MidAtlantic Express									
Midwest/Republic		258							
Northwest Airlink									
PenAir			3,747						
Republic Airlines			34						
Silver Airways				416	346				
United Express		2,802	4,699	516	1,035	2,018	924	-1,094	179.1%
US Airways Express	50,170	19,502	10,282						
Non-Scheduled Operations (Incl. Charter)	**1,008**	**501**	**176**	**109**	**34**	**84**	**137**	**53**	**125.7%**
Total Domestic Operations	**395,042**	**298,117**	**296,079**	**336,948**	**166,423**	**211,555**	**297,126**	**85,571**	**88.2%**

Source: Massport
Note: Excludes general aviation and all-cargo operations; Airlines listed without data populated conducted operations during specific intermittent annual periods not displayed above.
1 Alaska Airlines includes Virgin America beginning in 2018 (following 2016 acquisition).
2 American Airlines includes US Airways beginning in 2014 (following 2013 merger).
3 Delta Air Lines totals include Northwest Airlines beginning in 2009 (following 2008 merger).
4 Southwest Airlines include AirTran Airways beginning 2012 (following 2011 merger).
5 United Airlines totals include Continental Airlines beginning in 2011 (following 2010 merger).
6 US Airways totals in this chart include America West Airlines beginning in 2006 (following 2005 merger).

Table F-3 Logan Airport Changes in International Passenger Operations by Carrier

Airline	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Scheduled Jet Carriers	**27,427**	**20,697**	**28,225**	**39,284**	**15,009**	**19,965**	**33,525**	**13,560**	**85.3%**
Aer Lingus	1,160	1,097	1,973	1,860	868	655	1,910	1,255	102.7%
Aeromexico			345	16					
Air Berlin									
Air Canada	10,047	3,895	1,686	1,932	14	369	610	241	31.6%
Air Europa									
Air France	1,046	995	910	856	402	614	961	347	112.3%
Air Jamaica									
Air One									
Alitalia	729	624	562	550	72				
American Airlines[1]	4,657	2,422	571	183	181	550	899	349	491.3%
Astraeus									
Avianca				218					
British Airways	2,159	2,082	2,575	2,650	1,136	991	1,703	712	64.3%
Canadian Airlines	417								
Cathay Pacific			279	699	117	50	83	33	11.9%
Condor							104	104	
Copa Airlines			646	966	188	283	228	-55	23.6%
Delta Air Lines[2]	733	1,675	3,122	4,722	1,397	1,477	4,976	3,499	105.4%
Eastern Airlines					8	5		-5	
El Al			152	296	58		164	164	55.4%

Table F-3 Logan Airport Changes in International Passenger Operations by Carrier

Airline	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Emirates			914	719	306	454	702	248	97.6%
Eurowings									
Finnair									
FlyGlobespan									
Fly Play							453	453	
Frontier Airlines[3]						30	344	314	
Hainan Airlines			744	1,056	100				
Iberia Airlines[4]		435	336	859	132	158	696	538	81.0%
Icelandair	726	816	1,287	1,044	906	1,122	1,450	328	138.9%
ITA Airways[5]							484	484	
Japan Airlines			728	728	396	644	730	86	100.3%
JetBlue		2,262	6,488	9,520	5,084	7,771	8,403	632	88.3%
KLM Royal Dutch Airlines				263	251	304	364	60	138.4%
Korean Air Lines	314			367	208	314	366	52	99.7%
LACSA Airlines									
LATAM				476	129	5	54	49	11.3%
Lufthansa	1,140	1,657	1,687	1,703	511	866	1,446	580	84.9%
Northwest Airlines	744								
Norwegian Air Shuttle[6]			34	1,429	134				
Olympic Airways	256								
Primera Air									

Table F-3 Logan Airport Changes in International Passenger Operations by Carrier

Airline	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Qatar Airways				730	350	528	728	200	99.7%
Royal Air Maroc				161	50	2		(2)	
Sabena	724								
SATA International Airlines		403	542	809	288	409	648	239	80.1%
Scandinavian Airlines				369			389	389	105.4%
Spirit Airlines					538	621	777	156	
SWISS International	926	720	711	978	198	328	804	476	82.2%
TACA[7]				136					
TACV - Cabo Verde		240	60	112	42				
TAP - Air Portugal	200			644	328	525	965	440	149.8%
Thomas Cook Airlines				2					
Trans World Airlines									
Turkish Airlines			726	674	274	500	742	242	110.1%
United Airlines	728			21	1		528	528	2514.3%
US Airways		667							
VG Airlines									
Virgin Atlantic Airways	721	707	702	1,361	342	390	670	280	49.2%
WestJet Airlines				4			144	144	3600.0%
Wow Air			445	171					
Regional/Commuter Carriers	**15,594**	**12,494**	**14,153**	**15,149**	**3,787**	**2,675**	**9,628**	**6,953**	**63.6%**
Air Canada Regional[8]	4,088	7,065	10,024	8,910	2,913	2,054	4,557	2,503	51.1%

Table F-3 Logan Airport Changes in International Passenger Operations by Carrier

Airline	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
American Eagle Airlines	8,975	2,480					1,614	1,614	
Delta Connection	2,531	81	38	50					
Porter Airlines		2,868	4,091	3,959	562	603	2,839	2,236	71.7%
WestJet Encore				2,230	312	18	618	600	27.7%
Non-Scheduled Operations (Incl. Charter)	**2,141**	**305**	**248**	**43**	**49**	**24**	**32**	**8**	**74.4%**
Total International Operations	**45,162**	**33,496**	**42,626**	**54,476**	**18,845**	**22,664**	**43,185**	**20,521**	**79.3%**

Source: Massport.

Note: Excludes general aviation and all-cargo operations; Airlines listed without data populated conducted operations during specific intermittent annual periods not displayed above.

1 American Airlines includes US Airways beginning in 2014 (following 2013 merger).

2 Delta Air Lines totals include Northwest Airlines beginning in 2009 (following 2008 merger).

3 The 30 movements reported for Frontier Airlines in 2021 have been reallocated as scheduled movements in this ESPR, compared to the EDR 2020/2021 appendix E.

4 LEVEL Airlines service to Barcelona is operated by Iberia.

5 ITA (Italian state-owned) took over Alitalia, which went bankrupt in 2020, operations in late 2021. ITA announced it aims to reintroduce the Alitalia brand (pending as of 2023).

6 Norwegian Air Shuttle includes Norwegian UK.

7 TACA operated as Avianca El Salvador (parent company: Avianca Group); LACSA operated as Avianca Costa Rica (parent company: Avianca Group).

8 Air Canada Regional includes flights operated by Sky Regional Airlines and Jazz Air.

F.1.2 Historical Scheduled Destinations

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Domestic		**210,069**	**149,961**	**152,211**	**171,986**	**88,103**	**105,663**	**152,194**	**46,531**	**88.5%**
Akron/Canton	CAK		475	287						
Albany	ALB	3,433	647	1,095	360					
Albuquerque	ABQ									
Allentown/Bethlehem	ABE	780								
Asheville	AVL					32	116	210	94	
Atlanta	ATL	7,110	5,548	5,192	6,494	3,326	3,914	4,301	387	66.2%
Atlantic City Pomona	ACY		536	166				46	46	
Augusta	AUG	584	1,000	1,248	1,226	1,244	1,234	1,234		100.7%
Augusta	AGS							4	4	
Austin	AUS		365	444	1,122	452	1,007	1,734	727	154.5%
Baltimore	BWI	1,773	7,053	4,897	5,658	2,564	1,744	3,036	1,292	53.7%
Bangor	BGR	6,644					234	141	-93	
Bar Harbor	BHB	1,196	815	1,095	1,095	986	1,691	1,507	-184	137.6%
Bedford	BED					1	1		-1	
Binghamton	BGM									
Boise	BOI									
Bozeman	BZN					22	60	48	-12	
Buffalo	BUF	950	2,181	2,203	2,337	717	345	501	156	21.4%
Burbank	BUR				299	83				

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Burlington	BTV	5,913					214		(214)	
Charleston	CHS			365	1,034	515	935	1,061	126	102.6%
Charlotte	CLT	2,758	4,180	3,920	4,269	2,975	3,441	4,631	1,190	108.5%
Chicago Midway	MDW	868	1,756	1,531	1,538	964	943	1,252	309	81.4%
Chicago O'Hare	ORD	10,063	7,403	7,401	7,894	3,917	4,663	6,750	2,087	85.5%
Cincinnati	CVG	2,235	1,364	1,218	1,304	373	762	1,870	1,108	143.5%
Cleveland	CLE	2,797	1,369	2,070	2,202	823	1,106	1,646	540	74.7%
Cleveland Burke Lakefront	BKL						1		-1	
Columbia	CAE									
Columbus	CMH	2,708	972	1,081	1,453	329	743	1,501	758	103.3%
Corpus Christi	CRP									
Dallas Love Field	DAL			153	409	25				
Dallas/Fort Worth	DFW	5,002	2,938	3,406	3,126	2,144	2,382	3,374	992	107.9%
Dayton	DAY									
Denver	DEN	2,628	2,812	2,611	3,285	1,884	2,705	2,805	100	85.4%
Des Moines	DSM									
Detroit	DTW	2,937	2,353	3,875	3,615	1,977	1,860	2,461	601	68.1%
El Paso	ELP									
Elmira/Corning	ELM	441								
Flint	FNT							52	52	
Fort Lauderdale	FLL	3,327	2,370	2,258	3,047	2,289	3,530	2,719	(811)	89.2%

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Fort Myers	RSW	949	1,587	1,742	2,060	1,605	1,732	1,854	122	90.0%
Fort Walton Beach	VPS					29	96	56	(40)	
Grand Rapids	GRR						83	86	3	
Green Bay	GRB							1	1	
Greensboro	GSO	415								
Greenville/Spartanburg	GSP						1	1		
Harrisburg	MDT	1,307	551	325	330	117	135	297	162	89.9%
Hartford	BDL									
Hilton Head Island	HHH						45	19	-26	
Honolulu	HNL				210	67	190	211	21	100.7%
Houston	HOU			978	665	63	4	9	5	1.4%
Houston Intercontinental	IAH	1,995	1,717	1,831	1,584	916	1,380	1,606	226	101.4%
Hyannis	HYA	2,274	1,165	787	383	276	602	390	-212	101.9%
Indianapolis	IND	765	1,121	1,181	1,356	252	827	1,757	930	129.5%
Islip	ISP	4,222								
Ithaca	ITH	872								
Jackson	JAC						14		-14	
Jacksonville	JAX		365	767	1,900	554	943	1,290	347	67.9%
Kansas City	MCI	597	313	661	886	178	354	1,083	729	122.2%
Kansas City	MKC						1	1		
Key West	EYW					20	316	155	-161	

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Knoxville	TYS					26	93	109	16	
Las Vegas	LAS	1,098	756	1,162	2,092	1,014	1,072	1,492	420	71.3%
Lebanon	LEB		1,734	1,460	1,460	1,534	1,460	1,460		100.0%
Long Beach	LGB		459	292	403	96				
Los Angeles	LAX	3,647	3,382	4,456	5,248	2,382	3,431	4,684	1,253	89.2%
Louisville	SDF							185	185	
Madison	MSN					14	2	3	1	
Manchester	MHT									
Martha's Vineyard	MVY	3,863	3,218	2,731	2,596	1,558	1,850	2,376	526	91.5%
Massena	MSS				1,095	1,101	739	728	-11	66.5%
Memphis	MEM	972	1,048					177	177	
Miami	MIA	2,068	2,238	2,520	2,224	1,620	3,633	4,019	386	180.7%
Milwaukee	MKE	1,189	2,213	854	1,022	161	162	1,005	843	98.4%
Minneapolis	MSP	3,078	1,927	2,737	3,230	1,679	1,732	2,295	563	71.1%
Montrose	MTJ					4	16		-16	
Myrtle Beach	MYR	105	365	383	378	272	595	541	-54	143.1%
Nantucket	ACK	5,022	3,884	4,311	4,228	2,524	2,936	3,346	410	79.1%
Nashville	BNA	642		688	3,063	1,524	1,850	2,383	533	77.8%
New Orleans	MSY		348	365	914	427	314	752	438	82.3%
New York J F Kennedy	JFK	9,899	7,054	6,745	5,472	2,906	2,994	7,231	4,237	132.2%
New York La Guardia	LGA	11,872	11,705	9,352	10,893	3,619	3,384	8,879	5,495	81.5%

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
New York Newark	EWR	5,206	3,666	5,366	5,926	2,414	2,460	4,784	2,324	80.7%
Newport News	PHF		549							
Norfolk	ORF	838			249	22	224	155	-69	62.3%
Northwest Florida	ECP									
Oakland	OAK		195	88	44					
Oklahoma City	OKC									
Omaha	OMA									
Ontario	ONT									
Orlando	MCO	4,914	3,179	3,057	4,313	2,744	3,921	4,565	644	105.8%
Palm Springs	PSP				35	2	2	6	4	17.2%
Pensacola	PNS							81	81	
Philadelphia	PHL	11,785	6,548	7,971	7,907	3,660	3,005	4,826	1,821	61.0%
Phoenix	PHX	1,386	1,348	1,569	1,692	984	1,100	1,704	604	100.7%
Pittsburgh	PIT	3,086	2,312	2,457	3,485	1,096	1,092	2,115	1,023	60.7%
Plattsburgh	PBG		1,025	756						
Plattsburgh	PLB									
Pontiac	PTK									
Portland (ME)	PWM	6,267			368	365	633	102	-531	27.7%
Portland (OR)	PDX		352	519	746	157	326	408	82	54.7%
Presque Isle	PQI	1,835	991	991						
Providence	PVD	91				19	2	2		

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Provincetown	PVC	2,023	2,410	1,957	1,785	1,007	1,468	1,461	-7	81.8%
Raleigh/Durham	RDU	3,775	3,259	3,598	4,433	1,865	2,321	3,042	721	68.6%
Richmond	RIC	1,537	1,431	2,603	2,369	805	1,123	1,864	741	78.7%
Rochester	ROC	3,644	908	886	1,369	518	480	1,101	621	80.4%
Rockland	RKD	1,152	1,301	1,372	1,350	1,398	1,374	1,374		101.8%
Rutland	RUT	1,259	1,095	1,095	1,095	1,098	1,095	1,095		100.0%
Sacramento	SMF			48	88		52	110	58	125.2%
Salt Lake City	SLC	1,094	669	617	1,148	744	985	1,078	93	93.9%
San Antonio	SAT						48	336	288	
San Diego	SAN	366	571	1,052	1,232	630	819	1,251	432	101.6%
San Francisco	SFO	3,526	3,711	4,272	5,075	2,198	2,160	3,856	1,696	76.0%
San Jose	SJC	842	232	223	278	50	120	28	-92	10.1%
Saranac Lake	SLK		1,174	1,095	1,095	1,098	1,095	789	-306	72.1%
Sarasota/Bradenton	SRQ		82	212	306	251	399	345	-54	112.9%
Savannah	SAV			365	535	342	410	718	308	134.1%
Seattle/Tacoma	SEA	458	1,001	1,625	2,289	1,482	2,039	2,526	487	110.4%
South Bend	SBN							1	1	
Spokane	GEG									
St. Louis	STL	2,187	934	722	1,227	591	597	1,458	861	118.9%
St. Petersburg/Clearwater	PIE						1	2	1	
Steamboat Springs Hayden	HDN				30	30	28	25	-3	82.9%

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Syracuse	SYR	3,876	991	578	695	321	158	515	357	74.1%
Tampa	TPA	2,502	1,246	1,177	2,696	1,661	2,074	2,368	294	87.8%
Traverse City	TVC						85	100	15	
Trenton	TTN									
Tulsa	TUL									
Washington Dulles	IAD	8,625	4,625	2,505	1,444	834	959	1,371	412	95.0%
Washington National	DCA	8,474	9,419	8,678	9,246	4,170	5,256	11,267	6,011	121.9%
Watertown	ART									
West Palm Beach	PBI	1,674	1,450	1,650	1,978	1,235	1,065	1,636	571	82.7%
Westchester County	HPN	6,065		263		132		154	154	
Wichita	ICT									
Wilkes-Barre Scranton	AVP	584								
Williamsport	IPT									
Wilmington	ILM						70	210	140	
International		**23,711**	**18,761**	**21,765**	**27,504**	**9,700**	**10,888**	**21,896**	**11,008**	**79.6%**
Amsterdam	AMS	366	457	579	714	300	406	713	307	99.8%
Aruba	AUA	9	407	417	685	329	656	761	105	111.1%
Athens	ATH	74						67	67	
Barbados	BGI			9	74	27	44	66	22	89.5%
Barcelona	BCN				156	31		97	97	62.0%
Beijing/Peking	PEK			287	322	37				

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Bermuda	BDA	550	532	536	695	158	183	215	32	30.9%
Bogota	BOG				90					
Brussels	BRU	362								
Calgary	YYC							30	30	
Cancun	CUN		307	264	333	285	422	718	296	215.6%
Casablanca Mohamed V	CMN				79	31				
Charlottetown	YYG									
Chongqing	CKG									
Cologne/Bonn	CGN									
Connaught	NOC									
Copenhagen	CPH				196	1	2	204	202	103.9%
Doha	DOH				365	222	261	365	104	100.0%
Dubai	DXB			457	361	156	228	353	125	97.9%
Dublin	DUB	223	348	653	885	393	326	973	647	109.9%
Dusseldorf	DUS									
Edinburgh	EDI				92			92	92	100.0%
Fort De France	FDF			9						
Frankfurt	FRA	580	548	536	501	186	304	462	158	92.2%
Fredericton	YFC									
Freeport	FPO									
Funchal	FNC									

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Gander	YQX									
Glasgow	GLA									
Grand Cayman	GCM		17	26	30	31	6	22	16	72.6%
Halifax	YHZ	3,210	852	700	851	158		210	210	24.7%
Havana	HAV				52	13				
Helsinki	HEL									
Hong Kong	HKG			140	348	60	25	47	22	13.5%
Ilha Do Sal	SID				4	20	7		-7	
Istanbul	IST			365	339	145	247	370	123	109.1%
Las Palmas	LPA									
Lerwick Sumburgh	LSI									
Liberia	LIR			26	26	27	27	34	7	131.5%
Lisbon	LIS	44	26	44	414	125	259	630	371	152.2%
London Gatwick	LGW	362			365	79		150	150	41.1%
London Heathrow	LHR	2,187	2,331	2,026	2,336	841	859	2,221	1,362	95.1%
London Stansted	STN									
Madrid	MAD		218	166	353	35	78	252	174	71.3%
Manchester	MAN	26			48					
Mexico City	MEX			166	369	8				
Milan Malpensa	MXP	366								
Montego Bay	MBJ		126	56	126	66	119	136	17	108.2%

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Montreal Dorval	YUL	3,401	2,008	2,047	1,721	482	451	968	517	56.3%
Moscow Sheremetyevo	SVO									
Munich	MUC		313	357	365	75	126	326	200	89.3%
Nassau	NAS		180	136	187	202	50	158	108	84.4%
Nykoping	NYO									
Oslo	OSL									
Ottawa	YOW	2,575	744	630	639	132				
Panama City	PTY			334	486	109	141	113	-28	23.2%
Paris De Gaulle	CDG	898	710	916	898	274	309	786	477	87.5%
Pointe-A-Pitre	PTP			9						
Ponta Delgada	PDL	30	165	196	340	163	185	273	88	80.4%
Port Au Prince	PAP			26	122	69	127	4	-123	3.3%
Porto	OPO									
Praia	RAI		121	30	48	13	2		-2	
Providenciales	PLS	4	39	86	86	81	72	108	36	125.0%
Puerto Plata	POP	4		26	30	16	16	44	28	145.3%
Punta Cana	PUJ		95	174	265	78	76	323	247	122.0%
Quebec	YQB	1,229								
Reykjavik Keflavik	KEF	393	404	854	612	225	409	861	452	140.7%
Rome Leonardo Da Vinci-Fiumicino	FCO		313	271	402	40	37	412	375	102.5%
Saint Lucia Hewanorra	UVF			26	30	26	43	45	2	148.6%

Table F-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2019	2020	2021	2022	2021-2022 Change	2022 % of 2019
Saint Maarten	SXM		39	56	35	33	65	72	7	205.7%
Saint Thomas	STT	78	125	184	83	94	213	156	-57	188.3%
San Juan	SJU	1,750	1,294	1,068	1,011	1,098	1,183	1,507	324	149.1%
San Salvador	SAL				86					
Santiago	STI			206	475	338	636	390	-246	82.1%
Santo Domingo	SDQ		305	365	627	425	661	435	-226	69.4%
Sao Paulo Guarulhos	GRU				235	70	3	28	25	11.9%
Sao Vicente	VXE		4							
Seoul Incheon	ICN				184	105	157	182	25	99.1%
Shanghai Pu Dong	PVG			83	209	24				
Shannon	SNN	366	213	352	241	73		295	295	122.6%
Stockholm Arlanda	ARN									
Tel Aviv	TLV			75	148	31		177	177	119.6%
Terceira	TER	44	17	31	70	23	20	51	31	73.3%
Tokyo Narita	NRT			365	365	169	208	284	76	77.8%
Toronto	YYZ	3,691	3,603	2,799	3,671	1,072	786	2,733	1,947	74.5%
Toronto Island	YTZ		1,535	2,236	2,032	296	300	1,473	1,173	72.5%
Vancouver	YVR	366			92			100	100	108.7%
Zurich	ZRH	523	365	365	501	100	153	404	251	80.7%
Total Scheduled Carrier Departures		**233,780**	**168,722**	**173,976**	**199,491**	**97,803**	**116,551**	**174,090**	**57,539**	**87.3%**

Note: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.
Source: OAG Schedules.

F.2 Derivative Forecasts

Derivative forecasts based on the Future Planning Horizon were developed to support the air quality, noise, and Vehicle Miles Traveled (VMT) analyses for the 2022 ESPR. The derivative forecasts include:

- Annual aircraft operations by aircraft type (to support air quality modeling);
- Average daily arriving and departing operations by aircraft type and stage length (to support noise modeling); and
- Peak month, average day arriving and departing origin-destination passengers by time of day (to support VMT modeling).

F.2.1 Operations by Aircraft Type

Table F-5 provides a detailed summary of the Future Planning Horizon forecast by user category and aircraft type.

Table F-5 Forecast Logan Airport Operations by Aircraft Type, Actual 2022 and Future Planning Horizon

Category/Aircraft Type	2022 Operations	Future Planning Horizon Operations
Passenger Airlines		
Airbus A220-100	10,530	19,520
Airbus A220-300	12,029	25,140
Airbus A319	15,738	7,540
Airbus A319 neo	0	19,110
Airbus A320	24,492	15,575
Airbus A320 neo	2,668	19,050
Airbus A321	51,586	40,100
Airbus A321 neo	9,246	39,550
Airbus A330-200	5,242	0
Airbus A330-300	3,163	3,490
Airbus A330-900 neo	842	5,909
Airbus A340-300	321	0
Airbus A340-600	563	0
Airbus A350-900	757	2,500
Airbus 350-1000	101	1,480
Airbus A380	371	885
Boeing 717-200	7	0

Table F-5 Forecast Logan Airport Operations by Aircraft Type, Actual 2022 and Future Planning Horizon

Category/Aircraft Type	2022 Operations	Future Planning Horizon Operations
Boeing 737-700	7,648	4,210
Boeing 737 Max 7	0	12,550
Boeing 737-800	21,889	11,560
Boeing B737 Max 8	2,305	19,200
Boeing 737-900	12,499	10,020
Boeing B737 Max 9	7,050	20,050
Boeing B737 Max 10	0	20,050
Boeing 747-400	474	0
Boeing 747-8	0	960
Boeing 757-200	6,271	0
Boeing 757-300	82	800
Boeing 767-300	2,802	0
Boeing 767-400	535	0
Boeing 777-200	1,059	3,125
Boeing 777-300	2,577	4,980
Boeing 777-9	0	2,630
Boeing 787-8	216	0
Boeing 787-9	1,586	4,090
Boeing 787-10	144	3,110
Ilyushin	20	0
Challenger 604	4	0
CanadairRJ-200	10	0
Canadair CRJ-900	4,907	10,023
Cessna C-402	25,589	8,610
Cessna C208	6	0
Cessna Citation Ii	8	0
DHC Dash-8-400	4,083	6,340
Embraer 145	2,961	1,877
Embraer 170	515	350
Embraer 175	52,480	55,689
Embraer 190	40,159	0

Table F-5 Forecast Logan Airport Operations by Aircraft Type, Actual 2022 and Future Planning Horizon

Category/Aircraft Type	2022 Operations	Future Planning Horizon Operations
Embraer 195	0	23,899
Embraer 195-E2	0	3,140
Gulfstream G650	6	0
Pilatus PC-12	1,386	2,040
Tecnam P2012	3,385	23,773
Subtotal	**340,311**	**452,925**
Cargo Airlines		
Airbus A300-600	640	0
Boeing 767-200	137	0
Boeing 767-300	6,334	8,663
McDonnell Douglas MD-10	2	0
McDonnell Douglas MD-11	213	0
Boeing 757-200	64	743
Cessna 208	381	495
Beech-99	27	0
Subtotal	**7,798**	**9,900**
General Aviation (GA)		
Piston	1,581	1,667
Business Jet	24,080	25,740
Turboprop	3,737	3,941
Helicopter	1,109	826
Subtotal	**30,507**	**32,175**
Grand Total	**378,613**	**495,000**

Source: Massport and InterVISTAS.
Notes: Future Planning Horizon represents a 10- to 15-year planning horizon.
Totals may not add due to rounding.

F.2.2 Operations by Stage Length and Time-of-Day

A forecast of aircraft operations by stage length and time of day has also been developed for the Future Planning Horizon, with consideration of the fleet mix expectations presented above, and historical data on operations. The stage length assumptions are summarized in **Table F-6**. Passenger flights with stage lengths up to 500 miles are forecast to continue representing the largest share of operations at Logan

Airport. This is consistent with historical trends. As shown, larger aircraft are used to serve longer-duration flights, such as international flights to Asia, Europe, and South America.

Table F-6 Stage Length Assumptions, Total Passenger Airline Operations, Future Planning Horizon

Stage Length (nm)	Piston	TP ≤ 50 seats	RJ ≤ 50 seats	TP 51-99 seats	RJ 51-99 seats	Jet 100-149 seats	Jet 150-199 seats	Jet ≥ 200 seats	Total	Percent of Total
0 to 500	32,383	2,040	1,877	6,340	36,908	60,727	35,896	-	176,172	38.9%
501 to 1,000	-	-	-	-	26,008	30,293	37,228	-	93,529	20.7%
1,001 to 1,500	-	-	-	-	3,146	14,505	44,086	-	61,738	13.6%
1,501 to 2500	-	-	-	-	-	9,583	50,599	400	60,581	13.4%
2,501 to 3,500	-	-	-	-	-	-	27,346	19,606	46,952	10.4%
3,501 to 4,500	-	-	-	-	-	-	-	5,609	5,609	1.2%
4,501 to 5,500	-	-	-	-	-	-	-	2,992	2,992	0.7%
Over 5,500	-	-	-	-	-	-	-	5,352	5,352	1.2%
Total	**32,383**	**2,040**	**1,877**	**6,340**	**66,062**	**115,109**	**195,155**	**33,959**	**452,925**	**100%**

Source: InterVISTAS.
Notes: Future planning horizon represents a 10-year to 15-year planning horizon.
Totals may not add due to rounding.
Stage length is measured in nautical miles (nm).
TP stands for Turboprop.
RJ stands for Regional jet.
NB stands for Narrow-body jet.
WB stands for Wide-body jet.

Table F-7 summarizes stage length assumptions for cargo airline operations. The profile of cargo operations by stage length is based primarily on the distribution observed in 2022.

Table F-7 Stage Length Assumptions, Cargo Operations, Future Planning Horizon

Stage Length (nm)	Non-Jet	Narrowbody Jet	Widebody Jet	Total	Percent of Total
0 to 500	495	149	1,261	1,904	19.2%
501 to 1,000	-	186	4,549	4,735	47.8%
1,001 to 1,500	-	149	2,460	2,608	26.3%
1,501 to 2500	-	260	208	468	4.7%
2,501 to 3,500	-	-	184	184	0.0%
Total	495	743	8,662	9,900	100%

Source: InterVISTAS.
Notes: Future planning horizon represents a 10-year to 15-year planning horizon.
Totals may not add due to rounding.
Stage length is measured in nautical miles (nm).

Table F-8 summarizes arrival and departure times of passenger, cargo, and General Aviation (GA) flights organized by stage length. Nighttime hours are defined as 10:00 PM to 7:00 AM. The results are based on assumptions regarding future development of flight schedules.

Table F-8 Time-of-Day Assumptions by User Category and Stage Length, Future Planning Horizon

User Category / Stage Length (nm)	Arrivals Day	Arrivals Night	Departures Day	Departures Night
Passenger Airlines				
0 to 500	89.5%	10.5%	89.8%	10.2%
501 to 1,000	83.8%	16.2%	89.6%	10.4%
1,001 to 1,500	74.3%	25.7%	89.0%	11.0%
1,501 to 2500	64.9%	35.1%	91.2%	8.8%
2,501 to 3,500	94.5%	5.5%	76.5%	23.5%
3501-4500	99.8%	0.2%	98.2%	1.8%
4501-5500	27.0%	73.0%	76.8%	23.2%
5501+	97.1%	2.9%	58.4%	41.6%
Cargo Airlines				
0-500	70.5%	29.5%	41.6%	58.4%
501-1000	69.8%	30.2%	57.0%	43.0%
1001-1500	90.0%	10.0%	90.3%	9.7%
1501-2500	50.0%	50.0%	50.0%	50.0%

Table F-8 Time-of-Day Assumptions by User Category and Stage Length, Future Planning Horizon

User Category / Stage Length (nm)	Arrivals Day	Arrivals Night	Departures Day	Departures Night
2501-3500	50.0%	50.0%	50.0%	50.0%
General Aviation				
0-500	92.4%	7.6%	92.8%	7.2%
501-1000	91.1%	8.9%	96.4%	3.6%
1001-1500	90.7%	9.3%	95.0%	5.0%
1501-2500	76.8%	23.2%	93.1%	6.9%
2501-3500	90.0%	10.0%	79.2%	20.8%

Source: InterVISTAS.
Notes: Future Planning Horizon represents a 10- to 15-year Future Planning Horizon.
Totals may not add due to rounding
Stage length is measured in nautical miles (nm).

F.2.3 Peak Month, Average Day Hourly Forecast

The peak month, average day passenger forecast reflects an average busy weekday during the peak month at Logan Airport in terms of passenger numbers. The peak month is usually a summer month as more people travel due to summer vacations. In 2022, the peak month for passenger traffic was August, and the selected busy day was Tuesday, August 2, 2022. The percentage of Origin and Destination (O&D) passengers was determined from U.S. Department of Transportation T-100 data for the month of August by airline and airport.

Table F-9 shows the peak month average day local passengers for domestic and international destinations. 2022 represents actual data, while the Future Planning Horizon is forecasted data for the 10- to 15-year horizon. As shown, the portion of domestic local passengers and portion of international local passengers in the Future Planning Horizon as compared to 2022. International local traffic is anticipated to increase marginally. Peak month average day domestic passenger traffic is 4.6 percent higher than average day domestic traffic, and peak month average day international passenger traffic is 5.9 percent higher than average day international traffic in the Future Planning Horizon. This reflects a gradual flattening of the peaks throughout the year. Peak month average day local domestic passengers and international passengers increase in the future planning horizon compared to 2022 levels.

Table F-9 Peak Month Average Day Local Passengers, 2022 Base Year and Future Planning Horizon

	2022 Domestic	2022 International	Future Planning Horizon Domestic	Future Planning Horizon International
Annual Enplaned + Deplaned Passengers	29,527,910	6,450,000	41,826,300	11,556,000
Percent Peak Month	9.35%	11.80%	9.21%	10.53%
Peak Month Enplaned + Deplaned Passengers	2,760,000	761,000	3,854,202	1,217,116
Percent Local	94.1%	87.8%	94.1%	88.3%
Peak Month Local Passengers	2,598,315	668,326	3,627,707	1,074,400
Peak Month, Average Day Local Passengers	85,906	19,524	119,898	33,522
Peak Month, Average Day as Percent of Average Day	106.2%	110.5%	104.6%	105.9%

Source: Massport and InterVISTAS.
Notes: Future planning horizon represents a 10-year to 15-year planning horizon.

Forecast peak month, average day passengers are also distributed by terminal, as shown in **Table F-10.** The terminal distribution forecast for the Future Planning Horizon assumes the airline locations from a proposed Massport future gate allocation plan. According to this plan, Terminal B has the majority of narrowbody aircraft equivalent gates, followed by Terminal C, then Terminal A. Terminal E has the least number of gates allocated in the Future Planning Horizon, but does represent an increase of 4 gates the 2022 distribution. The forecast also assumes that the share of passengers using Terminal E will increase once planned renovations are complete.

Table F-10 Actual and Assumed Future Distribution of Passengers by Terminal

Terminal	Narrowbody Equivalent Gates	Percent of Total	2022 ADPM Passengers	Future Planning Horizon ADPM Passengers
A	21	19.3%	23.3%	22.8%
B	41	37.6%	36.2%	34.3%
C	27	24.8%	26.8%	25.7%
E	20	18.3%	13.6%	17.3%
Total Airport	109	100%	100%	100%

Source: Massport and InterVISTAS.
Notes: Future planning horizon represents a 10-year to 15-year planning horizon.

Actual and forecast local passengers by terminal for the peak month, average day are shown in **Table F-11**. Domestic passenger numbers are forecast to increase by approximately 34,000, and international passengers are forecast increase by approximately 14,000 in the Future Planning Horizon, as compared to 2022 levels.

Table F-11 Peak Month Average Day Local Passengers by Terminal, 2022 Actual and Future Forecast

Terminal	2022 Domestic	2022 International	Future Planning Horizon Domestic	Future Planning Horizon International
A	22,224	1,746	31,258	2,718
B	37,660	2,163	51,879	3,157
C	24,774	2,952	33,768	4,834
E	1,248	12,663	2,993	22,813
Total Airport	85,906	19,524	119,898	33,522

Source: InterVISTAS.
Notes: Future planning horizon represents a 10-year to 15-year planning horizon.

The hourly distribution of local passengers by terminal in 2022 was developed using published flight schedules, which provide departure and arrival times, seat counts, and airline assignments by terminal. The hourly distribution of local passengers by terminal for the average day, peak month in 2022 is provided in **Table F-12**.

Table F-13 provides the hourly distribution of local passengers by terminal for the average day, peak month in the future planning horizon. The peak hour for arriving and departing local passengers at each terminal remains the same in the future planning horizon except for Terminal E arrivals which have shifted to earlier in the afternoon. This is primarily due to the timing of additional international arriving flights in the future planning horizon flight schedule.

Table F-12 Terminal Distribution of Local Passengers by Hour for an Average Day Peak Month, 2022

Hour	Terminal A		Terminal B		Terminal C		Terminal E		Total Airport		
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Total
00:00-00:59	1.5%	0.0%	3.9%	0.0%	1.4%	0.0%	0.0%	0.0%	2.1%	0.0%	1.1%
01:00-01:59	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.3%
02:00-02:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
03:00-03:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
04:00-04:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
05:00-05:59	0.0%	1.2%	1.6%	3.8%	6.6%	2.4%	0.0%	0.0%	2.3%	2.4%	2.3%
06:00-06:59	2.9%	7.3%	2.3%	11.6%	1.7%	5.6%	0.0%	0.0%	1.9%	7.7%	4.8%
07:00-07:59	3.5%	12.3%	2.3%	7.4%	3.7%	10.6%	5.0%	4.4%	3.4%	9.1%	6.2%
08:00-08:59	4.0%	8.6%	2.2%	8.6%	2.5%	10.0%	4.2%	1.0%	3.0%	8.2%	5.6%
09:00-09:59	4.3%	3.5%	4.0%	5.1%	1.5%	6.5%	0.0%	7.0%	2.8%	5.3%	4.0%
10:00-10:59	7.6%	5.6%	5.9%	3.6%	5.7%	5.0%	5.3%	4.0%	6.1%	4.5%	5.3%
11:00-11:59	3.0%	6.7%	4.2%	6.7%	2.7%	6.3%	3.3%	4.3%	3.4%	6.3%	4.9%
12:00-12:59	3.7%	4.0%	7.0%	7.3%	4.0%	2.3%	7.0%	4.0%	5.5%	4.8%	5.2%
13:00-13:59	5.9%	4.5%	4.6%	4.4%	9.0%	3.4%	8.9%	6.5%	6.6%	4.4%	5.5%
14:00-14:59	4.4%	2.8%	9.3%	4.5%	4.0%	7.1%	11.4%	0.0%	7.2%	4.3%	5.8%
15:00-15:59	9.6%	4.3%	4.4%	8.2%	7.6%	2.5%	12.2%	1.0%	7.5%	4.9%	6.2%
16:00-16:59	5.5%	5.0%	7.3%	4.6%	8.2%	6.3%	2.4%	0.0%	6.4%	4.7%	5.5%
17:00-17:59	7.7%	7.8%	6.1%	6.4%	4.4%	8.3%	4.8%	17.3%	5.8%	8.4%	7.1%
18:00-18:59	7.8%	11.2%	5.8%	5.7%	9.4%	7.3%	14.0%	1.0%	8.4%	7.0%	7.7%
19:00-19:59	6.0%	7.1%	4.2%	7.5%	5.7%	4.9%	2.8%	9.7%	4.7%	7.0%	5.8%
20:00-20:59	5.4%	5.4%	4.6%	2.1%	4.9%	4.9%	11.4%	13.1%	5.9%	4.8%	5.4%
21:00-21:59	4.6%	2.1%	5.8%	0.6%	5.4%	4.4%	2.7%	7.0%	4.9%	2.6%	3.8%
22:00-22:59	3.1%	0.0%	4.4%	1.4%	5.9%	1.0%	4.7%	10.6%	4.5%	1.9%	3.2%
23:00-23:59	9.7%	0.7%	8.7%	0.6%	5.8%	1.1%	0.0%	9.3%	6.8%	1.7%	4.3%
Peak Percent	9.7%	12.3%	9.3%	11.6%	9.4%	10.6%	14.0%	17.3%	8.4%	9.1%	7.7%
Peak Hour	23:00-23:59	07:00-07:59	14:00-14:59	06:00-06:59	18:00-18:59	07:00-07:59	18:00-18:59	17:00-17:59	18:00-18:59	07:00-07:59	18:00-18:59

Source: Massport and InterVISTAS.
Notes: 2022 gate assignments provided by Massport.

Table F-13 Assumed Distribution of Local Passengers by Hour for an Average Day Peak Month, Future Planning Horizon

Hour	Terminal A		Terminal B		Terminal C		Terminal E		Total Airport		
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Total
00:00-00:59	1.0%	0.0%	2.9%	0.0%	1.2%	0.0%	1.1%	2.6%	1.7%	0.4%	1.1%
01:00-01:59	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	1.9%	0.6%	0.3%	0.5%
02:00-02:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
03:00-03:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
04:00-04:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.2%	0.1%
05:00-05:59	1.0%	0.8%	1.7%	5.0%	4.9%	1.9%	1.1%	0.0%	2.2%	2.5%	2.3%
06:00-06:59	4.1%	7.2%	2.8%	8.6%	3.3%	6.7%	1.1%	1.4%	2.9%	6.7%	4.8%
07:00-07:59	5.7%	10.9%	3.2%	7.4%	5.3%	10.3%	4.7%	2.6%	4.5%	8.3%	6.4%
08:00-08:59	3.2%	10.1%	3.6%	8.6%	3.9%	9.5%	3.9%	0.5%	3.6%	8.0%	5.8%
09:00-09:59	3.7%	5.0%	4.9%	5.7%	1.5%	7.1%	3.4%	7.7%	3.6%	6.2%	4.9%
10:00-10:59	6.6%	4.8%	6.2%	4.9%	5.0%	4.5%	4.9%	3.1%	5.8%	4.5%	5.1%
11:00-11:59	2.7%	5.9%	2.7%	5.7%	2.6%	5.1%	4.9%	3.8%	3.1%	5.3%	4.2%
12:00-12:59	4.2%	3.2%	7.0%	5.8%	4.8%	2.3%	4.6%	7.8%	5.4%	4.6%	5.0%
13:00-13:59	4.6%	4.6%	4.6%	5.5%	8.0%	3.4%	9.1%	4.2%	6.3%	4.5%	5.4%
14:00-14:59	6.1%	2.9%	8.1%	5.0%	3.2%	7.4%	11.2%	0.0%	7.1%	4.4%	5.7%
15:00-15:59	8.8%	5.5%	4.1%	7.0%	7.3%	2.2%	10.0%	0.5%	7.0%	4.4%	5.7%
16:00-16:59	4.6%	5.9%	7.8%	4.3%	8.3%	5.8%	4.1%	6.7%	6.5%	5.4%	6.0%
17:00-17:59	6.3%	6.5%	6.0%	6.6%	4.4%	8.3%	6.6%	14.7%	5.8%	8.2%	7.0%
18:00-18:59	8.5%	9.1%	6.4%	5.9%	8.8%	7.8%	9.5%	4.0%	8.0%	6.8%	7.4%
19:00-19:59	6.7%	8.0%	5.1%	7.0%	5.4%	5.3%	3.1%	5.2%	5.1%	6.5%	5.8%
20:00-20:59	4.8%	6.0%	3.9%	4.1%	4.9%	4.7%	8.1%	9.6%	5.2%	5.5%	5.3%
21:00-21:59	4.1%	2.3%	5.5%	1.4%	4.5%	4.9%	3.3%	9.3%	4.5%	3.7%	4.1%
22:00-22:59	4.1%	0.5%	4.0%	1.1%	6.7%	0.8%	4.4%	7.4%	4.7%	1.8%	3.3%
23:00-23:59	9.3%	0.7%	7.6%	0.4%	5.9%	1.4%	0.9%	7.0%	6.3%	1.7%	4.0%
Peak Percent	9.3%	10.9%	8.1%	8.6%	8.8%	10.3%	11.2%	14.7%	8.0%	8.3%	7.4%
Peak Hour	23:00-23:59	07:00-07:59	14:00-14:59	06:00-06:9	18:00-18:59	07:00-07:59	14:00-14:59	17:00-17:59	18:00-18:59	07:00-07:59	18:00-18:59

Source: Massport and InterVISTAS.
Notes: Gate assignments planned for the Future Planning Horizon (based on Massport assumptions for 2022).

Arriving and departing local passengers by terminal and hour of the day in 2022 are shown in **Table F-14.** In 2022, Terminal B was the busiest terminal with nearly 40,000 local passengers. Terminal C was the second busiest with over 28,000 passengers, followed by Terminal A with nearly 24,000 passengers. Terminal E handled almost 14,000 local passengers.

Table F-14 Peak Month Average Day Local Passengers by Terminal and by Hour, 2022

Hour	Terminal A		Terminal B		Terminal C		Terminal E		Total Airport		
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Total
00:00-00:59	168	-	782	-	189	-	-	-	1,140	-	1,140
01:00-01:59	-	-	286	-	-	-	-	-	286	-	286
02:00-02:59	-	-	-	-	-	-	-	-	-	-	-
03:00-03:59	-	-	-	-	-	-	-	-	-	-	-
04:00-04:59	-	-	-	-	-	-	-	-	-	-	-
05:00-05:59	-	146	322	764	889	339	-	-	1,211	1,250	2,461
06:00-06:59	335	908	455	2,309	223	806	-	-	1,013	4,023	5,036
07:00-07:59	402	1,530	456	1,481	501	1,522	423	240	1,782	4,774	6,555
08:00-08:59	456	1,076	439	1,717	342	1,436	358	56	1,596	4,285	5,881
09:00-09:59	490	432	803	1,020	206	928	-	381	1,498	2,762	4,260
10:00-10:59	869	700	1,170	723	762	710	448	217	3,249	2,351	5,600
11:00-11:59	345	837	831	1,329	359	908	275	234	1,810	3,309	5,119
12:00-12:59	427	495	1,394	1,460	532	334	589	217	2,942	2,505	5,447
13:00-13:59	673	562	904	885	1,205	490	749	355	3,531	2,293	5,824
14:00-14:59	510	345	1,836	892	535	1,013	960	-	3,841	2,250	6,090
15:00-15:59	1,097	533	875	1,633	1,014	352	1,028	56	4,014	2,574	6,588
16:00-16:59	633	622	1,457	917	1,099	900	199	-	3,388	2,439	5,827
17:00-17:59	883	972	1,202	1,270	595	1,186	402	948	3,082	4,377	7,459
18:00-18:59	891	1,405	1,146	1,144	1,256	1,041	1,181	56	4,474	3,645	8,119
19:00-19:59	686	889	832	1,506	768	707	233	533	2,520	3,635	6,155
20:00-20:59	624	679	908	421	652	703	964	717	3,148	2,521	5,669
21:00-21:59	527	263	1,142	110	731	629	229	382	2,629	1,385	4,013
22:00-22:59	354	-	870	288	788	146	394	579	2,406	1,013	3,420
23:00-23:59	1,112	91	1,723	120	775	154	-	508	3,609	873	4,483
Total	11,485	12,485	19,832	19,991	13,421	14,306	8,431	5,480	53,168	52,262	105,430

Source: Massport and InterVISTAS.
Notes: Bold indicates airport-wide peak hour passengers.

Table F-15 shows a similar peak month, busy day passenger distribution by terminal and time of day for the future planning horizon.

Table F-15 Peak Month Average Day Local Passengers by Terminal and by Hour, Future Planning Horizon

Hour	Terminal A		Terminal B		Terminal C		Terminal E		Total Airport		
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Total
00:00-00:59	170	-	791	-	224	-	158	286	1,343	286	1,629
01:00-01:59	-	-	483	-	-	-	-	210	483	210	693
02:00-02:59	-	-	-	-	-	-	-	-	-	-	-
03:00-03:59	-	-	-	-	-	-	-	-	-	-	-
04:00-04:59	-	-	-	-	-	163	-	-	-	163	163
05:00-05:59	168	148	469	1,374	890	377	168	-	1,695	1,899	3,594
06:00-06:59	678	1,268	756	2,379	599	1,349	158	158	2,191	5,154	7,345
07:00-07:59	941	1,924	876	2,060	971	2,091	690	288	3,478	6,363	9,842
08:00-08:59	526	1,772	979	2,394	714	1,923	578	57	2,797	6,146	8,943
09:00-09:59	607	875	1,340	1,574	284	1,440	507	848	2,737	4,737	7,475
10:00-10:59	1,076	852	1,702	1,358	918	908	723	340	4,420	3,458	7,878
11:00-11:59	435	1,035	734	1,586	470	1,032	727	417	2,366	4,069	6,436
12:00-12:59	685	561	1,923	1,614	881	461	673	861	4,161	3,496	7,658
13:00-13:59	746	803	1,262	1,522	1,463	692	1,340	464	4,811	3,481	8,291
14:00-14:59	992	502	2,208	1,383	584	1,501	1,648	-	5,431	3,386	8,817
15:00-15:59	1,445	974	1,113	1,932	1,347	442	1,476	57	5,381	3,405	8,786
16:00-16:59	755	1,045	2,141	1,202	1,530	1,169	609	745	5,034	4,162	9,196
17:00-17:59	1,030	1,150	1,652	1,829	811	1,680	982	1,620	4,475	6,278	10,753
18:00-18:59	1,395	1,608	1,760	1,620	1,619	1,575	1,404	437	6,179	5,239	11,418
19:00-19:59	1,099	1,400	1,406	1,933	993	1,079	453	575	3,951	4,986	8,938
20:00-20:59	780	1,052	1,077	1,122	908	955	1,198	1,057	3,963	4,185	8,149
21:00-21:59	665	403	1,510	380	829	988	491	1,028	3,495	2,799	6,295
22:00-22:59	679	82	1,093	291	1,228	154	644	822	3,645	1,349	4,994
23:00-23:59	1,520	131	2,088	122	1,085	274	136	773	4,829	1,299	6,128
Total	16,392	17,584	27,363	27,673	18,349	20,253	14,764	11,042	76,868	76,552	153,420

Source: Massport and InterVISTAS.
Notes: Gate assignments planned for the Future Planning Horizon (based on Massport assumptions for 2022).
Bold indicates airport-wide peak hour passengers.

Based on **Table F-15**, Terminal B is expected to remain the busiest terminal with nearly 55,000 local passengers, followed by Terminal C with over 38,500 passengers. Terminal A is forecast to process nearly 34,000 passengers, and Terminal E is forecast to process almost 26,000 local passengers in the Future Planning Horizon. The overall airport-wide peak of total local passengers remains in the 18:00 hour.

F.2.4 Conclusion

Passenger demand continues to grow at Logan Airport and is forecast to increase from over 36 million scheduled and charter passengers in 2022 to 53.5 million passengers in the Future Planning Horizon. This translates into a 48.0 percent overall growth. Passenger aircraft operations are expected to increase at a lower overall growth rate of 33.0 percent, increasing from over 340,000 to almost 453,000. When compared to the pre-pandemic 2019 traffic, these increases are only 26.0 percent for passengers and 16.0 percent for passenger aircraft operations.

Average aircraft throughput is expected to increase from 132 seats per operation in 2022 to 141 seats per operation in the Future Planning Horizon. This discrepancy between passenger and operations growth rate will be the result of airlines flying larger aircraft and operating aircraft with higher seat capacities. New, modern and efficient aircraft types are continuing to enter service such as the Boeing 737 MAX and Airbus 320 NEO family. These aircraft will open new market opportunities in addition to replacing older, aging aircraft. The 50-seat RJ market is expected to continue shrinking as more carriers shift operations to larger, 76- to 90-seat, aircraft such as the Embraer 175 and 195. Long-haul operations will continue to grow in Europe and the Middle East, and remain the most mature international market. However, Asia is forecast to grow the fastest as it has been the slowest market to recover from COVID-19.

G. Regional Transportation Supporting Documentation

This appendix provides detailed tables in support of Chapter 5, *Regional Transportation*:

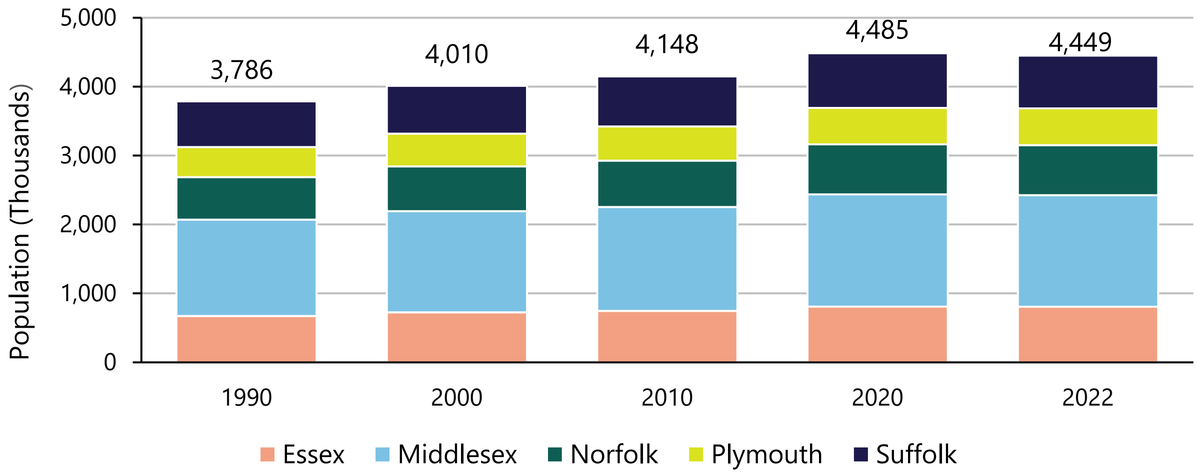
G.1 Logan Airport Catchment Area Population

Table G-1 Logan Airport Primary Catchment Area Population, 1990, 2000, 2010, 2020, 2022

	Population (thousands)					Compound Annual Growth Rates		
County	1990	2000	2010	2020	2022	1990-2000	2000-2010	2010-2022
Essex	671	725	745	808	807	0.8%	0.3%	0.7%
Middlesex	1,399	1,467	1,508	1,629	1,617	0.5%	0.3%	0.6%
Norfolk	617	651	673	724	726	0.5%	0.3%	0.7%
Plymouth	436	474	496	530	533	0.8%	0.5%	0.7%
Suffolk	663	693	726	793	766	0.4%	0.5%	0.6%
Boston Catchment Area	3,786	4,010	4,148	4,485	4,449	0.6%	0.3%	0.6%
Massachusetts	6,023	6,361	6,566	6,996	6,982	0.5%	0.3%	0.6%
New England	13,230	13,950	14,470	15,074	15,130	0.5%	0.4%	0.4%
U.S.	249,623	282,162	309,327	331,512	333,288	1.2%	0.9%	0.6%

Source: Woods & Poole Economics, Inc. 2023. Complete Economic and Demographic Data Source (CEDDS).
Note: Due to rounding, the sums presented in the above figure may not add up precisely. Population data may have changed compared to previous ESPR and EDR reports, due to revisions conducted by the U.S. Department of Commerce. Population data shown in 2022 are estimates.

Figure G-1 Logan Airport Primary Catchment Area Population Growth, 1990, 2000, 2010, 2020, 2022



Source: Woods & Poole Economics, Inc. 2023. Complete Economic and Demographic Data Source (CEDDS).
Note: Population data may have changed due to revisions conducted by the U.S. Department of Commerce. Population data shown in 2022 are estimates.

G.2 New England Airports Operations Classifications

Table G-2 Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2000													
Commercial	132,062	103,750	61,506	47,609	45,745	21,446	5,260	4,029	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	56,200	46,518	31,601	204,512	619,397	35,233	654,630
Military & Other	5,811	2,764	586	2,072	10,241	26,507	328	495	9,973	1,287	60,064	0	60,064
Total	169,736	158,698	107,832	106,252	115,363	82,784	61,788	51,042	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	4,581	5,631	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	56,092	45,464	30,148	197,770	608,635	28,739	637,374
Military & Other	5,913	2,635	607	2,259	11,821	26,623	437	917	8,221	1,252	60,685	0	60,685
Total	165,029	148,336	106,634	112,043	121,068	80,139	61,110	52,012	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	3,827	4,062	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	62,163	52,277	28,333	210,221	608,964	25,596	634,560
Military & Other	6,085	2,587	376	2,162	12,167	27,297	593	418	8,220	1,424	61,329	0	61,329
Total	147,117	144,655	92,271	105,781	110,775	87,420	66,583	56,757	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	3,705	868	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	54,224	55,972	24,866	190,789	556,599	28,660	585,259
Military & Other	4,214	2,496	324	1,449	11,466	32,938	776	378	7,720	1,142	62,903	0	62,903
Total	135,246	129,675	98,060	88,143	100,220	95,270	58,705	57,218	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	4,501	0	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	58,881	61,343	25,962	175,301	542,212	31,236	573,448
Military & Other	4,100	346	749	1,338	12,404	29,676	1,010	530	7,797	1,195	59,145	0	59,145
Total	145,192	118,720	103,547	89,359	108,832	84,530	64,392	61,873	37,740	180,804	994,989	405,258	1,400,247

Table G-2 Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2005													
Commercial	119,048	88,374	76,342	42,661	43,987	25,976	6,137	2,727	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	60,893	62,743	25,446	165,424	518,449	31,236	549,685
Military & Other	3,701	241	479	1,405	11,468	24,154	1,063	519	7,669	904	51,603	0	51,603
Total	156,090	116,753	103,190	80,257	105,343	80,146	68,093	65,989	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	5,177	3,793	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	51,702	56,770	25,962	167,560	497,017	31,444	528,461
Military & Other	4,348	229	738	1,536	9,299	22,359	1,157	609	7,797	1,433	49,505	0	49,505
Total	150,237	107,021	93,138	75,771	95,112	75,673	58,036	61,172	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	4,594	3,162	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	51,200	61,296	27,000	160,992	481,526	28,632	510,158
Military & Other	5,097	242	644	1,384	9,528	20,949	944	879	8,017	1,438	49,122	0	49,122
Total	141,502	103,751	93,737	74,558	96,977	69,062	56,738	65,337	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	4,013	2,553	1,347	104	340,760	347,784	688,544
General Aviation[1]	22,908	19,470	16,198	31,869	46,391	27,143	44,642	43,763	31,051	164,195	447,630	23,820	471,450
Military & Other	3,637	187	840	974	9,688	20,449	243	886	7,993	1,590	46,487	0	46,487
Total	124,739	92,753	80,543	73,677	93,911	66,874	48,898	47,202	40,391	165,889	834,877	371,604	1,206,481
2009													
Commercial	82,021	62,233	54,336	35,909	31,153	16,485	3,096	2,527	422	0	288,182	333,064	621,246
General Aviation[1]	19,586	19,438	14,354	25,473	32,872	19,558	37,722	41,700	25,161	148,696	384,560	12,242	396,802
Military & Other	2,726	260	1,163	778	8,628	16,267	486	17	6,851	1,215	38,391	0	38,391
Total	104,333	81,931	69,853	62,160	72,653	52,310	41,304	44,244	32,434	149,911	711,133	345,306	1,056,439

Table G-2 Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2010													
Commercial	80,418	60,128	53,971	35,035	29,538	16,190	3,201	1,629	1,516	0	281,626	337,961	619,587
General Aviation[1]	18,759	21,096	13,636	24,776	36,106	20,142	31,884	41,843	25,674	161,942	395,858	14,682	410,540
Military & Other	3,028	347	933	446	4,776	15,525	381	572	7,707	1,795	35,510	0	35,510
Total	102,205	81,571	68,540	60,257	70,420	51,857	35,466	44,044	34,897	163,737	712,994	352,643	1,065,637
2011													
Commercial	86,838	57,194	51,379	35,157	29,166	16,177	3,367	2,017	1,717	750	283,762	340,757	624,519
General Aviation[1]	16,483	21,774	12,497	21,453	42,562	19,503	33,919	44,050	27,056	160,840	400,137	28,230	428,367
Military & Other	3,630	369	874	533	5,890	13,220	310	634	8,158	1,409	35,027	0	35,027
Total	106,951	79,337	64,750	57,143	77,618	48,900	37,596	46,701	36,931	162,999	718,926	368,987	1,087,913
2012													
Commercial	79,704	50,301	45,379	33,118	27,067	14,826	3,936	1,639	502	635	257,107	326,755	583,862
General Aviation[1]	15,589	24,781	12,504	20,864	42,352	18,069	34,775	42,655	30,186	164,841	406,616	28,114	434,730
Military & Other	3,726	434	1,073	584	7,079	11,503	416	740	7,917	738	34,210	0	34,210
Total	99,019	75,516	58,956	54,566	76,498	44,398	39,127	45,034	38,605	166,214	697,933	354,869	1,052,802
2013													
Commercial	78,213	48,340	43,572	31,076	26,814	14,707	4,094	1,586	560	253	249,215	334,657	583,872
General Aviation[1]	15,192	24,729	11,432	20,021	40,413	15,535	28,794	32,888	28,951	153,706	371,661	26,682	398,343
Military & Other	2,558	435	1,224	471	6,972	11,045	423	593	7,573	529	31,823	0	31,823
Total	95,963	73,504	56,228	51,568	74,199	41,287	33,311	35,067	37,084	154,488	652,699	361,339	1,014,038
2014													
Commercial	79,060	44,351	38,674	29,538	26,057	14,428	4,795	2,368	8,278	256	247,805	337,381	585,186
General Aviation[1]	14,752	29,490	12,293	16,535	40,858	15,548	26,273	29,138	24,440	133,437	342,764	26,416	369,180
Military & Other	2,665	1,036	908	560	6,842	11,567	529	956	7,621	602	33,286	0	33,286
Total	96,477	74,877	51,875	46,633	73,757	41,543	31,597	32,462	40,339	134,295	623,855	363,797	987,652

Table G-2 Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2015													
Commercial	76,425	42,417	38,060	30,415	25,178	13,618	6,316	2,414	8,547	220	243,610	344,764	588,374
General Aviation[1]	14,402	22,700	12,934	17,916	41,576	16,487	27,711	35,711	26,848	127,467	343,752	28,166	371,918
Military & Other	2,680	430	811	567	5,912	10,684	685	889	7,499	592	30,749	0	30,749
Total	93,507	65,547	51,805	48,898	72,666	40,789	34,712	39,014	42,894	128,279	618,111	372,930	991,041
2016													
Commercial	77,174	43,659	40,589	32,171	26,405	14,603	7,195	2,616	9,435	266	254,113	360,442	614,555
General Aviation[1]	14,460	26,032	14,447	18,334	38,614	16,815	28,811	31,858	29,043	120,891	339,305	30,780	370,085
Military & Other	3,178	397	501	488	6,114	11,271	683	780	8,913	632	32,957	0	32,957
Total	94,812	70,088	55,537	50,993	71,133	42,689	36,689	35,254	47,391	121,789	626,375	391,222	1,017,597
2017													
Commercial	78,435	45,831	37,850	32,845	26,684	15,874	6,820	2,925	9,597	295	257,156	370,251	627,407
General Aviation[1]	13,233	26,274	13,169	18,392	34,386	17,157	18,389	26,332	31,555	128,018	326,905	31,120	358,025
Military & Other	3,006	490	697	568	5,080	9,985	574	850	8,150	759	30,159	0	30,159
Total	94,674	72,595	51,716	51,805	66,150	43,016	25,783	30,107	49,302	129,072	614,220	401,371	1,015,591
2018													
Commercial	78,463	49,425	36,085	35,534	28,611	17,241	6,038	3,710	8,709	286	264,102	393,084	657,186
General Aviation[1]	13,280	21,124	15,664	20,717	38,078	16,670	18,220	14,473	30,424	120,945	309,595	30,940	340,535
Military & Other	2,898	399	423	675	3,547	9,758	536	753	7,600	433	27,022	0	27,022
Total	94,641	70,948	52,172	56,926	70,236	43,669	24,794	18,936	46,733	121,664	600,719	424,024	1,024,743
2019													
Commercial	76,352	46,393	34,965	35,855	28,413	17,678	6,094	5,554	9,346	426	261,076	398,254	659,330
General Aviation[1]	12,652	23,017	15,762	21,731	40,894	17,117	21,853	17,186	28,742	127,755	326,624	28,922	355,546
Military & Other	2,379	351	412	646	3,963	10,805	483	745	3,457	490	23,816	0	23,816
Total	91,383	69,761	51,139	58,232	73,270	45,600	28,430	23,485	41,545	128,671	611,516	427,176	1,038,692

Table G-2 Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2020													
Commercial	44,420	25,510	24,153	21,559	14,852	11,184	2,754	2,486	7,225	231	154,374	192,844	347,218
General Aviation[1]	10,872	20,243	13,892	16,832	37,241	11,970	27,393	14,109	28,656	98,925	280,133	13,858	293,991
Military & Other	2,850	600	655	937	4,466	11,792	262	651	2,672	569	25,454	0	25,454
Total	58,142	46,353	38,700	39,328	56,559	34,946	30,409	17,246	38,553	99,725	459,961	206,702	666,663
2021													
Commercial	56,187	32,296	25,520	30,955	19,519	16,231	3,600	2,088	11,272	448	198,116	241,992	440,107
General Aviation[1]	13,312	23,342	19,795	21,822	63,070	13,968	36,025	16,929	45,981	122,944	377,188	24,042	401,230
Military & Other	3,308	608	678	964	6,533	12,740	406	1,903	5,850	1,174	34,164	0	34,164
Total	72,807	56,246	45,993	53,741	89,122	42,939	40,031	20,920	63,103	124,566	609,468	266,034	875,502
2022													
Commercial	63,301	42,296	26,791	30,706	24,050	17,657	8,548	5,938	11,174	554	231,015	348,109	579,124
General Aviation[1]	12,887	23,786	18,953	21,298	72,409	14,571	17,489	15,783	44,247	119,961	361,384	30,504	391,888
Military & Other	3,197	746	664	1,013	5,108	9,962	335	1,038	6,298	1,701	30,062	0	30,062
Total	79,385	66,828	46,408	53,017	101,567	42,190	26,372	22,759	61,719	122,216	622,461	378,613	1,001,074

Source: Massport, Federal Aviation Administration (FAA) Tower Counts, and individual airport records.
Note:
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 Commercial operations at Hanscom Field include scheduled commercial operations only; other air taxi operations counted as GA.
3 Operations at Logan Airport include international operations.
4 Commercial, GA, and military operations at Worcester Regional have been updated compared to the previous ESPR report to account for Part 139 operations not recorded by the FAA tower during the night hours when closed.

Table G-3 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2000 to 2001													
Commercial	(2.59%)	(3.03%)	0.27%	0.34%	3.31%	(14.73%)	(12.91%)	39.76%	(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%	(0.19%)	(2.27%)	(4.60%)	(3.30%)	(1.74%)	(18.43%)	(2.64%)
Military & Other	1.76%	(4.67%)	3.58%	9.03%	15.43%	0.44%	33.23%	85.25%	(17.57%)	(2.72%)	1.03%	-	1.03%
Total	(2.77%)	(6.53%)	(1.11%)	5.45%	4.95%	(3.20%)	(1.10%)	1.90%	(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%	3.92%	3.34%	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%	(16.46%)	(27.86%)	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%	10.82%	14.99%	(6.02%)	6.30%	0.05%	(10.94%)	(0.44%)
Military & Other	2.91%	(1.82%)	(38.06%)	(4.29%)	2.93%	2.53%	35.70%	(54.42%)	(0.01%)	13.74%	1.06%	-	1.06%
Total	(10.85%)	(2.48%)	(13.47%)	(5.59%)	(8.50%)	9.09%	8.96%	9.12%	(2.90%)	6.24%	(2.14%)	(15.34%)	(6.07%)
2002 Percent of Total	10.05%	9.89%	6.31%	7.23%	7.57%	5.97%	4.55%	3.88%	2.84%	14.91%	73.21%	26.79%	100.00%
2002 to 2003													
Commercial	(8.20%)	(12.73%)	9.36%	(7.06%)	(1.63%)	4.97%	(3.19%)	(78.63%)	(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%	(12.77%)	7.07%	(12.24%)	(9.24%)	(8.60%)	11.97%	(7.77%)
Military & Other	(30.75%)	(3.52%)	(13.83%)	(32.98%)	(5.76%)	20.67%	30.86%	(9.57%)	(6.08%)	(19.80%)	2.57%	-	2.57%
Total	(8.07%)	(10.36%)	6.27%	(16.67%)	(9.53%)	8.98%	(11.83%)	0.81%	(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%	4.29%	4.18%	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%)	21.48%	(100.00%)	(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%)	8.59%	9.60%	4.41%	(8.12%)	(2.58%)	8.99%	(2.02%)
Military & Other	(2.71%)	(86.14%)	131.17%	(7.66%)	8.18%	(9.90%)	30.15%	40.21%	1.00%	4.64%	(5.97%)	-	(5.97%)
Total	7.35%	(8.45%)	5.60%	1.38%	8.59%	(11.27%)	9.69%	8.14%	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%	4.60%	4.42%	2.70%	12.91%	71.06%	28.94%	100.00%

Table G-3 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
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%	3.42%	2.28%	(1.99%)	(5.63%)	(4.38%)	0.00%	(4.14%)
Military & Other	(9.73%)	(30.35%)	(36.05%)	5.01%	(7.55%)	(18.61%)	5.25%	(2.08%)	(1.64%)	(24.35%)	(12.75%)	-	(12.75%)
Total	7.51%	(1.66%)	(0.34%)	(10.19%)	(3.21%)	(5.19%)	5.75%	6.65%	(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%	4.89%	4.74%	2.61%	12.22%	70.60%	29.40%	100.00%
2005 to 2006													
Commercial	(6.47%)	(8.02%)	(11.81%)	(9.37%)	(6.01%)	(9.66%)	(15.64%)	39.09%	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%)	(15.09%)	(9.52%)	2.03%	1.29%	(4.13%)	0.67%	(3.86%)
Military & Other	17.48%	(4.98%)	54.07%	9.32%	(18.91%)	(7.43%)	8.84%	17.34%	1.67%	58.52%	(4.07%)	-	(4.07%)
Total	(3.75%)	(8.34%)	(9.74%)	(5.59%)	(9.71%)	(5.58%)	(14.77%)	(7.30%)	3.93%	1.23%	(5.72%)	(0.72%)	(4.25%)
2006 Percent of Total	11.28%	8.03%	6.99%	5.69%	7.14%	5.68%	4.36%	4.59%	2.83%	12.92%	69.51%	30.49%	100.00%
2006 to 2007													
Commercial	(3.81%)	(0.93%)	2.69%	7.21%	(3.42%)	(3.81%)	(11.26%)	(16.64%)	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%)	(0.97%)	7.97%	4.00%	(3.92%)	(3.12%)	(8.94%)	(3.46%)
Military & Other	17.23%	5.68%	(12.74%)	(9.90%)	2.46%	(6.31%)	(18.41%)	44.33%	2.82%	0.35%	(0.77%)	-	(0.77%)
Total	(5.81%)	(3.06%)	0.64%	(1.60%)	1.96%	(8.74%)	(2.24%)	6.81%	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%	4.34%	5.00%	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%)	(12.65%)	(19.26%)	(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%	(12.81%)	(28.60%)	15.00%	1.99%	(7.04%)	(16.81%)	(7.59%)
Military & Other	(28.64%)	(22.73%)	30.43%	(29.62%)	1.68%	(2.39%)	(74.26%)	0.80%	(0.30%)	10.57%	(5.36%)	-	(5.36%)
Total	(11.85%)	(10.60%)	(14.08%)	(1.18%)	(3.16%)	(3.17%)	(13.82%)	(27.76%)	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%	4.05%	3.91%	3.35%	13.75%	69.20%	30.80%	100.00%

Table G-3 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2008 to 2009													
Commercial	(16.47%)	(14.86%)	(14.44%)	(12.06%)	(17.65%)	(14.51%)	(22.85%)	(1.02%)	(68.67%)	(100.00%)	(15.43%)	(4.23%)	(9.77%)
General Aviation[1]	(14.50%)	(0.16%)	(11.38%)	(20.07%)	(29.14%)	(27.94%)	(15.50%)	(4.71%)	(18.97%)	(9.44%)	(14.09%)	(48.61%)	(15.83%)
Military & Other	(25.05%)	39.04%	38.45%	(20.12%)	(10.94%)	(20.45%)	100.00%	(98.08%)	(14.29%)	(23.58%)	(17.42%)	-	(17.42%)
Total	(16.36%)	(11.67%)	(13.27%)	(15.63%)	(22.64%)	(21.78%)	(15.53%)	(6.27%)	(19.70%)	(9.63%)	(14.82%)	(7.08%)	(12.44%)
2009 Percent of Total	9.88%	7.76%	6.61%	5.88%	6.88%	4.95%	3.91%	4.19%	3.07%	14.19%	67.31%	32.69%	100.00%
2009 to 2010													
Commercial	(1.95%)	(3.38%)	(0.67%)	(2.43%)	(5.18%)	(1.79%)	3.39%	(35.54%)	259.24%	-	(2.27%)	1.47%	(0.27%)
General Aviation[1]	(4.22%)	8.53%	(5.00%)	(2.74%)	9.84%	2.99%	(15.48%)	0.34%	2.04%	8.91%	2.94%	19.93%	3.46%
Military & Other	11.08%	33.46%	(19.78%)	(42.67%)	(44.65%)	(4.56%)	(21.60%)	3264.71%	12.49%	47.74%	(7.50%)	-	(7.50%)
Total	(2.04%)	(0.44%)	(1.88%)	(3.06%)	(3.07%)	(0.87%)	(14.13%)	(0.45%)	7.59%	9.22%	0.26%	2.12%	0.87%
2010 Percent of Total	9.59%	7.65%	6.43%	5.65%	6.61%	4.87%	3.33%	4.13%	3.27%	15.37%	66.91%	33.09%	100.00%
2010 to 2011													
Commercial	7.98%	(4.88%)	(4.80%)	0.35%	(1.26%)	(0.08%)	5.19%	23.82%	13.26%	-	0.76%	0.83%	0.80%
General Aviation[1]	(12.13%)	3.21%	(8.35%)	(13.41%)	17.88%	(3.17%)	6.38%	5.27%	5.38%	(0.68%)	1.08%	92.28%	4.34%
Military & Other	19.88%	6.34%	(6.32%)	19.51%	23.32%	(14.85%)	(18.64%)	10.84%	5.85%	(21.50%)	(1.36%)	-	(1.36%)
Total	4.64%	(2.74%)	(5.53%)	(5.17%)	10.22%	(5.70%)	6.01%	6.03%	5.83%	(0.45%)	0.83%	4.63%	2.09%
2011 Percent of Total	9.83%	7.29%	5.95%	5.25%	7.13%	4.49%	3.46%	4.29%	3.39%	14.98%	66.08%	33.92%	100.00%
2012 to 2013													
Commercial	(1.87%)	(3.90%)	(3.98%)	(6.17%)	(0.93%)	(0.80%)	4.01%	(3.23%)	11.55%	(60.16%)	(3.07%)	2.42%	0.00%
General Aviation[1]	(2.55%)	(0.21%)	(8.57%)	(4.04%)	(4.58%)	(14.02%)	(17.20%)	(22.90%)	(4.09%)	(6.75%)	(8.60%)	(5.09%)	(8.37%)
Military & Other	(31.35%)	0.23%	14.07%	(19.35%)	(1.51%)	(3.98%)	1.68%	(19.86%)	(4.35%)	(28.32%)	(6.98%)	-	(6.98%)
Total	(3.09%)	(2.66%)	(4.63%)	(5.49%)	(3.01%)	(7.01%)	(14.86%)	(22.13%)	(3.94%)	(7.05%)	(6.48%)	1.82%	(3.68%)
2013 Percent of Total	9.46%	7.25%	5.54%	5.09%	7.32%	4.07%	3.28%	3.46%	3.66%	15.23%	64.37%	35.63%	100.00%

Table G-3 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2013 to 2014													
Commercial	1.08%	(8.25%)	(11.24%)	(4.95%)	(2.82%)	(1.90%)	17.12%	49.31%	1378.21%	1.19%	(0.57%)	0.81%	0.23%
General Aviation[1]	(2.90%)	19.25%	7.53%	(17.41%)	1.10%	0.08%	(8.76%)	(11.40%)	(15.58%)	(13.19%)	(7.78%)	(1.00%)	(7.32%)
Military & Other	4.18%	138.16%	(25.82%)	18.90%	(1.86%)	4.73%	25.06%	61.21%	0.63%	13.80%	4.60%	-	4.60%
Total	0.54%	1.87%	(7.74%)	(9.57%)	(0.60%)	0.62%	(5.15%)	(7.43%)	8.78%	(13.07%)	(4.42%)	0.68%	(2.60%)
2014 Percent of Total	9.77%	7.58%	5.25%	4.72%	7.47%	4.21%	3.20%	3.29%	4.08%	13.60%	63.17%	36.83%	100.00%
2014 to 2015													
Commercial	(3.33%)	(4.36%)	(1.59%)	2.97%	(3.37%)	(5.61%)	31.72%	1.94%	3.25%	(14.06%)	(1.69%)	2.19%	0.54%
General Aviation[1]	(2.37%)	(23.02%)	5.21%	8.35%	1.76%	6.04%	5.47%	22.56%	9.85%	(4.47%)	0.29%	6.62%	0.74%
Military & Other	0.56%	(58.49%)	(10.68%)	1.25%	(13.59%)	(7.63%)	29.49%	(7.01%)	(1.60%)	(1.66%)	(7.62%)	-	(7.62%)
Total	(3.08%)	(12.46%)	(0.13%)	4.86%	(1.48%)	(1.81%)	9.86%	20.18%	6.33%	(4.48%)	(0.92%)	2.51%	0.34%
2015 Percent of Total	9.44%	6.61%	5.23%	4.93%	7.33%	4.12%	3.50%	3.94%	4.33%	12.94%	62.37%	37.63%	100.00%
2015 to 2016													
Commercial	0.98%	2.93%	6.64%	5.77%	4.87%	7.23%	13.92%	8.37%	10.39%	20.91%	4.31%	4.55%	4.45%
General Aviation[1]	0.40%	14.68%	11.70%	2.33%	(7.12%)	1.99%	3.97%	(10.79%)	8.18%	(5.16%)	(1.29%)	9.28%	(0.49%)
Military & Other	18.58%	(7.67%)	(38.22%)	(13.93%)	3.42%	5.49%	(0.29%)	(12.26%)	18.86%	6.76%	7.18%	-	7.18%
Total	1.40%	6.93%	7.20%	4.28%	(2.11%)	4.66%	5.70%	(9.64%)	10.48%	(5.06%)	1.34%	4.90%	2.68%
2016 Percent of Total	9.32%	6.89%	5.46%	5.01%	6.99%	4.20%	3.61%	3.46%	4.66%	11.97%	61.55%	38.45%	100.00%
2016 to 2017													
Commercial	1.63%	4.97%	(6.75%)	2.10%	1.06%	8.70%	(5.21%)	11.81%	1.72%	10.90%	1.20%	2.72%	2.09%
General Aviation[1]	(8.49%)	0.93%	(8.85%)	0.32%	(10.95%)	2.03%	(36.17%)	(17.35%)	8.65%	5.90%	(3.65%)	1.10%	(3.26%)
Military & Other	(5.41%)	23.43%	39.12%	16.39%	(16.91%)	(11.41%)	(15.96%)	8.97%	(8.56%)	20.09%	(8.49%)	-	(8.49%)
Total	(0.15%)	3.58%	(6.88%)	1.59%	(7.01%)	0.77%	(29.73%)	(14.60%)	4.03%	5.98%	(1.94%)	2.59%	(0.20%)
2017 Percent of Total	9.32%	7.15%	5.09%	5.10%	6.51%	4.24%	2.54%	2.96%	4.85%	12.71%	60.48%	39.52%	100.00%

Table G-3 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2017 to 2018													
Commercial	0.04%	7.84%	(4.66%)	8.19%	7.22%	8.61%	(11.47%)	26.84%	(9.25%)	(2.05%)	2.70%	6.17%	4.75%
General Aviation[1]	0.36%	(19.60%)	18.95%	12.64%	10.74%	(3.21%)	(0.92%)	(45.04%)	(3.58%)	(5.31%)	(5.23%)	(0.58%)	(4.83%)
Military & Other	(3.59%)	(18.57%)	(39.31%)	18.84%	(30.18%)	(2.47%)	(6.62%)	(11.41%)	(6.75%)	(25.34%)	(9.93%)	-	(9.93%)
Total	(0.03%)	(2.27%)	0.88%	9.89%	6.18%	1.32%	(3.84%)	(37.10%)	(5.21%)	(5.39%)	(2.14%)	5.64%	0.94%
2019 Percent of Total	9.24%	6.92%	5.09%	5.56%	6.85%	4.26%	2.42%	1.85%	4.56%	11.87%	58.62%	41.38%	100.00%
2018 to 2019													
Commercial	(2.69%)	(6.13%)	(3.10%)	0.90%	(0.69%)	2.53%	0.93%	39.58%	7.31%	48.95%	(1.25%)	1.32%	0.29%
General Aviation[1]	(4.73%)	8.96%	0.63%	4.89%	7.40%	2.68%	19.94%	18.75%	(5.53%)	5.63%	5.50%	(6.52%)	4.41%
Military & Other	(17.91%)	(12.03%)	(2.60%)	(4.30%)	11.73%	10.73%	(9.89%)	(1.06%)	(54.51%)	13.16%	(11.90%)	-	(11.90%)
Total	(3.44%)	(1.67%)	(1.98%)	2.29%	4.32%	4.42%	14.66%	22.29%	(11.10%)	5.76%	1.75%	0.74%	1.33%
2019 Percent of Total	8.82%	6.73%	4.94%	5.62%	7.07%	4.40%	2.74%	2.26%	4.01%	12.42%	58.87%	41.23%	100.00%
2019 to 2020													
Commercial	(41.82%)	(45.01%)	(30.92%)	(39.87%)	(47.73%)	(36.73%)	(54.81%)	(55.24%)	(22.69%)	(45.77%)	(40.87%)	(51.58%)	(47.34%)
General Aviation[1]	(14.07%)	(12.05%)	(11.86%)	(22.54%)	(8.93%)	(30.07%)	25.35%	(17.90%)	(0.30%)	(22.52%)	(14.23%)	(52.08%)	(17.31%)
Military & Other	19.80%	70.94%	58.98%	45.05%	12.69%	9.13%	(45.76%)	(12.62%)	(22.71%)	(1.04%)	6.88%	-	6.88%
Total	(36.38%)	(33.55%)	(24.32%)	(32.46%)	(22.81%)	(23.36%)	6.96%	(26.57%)	(7.20%)	(22.50%)	(24.78%)	(51.61%)	(35.82%)
2020 Percent of Total	8.72%	6.95%	5.81%	5.90%	8.48%	5.24%	4.56%	2.59%	5.78%	14.96%	68.99%	31.01%	100.00%
2020 to 2021													
Commercial	26.49%	26.60%	5.66%	43.58%	31.42%	45.13%	30.72%	(16.01%)	56.01%	93.94%	28.34%	25.49%	26.75%
General Aviation[1]	22.44%	15.31%	42.49%	29.65%	69.36%	16.69%	31.51%	19.99%	60.46%	24.28%	34.65%	73.49%	36.48%
Military & Other	16.07%	1.33%	3.51%	2.88%	46.28%	8.04%	54.96%	192.32%	118.94%	106.33%	34.22%	-	34.22%
Total	25.22%	21.34%	18.84%	36.65%	57.57%	22.87%	31.64%	21.30%	63.68%	24.91%	32.50%	28.70%	31.33%
2021 Percent of Total	8.32%	6.42%	5.25%	6.14%	10.18%	4.90%	4.57%	2.39%	7.21%	14.23%	69.61%	30.39%	100.00%

Table G-3 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2022

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2021 to 2022													
Commercial	12.66%	30.96%	4.98%	(0.80%)	23.21%	8.79%	137.44%	184.39%	(0.87%)	23.66%	16.61%	43.85%	31.59%
General Aviation[1]	(3.19%)	1.90%	(4.25%)	(2.40%)	14.81%	4.32%	(51.45%)	(6.77%)	(3.77%)	(2.43%)	(4.19%)	26.88%	(2.33%)
Military & Other	(3.36%)	22.70%	(2.06%)	5.08%	(21.81%)	(21.81%)	(17.49%)	(45.45%)	7.66%	44.89%	(12.01%)	-	(12.01%)
Total	9.03%	18.81%	0.90%	(1.35%)	13.96%	(1.74%)	(34.12%)	8.79%	(2.19%)	(1.89%)	2.13%	42.32%	14.34%
2022 Percent of Total	7.93%	6.68%	4.64%	5.30%	10.15%	4.21%	2.63%	2.27%	6.17%	12.21%	62.18%	37.82%	100.00%

Source: Massport, Federal Aviation Administration (FAA) Tower Counts, and individual airport records.
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 Commercial operations at Hanscom Field include scheduled commercial operations only; other air taxi operations counted as GA.
3 Operations at Logan Airport include international operations.
4 Commercial, GA, and military operations at Worcester Regional have been updated compared to the previous EDR report to account for Part 139 operations not recorded by the FAA tower during the night hours when closed.

G.3 Worcester Regional Airport Supporting Documentation

Table G-4 Scheduled Passenger Operations by Market and Carrier for Worcester Regional Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Jet Carriers																				
Allegiant Airways	Sanford	SFB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boston-Maine Airways	Allentown/Bethlehem	ABE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boston-Maine Airways	Portsmouth	PSM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boston-Maine Airways	Sanford	SFB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Direct Air	Myrtle Beach	MYR	-	73	-	-	-	-	-	-	-	-	9,782	-	-	-	-	-	-	-
Direct Air	Orlando/Sanford	SFB	-	144	-	-	-	-	-	-	-	-	21,937	-	-	-	-	-	-	-
Direct Air	Punta Gorda	PGD	-	94	-	-	-	-	-	-	-	-	14,541	-	-	-	-	-	-	-
Direct Air	West Palm Beach	PBI	-	13	-	-	-	-	-	-	-	-	1,872	-	-	-	-	-	-	-
jetBlue	Fort Lauderdale/Hollywood	FLL	-	-	365	365	94	63	365	-	100.0%	-	-	36,500	36,500	9,400	6,300	47,400	41,100	129.9%
jetBlue	New York J F Kennedy	JFK	-	-	-	365	132	203	728	-	199.5%	-	-	-	36,500	13,200	20,300	72,800	52,500	199.5%
jetBlue	Orlando	MCO	-	-	365	365	95	-	-	-	-	-	-	36,500	36,500	9,500	-	-	-	-
Subtotal			-	324	730	1,095	321	266	1,093	827	99.8%	-	48,132	73,000	109,500	32,100	26,600	120,200	93,600	109.8%
Regional/Commuter Carriers																				
American Eagle	Chicago O'Hare	ORD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American Eagle	New York J F Kennedy	JFK	552	-	-	-	-	-	360	360	-	18,216	-	-	-	-	-	27,360	27,360	-
American Eagle	Philadelphia	PHL	-	-	-	494	151	58	3	(55)	0.6%	-	-	-	24,714	7,550	2,900	150	(2,750)	0.6%
Delta Connection	Atlanta	ATL	670	-	-	-	-	-	-	-	-	33,500	-	-	-	-	-	-	-	-
Delta Connection	Detroit	DTW	-	-	-	153	249	-	-	-	-	-	-	-	7,650	12,450	-	-	-	-
Delta Connection	New York La Guardia	LGA	-	-	-	-	-	51	301	250	-	-	-	-	-	-	3,576	21,591	18,015	-
US Airways Express	Philadelphia	PHL	1,464	-	-	-	-	-	-	-	-	54,168	-	-	-	-	-	-	-	-
Subtotal			2,686	-	-	647	400	109	664	555	102.6%	105,884	-	-	32,364	20,000	6,476	49,101	42,625	151.7%
Total			2,686	324	730	1,742	721	375	1,757	1,382	100.8%	105,884	48,132	73,000	141,864	52,100	33,076	169,301	136,225	119.3%

Source: OAG Schedules.

Notes: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above. All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger). All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger). All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table G-5 Worcester Regional Airport (ORH) 2022 Highlights

Passenger and Operation Trends	2022 Passengers: 160,700 (17.4 percent below 2019 levels) 2022 Operations: 22,888 (3.1 percent below 2019 levels) ORH serves 1.05 million commercial passengers from 2013 to 2022 YoY passenger count increases 473 percent to 161,000. YoY GA activity declines by 6 percent Airline seat capacity is 20 percent higher than in 2019 (Source: OAG).
Service Developments	August 2021: jetBlue reintroduces airline service at ORH after service suspension in October 2020. November 2021: American Airlines and Delta Air Lines resumed service after service suspension in 2020. 2023: Approximately 50 percent of departing seats from ORH terminate at New York. 2023: jetBlue bolsters Florida service, providing non-stop flights from ORH to Fort Myers and Orlando.
Facility Improvements / Upcoming Airport Plans	Massport, in collaboration with the City of Worcester and with the use of federal grants, initiated a 10-year, $100 million investment to revitalize and increase commercial operations at ORH, which includes, but is not limited to, the following initiatives: 2023: ORH commences Massport-funded $18m rehabilitation project for Runway 11-29. 2021: Massport begins Taxiway B rehabilitation and safety enhancement project. The $2.1m project is funded through an FAA grant.

G.4 Hanscom Field Supporting Documentation

Table G-6 Scheduled Passenger Operations by Market and Carrier for Hanscom Field

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Regional/Commuter Carriers																				
Boston-Maine Airways	Elmira/Corning	ELM									-									-
Boston-Maine Airways	Hyannis	HYA									-									-
Boston-Maine Airways	Manchester	MHT									-									-
Boston-Maine Airways	Martha's Vineyard	MVY									-									-
Boston-Maine Airways	Nantucket	ACK									-									-
Boston-Maine Airways	New Haven	HVN									-									-
Boston-Maine Airways	New London/Groton	GON									-									-
Boston-Maine Airways	Portsmouth	PSM									-									-
Boston-Maine Airways	Trenton	TTN									-									-
Pan American Airways	Atlantic City Pomona Field	ACY									-									-
Pan American Airways	Martha's Vineyard	MVY									-									-
Pan American Airways	New York Newark	EWR									-									-
Pan American Airways	Portsmouth	PSM									-									-
Pan American Airways	Westchester County	HPN									-									-
Shuttle America	Buffalo	BUF	1,119								-	55,950								-
Shuttle America	Hartford	BDL	173								-	8,636								-
Shuttle America	New York La Guardia	LGA	523								-	26,143								-
Shuttle America	Trenton	TTN	2,062								-	103,093								-
Streamline (Charter Air Transport)	Trenton	TTN									-									-
US Airways	Martha's Vineyard	MVY									-									-
US Airways	Nantucket	ACK									-									-
US Airways	New York La Guardia	LGA									-									-

Table G-6 Scheduled Passenger Operations by Market and Carrier for Hanscom Field

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	‘21-‘22 Change	‘22 vs ‘19 % Recovery	2000	2010	2015	2019	2020	2021	2022	‘21-‘22 Change	‘22 vs ‘19 %. Recovery
US Airways	Philadelphia	PHL									-									-
US Airways	Trenton	TTN									-									-
US Airways	Westchester County	HPN									-									-
Subtotal			**3,876**								**-**	**193,821**								**-**
Total			**3,876**								**-**	**193,821**								**-**

Source: OAG Schedules.
Notes: All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger). According to OAG schedules, the last scheduled flight was flown in 2011 on Streamline Air (a subsidiary of Charter Air Transport – based at Hanscom Field) to Trenton, NJ. Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.

Table G-7 Hanscom Field (BED) 2022 Highlights

Passenger and Operation Trends	• 2022 Passengers: 22,000 (36.5 percent above 2019 levels) – Non-scheduled • 2022 Operations: 122,200 (5.0 percent below 2019 levels) • Total aircraft operations at BED declined slightly to 122,216 aircraft operations, a 1.2 percent YoY decrease. • Handled four times more GA operations than Logan Airport and 1.6 times more than the second busiest GA airport in the region (Burlington International Airport).
Service Developments	• Due to the non-scheduled nature of operations at BED, private aviation activity drove aircraft operations. • COVID did not have the same effect on business and general aviation (B&GA) operations as commercial operations – thus, 2022 aircraft operations were near 2019 pre-COVID levels.
Facility Improvements / Upcoming Airport Plans	• BED is expected to receive 4 percent (or roughly $97 million) of Massport's $2.7 billion capital improvement program from FY2023 to FY2027 as the airport embraces operational improvement, safety, and asset development. • Three airside projects were completed in 2022: a runway incursion mitigation study, Taxiway N rehabilitation and lighting, and Customs and Boarder Protection (CBP) security improvements. • Four projects are underway at the time of this report that exceed $1 million each: North Airfield Hangars ($11m), airfield equipment replacement ($6.9m), Taxiway R between Runway 11 and Runway 23 RHPS maintenance and Taxiway G north maintenance ($2m), and salt storage relocation and civil air terminal parking expansion ($1.5m). • 19 projects are proposed to commence by the end of this decade – the two largest of these projects are Runway 5-23 rehabilitation with lighting, engineered materials arresting systems (EMAS), and geometry improvements ($27.5m); and Taxiway R geometry improvements with a new vehicle service road at Runway 11 ($23.3m). • Proposed construction of 27 hangars and renovation of the existing Navy Hanger by proponents Runway Realty Ventures, LLC and North Airfield Ventures, LLC is expected to begin 2024. .

G.5 Bradley International Airport Supporting Documentation

Table G-8 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Jet Carriers																				
Aer Lingus	Dublin	DUB				287	37								56,457	6,808				
Alaska	Chicago O'Hare	ORD	30								-	4,050								-
America West	Columbus	CMH	149								-	18,441								-
America West	Las Vegas	LAS	210								-	27,469								-
America West	Phoenix	PHX	275								-	37,772								-
American	Charlotte	CLT			1,775	2,108	1,323	1,284	1,690	406	80.2%			244,756	314,805	203,464	200,794	285,967	85,173	90.8%
American	Chicago O'Hare	ORD	2,139			964	177	91	546	455	56.7%	304,855			154,171	25,696	15,652	77,852	62,200	50.5%
American	Dallas/Fort Worth	DFW	1,343	1,052	695	590	305	426	518	92	87.8%	185,922	160,983	103,576	94,400	47,483	69,479	87,058	17,579	92.2%
American	Los Angeles	LAX	214			267	6					31,244			42,578	960				
American	Miami	MIA	366	413	400	352	190	635	483	(152)	137.3%	51,427	63,559	59,600	58,050	30,904	104,842	82,816	(22,026)	142.7%
American	Philadelphia	PHL			31	847	293		310	310	36.6%			3,069	109,517	38,056		39,922	39,922	36.5%
American	New York J F Kennedy	JFK									-									-
American	San Juan	SJU	366	365							-	69,348	55,856							-
American	St. Louis	STL									-									-
American	Washington National	DCA			18				124	124	-			2,196				15,872	15,872	-
Boston-Maine Airways	Fort Lauderdale/Hollywood	FLL									-									-
Breeze Airways	Akron/Canton	CAK							8	8	-							864	864	-
Breeze Airways	Charleston	CHS						118	268	150	-						12,874	31,596	18,722	-
Breeze Airways	Columbus	CMH						93	97	4	-						9,813	10,973	1,160	-
Breeze Airways	Jacksonville	JAX							125	125	-							14,931	14,931	-
Breeze Airways	Las Vegas	LAS							34	34	-							4,284	4,284	-
Breeze Airways	Louisville	SDF							2	2	-							216	216	-
Breeze Airways	Nashville	BNA							57	57	-							6,783	6,783	-
Breeze Airways	Norfolk	ORF						94	133	39	-						9,734	15,170	5,436	-
Breeze Airways	Pittsburgh	PIT						94	72	(22)	-						9,932	7,776	(2,156)	-
Breeze Airways	Richmond	RIC							28	28	-							3,024	3,024	-
Breeze Airways	Sarasota/Bradenton	SRQ							61	61	-							7,418	7,418	-

Table G-8 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Breeze Airways	Savannah	SAV							51	51	-							6,056	6,056	-
Continental	Cleveland	CLE	582								-	68,974								-
Continental	Houston Intercontinental	IAH	366								-	45,790								-
Continental	New York Newark	EWR	331								-	38,916								-
Delta	Atlanta	ATL	2,192	2,099	2,374	2,391	1,440	1,727	1,883	156	78.8%	392,835	300,185	354,751	386,814	224,463	259,608	324,840	65,232	84.0%
Delta	Boston	BOS	4								-	634								-
Delta	Cancun	CUN		35	35	17	13						5,470	5,207	3,086	2,340				
Delta	Cincinnati	CVG	1,464		4						-	244,837		471						-
Delta	Detroit	DTW		1,003	1,375	1,522	220	294	1,159	865	76.2%		129,228	187,833	190,939	29,299	39,738	157,117	117,379	82.3%
Delta	Fort Lauderdale/Hollywood	FLL	732	237							-	87,108	33,674							-
Delta	Fort Myers	RSW		99							-		13,104							-
Delta	Las Vegas	LAS		9							-		1,394							-
Delta	Los Angeles	LAX		83							-		13,257							-
Delta	Minneapolis	MSP		758	858	1,007	205	379	761	382	75.6%		99,431	114,722	131,162	26,822	62,942	118,723	55,781	90.5%
Delta	New York J F Kennedy	JFK	183								-	39,894								-
Delta	Orlando	MCO	1,838	261		9						218,705	99,129		959					
Delta	Salt Lake City	SLC									-									-
Delta	Tampa	TPA		813							-		33,625							-
Delta	West Palm Beach	PBI	732	205							-	87,108	37,536							-
Frontier	Atlanta	ATL						64	204	140	-						11,904	37,872	25,968	-
Frontier	Burlington	BTV					6				-					1,116				-
Frontier	Cancun	CUN							22	22	-							4,532	4,532	-
Frontier	Denver	DEN				96	40	49	228	179	237.5%				17,280	7,604	8,946	45,098	36,152	261.0%
Frontier	Las Vegas	LAS							145	145	-							26,856	26,856	-
Frontier	Miami	MIA				30	34	26		(26)					5,477	6,276	4,836		(4,836)	
Frontier	Orlando	MCO				127	134	196	338	142	265.8%				28,136	27,564	38,222	73,104	34,882	259.8%
Frontier	Raleigh/Durham	RDU				83		54	54		64.9%				14,966		10,026	10,466	440	69.9%
Frontier	San Juan	SJU							178	178	-							33,972	33,972	-
jetBlue	Washington National	DCA			730	349								85,300	34,914					
jetBlue	Fort Lauderdale/Hollywood	FLL		101	590	691	409	629	507	(122)	73.3%		15,086	88,479	103,714	64,592	96,036	81,640	(14,396)	78.7%

Table G-8 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
jetBlue	Fort Myers	RSW			212	242	257	207	238	31	98.3%			31,800	38,740	39,606	35,962	38,594	2,632	99.6%
jetBlue	Orlando	MCO		101	730	826	482	641	758	117	91.8%		15,086	109,500	123,879	75,890	102,046	124,456	22,410	100.5%
jetBlue	San Juan	SJU			465	660	354	467	570	103	86.3%			69,686	99,043	55,164	74,502	92,328	17,826	93.2%
jetBlue	Tampa	TPA			365	365	215	346	252	(94)	69.0%			48,750	54,750	33,982	55,218	40,900	(14,318)	74.7%
jetBlue	West Palm Beach	PBI			365	446	288	404	292	(112)	65.5%			45,550	71,737	45,500	58,472	48,292	(10,180)	67.3%
jetBlue	Cancun	CUN					15	209	159	(50)	-					2,334	33,450	25,734	(7,716)	-
jetBlue	Las Vegas	LAS					2	183	64	(119)	-					324	29,394	10,356	(19,038)	-
jetBlue	Los Angeles	LAX					4	191	241	50	-					624	30,690	39,042	8,352	-
jetBlue	Miami	MIA						149	148	(1)	-						24,078	23,544	(534)	-
jetBlue	San Francisco	SFO					3	128	61	(67)	-					486	20,652	9,882	(10,770)	-
Laker Airways (Bahamas)	Freeport	FPO	39								-	5,850								-
Midway Airlines	Raleigh/Durham	RDU	683								-	69,213								-
Midwest/Republic	Milwaukee	MKE	619								-	44,455								-
Northwest	Amsterdam	AMS									-									-
Northwest	Detroit	DTW	1,699								-	215,750								-
Northwest	Fort Myers	RSW									-									-
Northwest	Minneapolis	MSP	1,177								-	135,570								-
Northwest	Orlando	MCO									-									-
Northwest	Tampa	TPA									-									-
Northwest	West Palm Beach	PBI									-									-
Norwegian Air	Edinburgh	EDI									-									-
Southwest	Atlanta	ATL			172						-			24,482						-
Southwest	Baltimore	BWI	2,841	2,700	2,435	2,000	1,251	1,191	1,534	343	76.7%	389,158	367,534	353,038	294,277	189,965	186,057	244,418	58,361	83.1%
Southwest	Chicago Midway	MDW	723	923	974	883	480	522	669	147	75.8%	99,090	126,412	147,672	135,369	74,624	85,462	113,555	28,093	83.9%
Southwest	Denver	DEN		306	374	327	190	190	80	(110)	24.4%		41,922	61,917	54,781	31,906	32,930	12,848	(20,082)	23.5%
Southwest	Fort Lauderdale/Hollywood	FLL		70	387	242	125	11	13	2	5.4%		9,551	57,309	37,591	18,291	1,829	1,859	30	4.9%
Southwest	Fort Myers	RSW			212	229	195	61	18	(43)	7.9%			30,586	35,794	30,381	10,419	2,926	(7,493)	8.2%
Southwest	Las Vegas	LAS	52	361	306						-	7,163	49,398	44,037						-
Southwest	Nashville	BNA	672	361				256	357	101	-	92,064	49,398				40,544	58,251	17,707	-
Southwest	Orlando	MCO	375	1,016	1,003	1,008	692	508	474	(34)	47.0%	51,336	139,212	151,806	154,334	112,972	81,220	79,046	(2,174)	51.2%

Table G-8 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Southwest	Philadelphia	PHL									-									-
Southwest	St. Louis	STL				356	138	1	8	7	2.2%				58,077	22,774	143	1,144	1,001	2.0%
Southwest	Tampa	TPA		570	651	686	340	314	349	35	50.9%		78,129	93,905	108,402	53,740	49,446	55,539	6,093	51.2%
Southwest	West Palm Beach	PBI			4	4								633	633					
Spirit	Fort Lauderdale/Hollywood	FLL				521	298	316	70	(246)	13.4%				83,934	50,795	59,177	11,445	(47,732)	13.6%
Spirit	Fort Myers	RSW				151	109	66	92	26	60.8%				27,534	18,913	11,759	16,744	4,985	60.8%
Spirit	Miami	MIA						40	280	240	-						8,016	54,590	46,574	-
Spirit	Montego Bay	MBJ							10	10	-							1,820	1,820	-
Spirit	Myrtle Beach	MYR				258	203	406	478	72	185.3%				45,656	34,874	73,892	79,855	5,963	174.9%
Spirit	Orlando	MCO				696	352	491	562	71	80.8%				114,939	57,071	82,486	98,739	16,253	85.9%
Spirit	Tampa	TPA				212	180	86	67	(19)	31.6%				38,532	31,391	15,319	12,194	(3,125)	31.6%
Sun Country	Orlando	MCO						13		(13)	-						2,418		(2,418)	-
Sun Country	Minneapolis	MSP						43	20	(23)	-						6,450	3,720	(2,730)	-
Sunworld International	Philadelphia	PHL									-									-
Trans World Airlines	Portland (ME)	PWM	305								-	43,310								-
Trans World Airlines	St. Louis	STL	1,460								-	206,109								-
United	Chicago O'Hare	ORD	2,034	1,296	554	988	202	250	838	588	84.8%	299,522	198,709	72,529	145,068	28,476	34,265	122,297	88,032	84.3%
United	Denver	DEN	366			365	246	364	365	1	100.0%	46,901			60,713	33,650	56,065	60,849	4,784	100.2%
United	Detroit	DTW					2				-					358				-
United	Houston Intercontinental	IAH						1	155	154	-						166	22,455	22,289	-
United	New York Newark	EWR									-									-
United	San Francisco	SFO	366								-	45,384								-
United	Washington Dulles	IAD	1,455	1,192	82	750	114	439	823	384	109.7%	173,869	155,750	11,182	111,930	16,678	66,391	118,303	51,912	105.7%
US Airways	Baltimore	BWI	488								-	41,760								-
US Airways	Charlotte	CLT	1,464	1,588							-	214,719	228,119							-
US Airways	Fort Lauderdale/Hollywood	FLL	366								-	39,232								-
US Airways	Orlando	MCO	1,098								-	117,696								-
US Airways	Philadelphia	PHL	2,148	361							-	310,118	49,914							-
US Airways	Phoenix	PHX									-									-
US Airways	Pittsburgh	PIT	1,800								-	278,575								-

Table G-8 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
US Airways	Washington Dulles	IAD	732								-	86,376								-
US Airways	Washington National	DCA	1,329	361							-	171,891	51,434							-
US Airways	West Palm Beach	PBI	366								-	39,232								-
USA 3000 Airlines	Cancun	CUN									-									-
USA 3000 Airlines	Punta Cana	PUJ									-									-
Subtotal			38,171	18,695	18,175	23,953	11,569	14,747	20,131	5,384	84.0%	5,179,671	2,622,086	2,604,342	3,643,137	1,804,216	2,334,296	3,238,523	904,227	88.9%
Regional/ Commuter Carriers																				
Air Canada Express	Montreal Dorval	YUL	1,385	1,021	1,008	343	73					19,392	19,399	18,141	17,042	3,650				
Air Canada Express	Toronto	YYZ	1,589	1,287	1,395	1,013	148		144	144	14.2%	61,991	36,960	25,118	46,424	7,400		7,200	7,200	15.5%
America West Express	Columbus	CMH	450								-	22,493								-
American Connection	St. Louis	STL									-									-
American Eagle	Charlotte	CLT			290	91	117	320	159	(161)	173.9%			22,265	6,474	8,892	23,990	11,501	(12,489)	177.7%
American Eagle	Chicago O'Hare	ORD		1,501	1,604	546	572	909	410	(499)	75.1%		79,594	115,366	38,769	40,036	66,422	29,543	(36,879)	76.2%
American Eagle	New York J F Kennedy	JFK	1,460								-	48,166								-
American Eagle	Philadelphia	PHL			2,502	914	669	1,392	736	(656)	80.5%			146,222	53,306	41,327	92,787	52,367	(40,420)	98.2%
American Eagle	Pittsburgh	PIT			782						-			39,086						-
American Eagle	Raleigh/Durham	RDU		257							-		10,774							-
American Eagle	St. Louis	STL									-									-
American Eagle	Washington National	DCA			2,125	2,064	672	935	1,844	909	89.3%			130,975	124,954	44,551	65,756	130,987	65,231	104.8%
American Eagle	Miami	MIA					74	86	87	1	-					5,624	6,536	6,612	76	-
Continental Connection	Albany	ALB									-									-
Continental Connection	Binghamton	BGM									-									-
Continental Connection	Boston	BOS									-									-
Continental Connection	Buffalo	BUF	89								-	1,683								-
Continental Connection	Burlington	BTV	4								-	84								-
Continental Connection	New York J F Kennedy	JFK									-									-
Continental Connection	New York Newark	EWR		608							-		22,485							-
Continental Connection	Philadelphia	PHL									-									-
Continental Connection	Rochester	ROC	93								-	1,767								-
Continental Connection	Syracuse	SYR	97								-	1,851								-

Table G-8 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Continental Express	Cleveland	CLE	803	1,208							-	39,357	60,400							-
Continental Express	New York Newark	EWR	1,747	465							-	82,365	23,264							-
Delta Connection	Atlanta	ATL			4						-			326						-
Delta Connection	Cincinnati	CVG		1,218	475	313	72						61,642	25,537	22,679	5,472				
Delta Connection	Cleveland	CLE			243	313	72							15,450	23,777	5,472				
Delta Connection	Columbus	CMH									-									-
Delta Connection	Detroit	DTW		1,004	313	27	883	904	146	(758)	549.5%		54,265	20,860	2,019	66,999	67,993	10,990	(57,003)	544.2%
Delta Connection	Fort Lauderdale/Hollywood	FLL									-									-
Delta Connection	Fort Myers	RSW									-									-
Delta Connection	Indianapolis	IND									-									-
Delta Connection	Minneapolis	MSP		481	342	345	513	625	110	(515)	31.9%		36,567	25,556	25,844	38,981	46,845	8,360	(38,485)	32.3%
Delta Connection	Myrtle Beach	MYR	61								-	3,057								-
Delta Connection	New York J F Kennedy	JFK		365							-		18,250							-
Delta Connection	New York La Guardia	LGA							405	405	-							29,847	29,847	-
Delta Connection	Orlando	MCO			35						-			2,354						-
Delta Connection	Raleigh/Durham	RDU		100	261	313	78						6,136	17,611	23,777	5,907				
Delta Connection	Tampa	TPA									-									-
Delta Connection	Washington National	DCA		166							-		11,324							-
Delta Connection	West Palm Beach	PBI									-									-
Frontier Express	Milwaukee	MKE		140							-		6,313							-
Independence Air	Washington Dulles	IAD									-									-
Midway Airlines	Raleigh/Durham	RDU	1,348								-	67,393								-
Midwest Connect	Milwaukee	MKE	4								-	142								-
Northwest Airlink	Detroit	DTW									-									-
Northwest Airlink	Indianapolis	IND									-									-
Northwest Airlink	Memphis	MEM									-									-
Northwest Airlink	Minneapolis	MSP									-									-
OneJet	Pittsburgh	PIT									-									-
Shuttle America	Albany	ALB	66								-	3,286								-
Shuttle America	Bedford	BED	233								-	11,671								-

Table G-8 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Shuttle America	Buffalo	BUF	337								-	16,857								-
Shuttle America	Islip	ISP	27								-	1,329								-
Shuttle America	Wilmington	ILG	159								-	7,936								-
Swissair	New York J F Kennedy	JFK	31								-	1,023								-
Trans World Airlines	New York J F Kennedy	JFK	1,098								-	31,842								-
United Express	Chicago O'Hare	ORD		548	904	338	646	744	143	(601)	42.3%		36,797	60,980	23,571	46,090	48,794	10,484	(38,310)	44.5%
United Express	Cleveland	CLE									-									-
United Express	Houston Intercontinental	IAH			365	352	86	100	119	19	33.8%			26,998	24,650	6,530	7,468	9,044	1,576	36.7%
United Express	New York Newark	EWR			1,335						-			65,086						-
United Express	Washington Dulles	IAD		494	1,243	680	702	493	462	(31)	67.9%		30,270	77,783	47,246	49,844	35,070	34,518	(552)	73.1%
US Airways Express	Baltimore	BWI	1,185								-	43,850								-
US Airways Express	Buffalo	BUF	1,032								-	38,200								-
US Airways Express	Charlotte	CLT		537							-		45,043							-
US Airways Express	New York La Guardia	LGA		139							-		5,159							-
US Airways Express	New York Newark	EWR									-									-
US Airways Express	Philadelphia	PHL		2,404							-		183,838							-
US Airways Express	Rochester	ROC	937	478							-	34,658	16,242							-
US Airways Express	Syracuse	SYR	732								-	27,084								-
US Airways Express	Washington National	DCA		1,334							-		89,629							-
Subtotal			14,968	16,694	15,226	7,651	5,377	6,508	4,765	(1,743)	62.3%	567,477	901,282	835,714	480,533	376,775	461,661	341,453	(120,208)	71.1%
Total			53,139	35,389	33,402	31,605	16,946	21,255	24,896	3,641	78.8%	5,747,148	3,523,368	3,440,056	4,123,671	2,180,991	2,795,957	3,579,976	784,019	86.8%

Source: OAG Schedules.
Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table G-9 Bradley International Airport (BDL) 2022 Key Highlights

Passenger and Operation Trends	• 2022 Passengers: 5.8 million (14.2 percent below 2019 levels) • 2022 Operations: 79,400 (13.1 percent below 2019 levels) • BDL experienced steady passenger growth from 2012 to 2019, having surpassed 6 million passengers in 2016. • BDL's commercial activity continued to recover from the pandemic – commercial aircraft operations remained 13 percent below 2019 levels, and passenger counts were 14 percent below 2019 levels.
Service Developments	• BDL is the second-largest airport (by commercial passengers) in New England. • Scheduled carriers launched nine new non-stop services between 2019 and 2023 increasing BDL's total airport destinations from 30 in 2019 to 39 in 2023 (Source: OAG). • 2022: Air Canada resumes non-stop service to Toronto-Pearson. • 2023: Aer Lingus resumes non-stop service to Dublin, Ireland. • Delta Air Lines, American Airlines, Frontier, and United Airlines each add more than 125,000 scheduled seats in 2022..
Facility Improvements / Upcoming Airport Plans	• FY22: $21.7 million invested in capital improvement programs, including: • ConRAC (consolidated rental car) facility • Inline baggage screening building • Replacing airfield guidance signs • Reconstructing a portion of Taxiway S • Terminal Enhancement and Refurbishment Program • Reconstruction of Taxiway E • March 2019: Airport Master Plan published. This $1.4 billion plan proposed a range of projects to be completed through 2037, including a new Terminal B, taxiway enhancement, a new baggage inspection facility, and additional parking.

G.6 Rhode Island T.F. Green International Airport Supporting Documentation

Table G-10 Passenger Operations by Market and Carrier for Rhode Island T.F Green Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Jet Carriers																				
Allegiant Airways	Cincinnati	CVG				26	22	24	18	(6)	68.5%				4,653	3,894	4,125	3,186	(939)	68.5%
Allegiant Airways	Nashville	BNA							56	56	-							8,736	8,736	-
Allegiant Airways	Punta Gorda	PGD				100	127	121	123	2	123.0%				17,700	22,479	21,453	21,771	318	123.0%
Allegiant Airways	St. Petersburg/Clearwater	PIE									-									-
Allegiant Airways	Savannah	SAV				52									9,255					
American	Charlotte	CLT			1,176	1,366	878	711	1,019	308	74.6%			170,310	208,083	140,531	106,722	173,177	66,455	83.2%
American	Chicago O'Hare	ORD	1,464					1	208	207	-	203,104					150	26,624	26,474	-
American	Dallas/Fort Worth	DFW									-									-
American	Miami	MIA				73									9,362					
American	Philadelphia	PHL			366	914	209		194	194	21.2%			36,514	112,780	25,186		24,832	24,832	22.0%
American	Washington National	DCA			52				242	242	-			6,483				30,976	30,976	-
Breeze Airways	Charleston	CHS						95	259	164	-						10,260	30,222	19,962	-
Breeze Airways	Columbus	CMH							11	11	-							1,298	1,298	-
Breeze Airways	Jacksonville	JAX							22	22	-							2,376	2,376	-
Breeze Airways	Los Angeles	LAX							2	2	-							252	252	-
Breeze Airways	Louisville	SDF							2	2	-							216	216	-
Breeze Airways	Norfolk	ORF						91	165	74	-						9,443	18,246	8,803	-
Breeze Airways	Pittsburgh	PIT						90	157	67	-						9,335	18,006	8,671	-
Breeze Airways	Richmond	RIC							28	28	-							3,024	3,024	-
Continental	Cleveland	CLE	569								-	69,771								-
Continental	Houston Intercontinental	IAH	366								-	45,946								-
Continental	New York Newark	EWR	738								-	96,448								-
Condor	Frankfurt	FRA			22						-			5,940						-
Delta	Atlanta	ATL	1,464	510	997	1,043	262	711	1,024	313	98.2%	207,888	72,461	148,078	157,584	38,458	104,907	163,658	58,751	103.9%
Delta	Cincinnati	CVG	732								-	103,944								-
Delta	Detroit	DTW		414	707	414	87		262	262	63.3%		50,065	87,078	52,203	13,609		33,446	33,446	64.1%
Delta	Fort Lauderdale/Hollywood	FLL									-									-

Table G-10 Passenger Operations by Market and Carrier for Rhode Island T.F Green Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Delta	Minneapolis	MSP		74				42	65	23	-		9,211				5,569	8,605	3,036	-
Delta	Orlando	MCO	732								-	87,108								-
Frontier	Atlanta	ATL						23	55	32	-						4,272	10,218	5,946	-
Frontier	Austin	AUS									-									-
Frontier	Cancun	CUN							8	8	-							1,570	1,570	-
Frontier	Charlotte	CLT				114									21,569					
Frontier	Denver	DEN				74			52	52	69.9%				13,397			9,648	9,648	72.0%
Frontier	Fort Lauderdale/Hollywood	FLL							75	75	-							14,028	14,028	-
Frontier	Fort Myers	RSW				56	47	70	110	40	195.9%				10,106	8,652	12,948	20,708	7,760	204.9%
Frontier	Miami	MIA						64		(64)	-						11,880		(11,880)	-
Frontier	Myrtle Beach	MYR						25		(25)	-						4,650		(4,650)	-
Frontier	New Orleans	MSY									-									-
Frontier	Orlando	MCO				252	165	264	228	(36)	90.4%				50,550	35,700	49,394	46,650	(2,744)	92.3%
Frontier	Philadelphia	PHL						25		(25)	-						4,644		(4,644)	-
Frontier	Portland (ME)	PWM						1		(1)	-						186		(186)	-
Frontier	Raleigh/Durham	RDU				57			63	63	110.8%				10,234			11,688	11,688	114.2%
Frontier	Tampa	TPA				95	57	125	59	(66)	62.2%				17,074	10,524	23,282	10,926	(12,356)	64.0%
jetBlue	Fort Lauderdale/Hollywood	FLL			365	365	178	210	321	111	87.9%			54,750	54,750	28,104	33,526	55,904	22,378	102.1%
jetBlue	Orlando	MCO			713	598	271	361	469	108	78.4%			106,886	89,764	41,682	59,628	75,966	16,338	84.6%
jetBlue	West Palm Beach	PBI				297	138	174	220	46	74.0%				44,614	21,672	26,420	32,230	5,810	72.2%
jetBlue	Fort Myers	RSW					44	135	78	(57)	-					6,936	15,252	12,636	(2,616)	-
jetBlue	Tampa	TPA					45	114	77	(37)	-					6,966	16,140	12,474	(3,666)	-
Laker Airways (Bahamas)	Freeport	FPO									-									-
Northwest	Detroit	DTW	1,682								-	200,509								-
Northwest	Minneapolis	MSP									-									-
Norwegian Air	Belfast	BFS									-									-
Norwegian Air	Bergen	BGO									-									-
Norwegian Air	Cork	ORK				26									4,941					
Norwegian Air	Dublin	DUB				222									41,711					

Table G-10 Passenger Operations by Market and Carrier for Rhode Island T.F Green Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Norwegian Air	Edinburgh	EDI									-									-
Norwegian Air	Fort De France	FDF									-									-
Norwegian Air	Pointe-A-Pitre	PTP									-									-
Norwegian Air	Shannon	SNN				35									6,588					
SATA Internacional	Ponta Delgada	PDL									-									-
Southwest	Baltimore	BWI	3,913	3,260	2,793	2,189	1,458	1,301	1,610	309	73.5%	535,911	442,637	407,651	325,736	219,374	203,899	257,974	54,075	79.2%
Southwest	Chicago Midway	MDW	1,072	1,135	988	828	464	382	667	285	80.6%	146,844	153,121	158,640	132,158	74,480	60,322	102,357	42,035	77.5%
Southwest	Denver	DEN									-									-
Southwest	Fort Lauderdale/Hollywood	FLL	9	594	477	446	228	119	22	(97)	4.9%	1,194	81,378	70,778	66,813	35,484	18,137	3,466	(14,671)	5.2%
Southwest	Fort Myers	RSW			48	61	63	44	53	9	87.1%			7,305	9,109	9,009	6,708	8,315	1,607	91.3%
Southwest	Houston	HOU	152								-	20,824								-
Southwest	Islip	ISP	608								-	83,237								-
Southwest	Kansas City	MCI	366								-	50,142								-
Southwest	Las Vegas	LAS		365							-		50,005							-
Southwest	Nashville	BNA	706	296							-	96,702	39,578							-
Southwest	Orlando	MCO	955	1,799	1,464	1,253	830	786	801	15	63.9%	130,855	245,156	215,253	198,408	129,826	123,086	124,687	1,601	62.8%
Southwest	Philadelphia	PHL		1,402							-		192,054							-
Southwest	Phoenix	PHX	366	361							-	50,142	49,398							-
Southwest	Tampa	TPA	745	813	735	588	179	408	359	(49)	61.1%	102,065	111,231	108,451	92,161	27,869	63,240	56,393	(6,847)	61.2%
Southwest	West Palm Beach	PBI			31	4	6							4,433	633	858				
Southwest	Washington National	DCA				752	487	104	582	478	77.4%				109,189	69,737	14,904	84,666	69,762	77.5%
Southwest	St. Louis	STL					16				-					2,288				-
Spirit	Detroit	DTW									-									-
Spirit	Fort Lauderdale/Hollywood	FLL									-									-
Spirit	Fort Myers	RSW									-									-
Sun Country	Las Vegas	LAS				30									4,929					
Sun Country	Minneapolis	MSP				127	34	54	47	(7)	37.1%				19,746	6,324	9,936	8,742	(1,194)	44.3%
Sun Country	Nashville	BNA				122									18,555					
Sun Country	New Orleans	MSY				22									3,518					
TACV	Praia	RAI			39						-			7,739						-

Table G-10 Passenger Operations by Market and Carrier for Rhode Island T.F Green Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
United	Chicago O'Hare	ORD	1,477	644	144		1		5	5	-	239,076	82,802	17,570		179		780	780	-
United	Washington Dulles	IAD						8	6	(2)	-						1,197	300	(897)	-
US Airways	Baltimore	BWI	2,462								-	263,921								-
US Airways	Charlotte	CLT	977	1,643							-	128,984	233,886							-
US Airways	Fort Lauderdale/Hollywood	FLL									-									-
US Airways	Orlando	MCO	52								-	5,605								-
US Airways	Philadelphia	PHL	1,830	1,299							-	253,015	130,008							-
US Airways	Pittsburgh	PIT	1,339								-	185,109								-
US Airways	Washington National	DCA	1,333	365							-	167,278	49,501							-
Subtotal			26,108	14,974	11,116	12,602	6,296	6,683	9,824	3,141	78.0%	3,475,622	1,992,492	1,613,859	1,918,741	979,821	1,035,615	1,530,977	495,362	79.8%
Regional/Commuter Carriers																				
Air Canada Express	Toronto	YYZ	989	625		105						37,482	11,880		5,243					
American Eagle	Charlotte	CLT			341	278	295	613	367	(246)	132.1%			26,810	20,865	21,881	46,445	27,749	(18,696)	133.0%
American Eagle	Chicago O'Hare	ORD				909	447	749	467	(282)	51.4%				69,117	33,972	53,701	32,302	(21,399)	46.7%
American Eagle	Detroit	DTW									-									-
American Eagle	Miami	MIA							20	20	-							1,520	1,520	-
American Eagle	New York J F Kennedy	JFK	1,291								-	42,589								-
American Eagle	New York La Guardia	LGA	2,756								-	90,957								-
American Eagle	Raleigh/Durham	RDU									-									-
American Eagle	Philadelphia	PHL			2,163	895	741	1,136	803	(333)	89.7%			142,721	61,358	49,462	76,637	55,514	(21,123)	90.5%
American Eagle	Washington National	DCA			1,755	2,247	901	935	1,708	773	76.0%			111,865	139,649	61,757	65,515	118,538	53,023	84.9%
Cape Air	Block Island	BID			418						-			3,765						-
Cape Air	Hyannis	HYA									-									-
Cape Air	Martha's Vineyard	MVY	1,762	747	192						-	15,861	6,722	1,725						-
Cape Air	Nantucket	ACK	2,453	681	244						-	22,073	6,128	2,196						-
Continental Connection	Albany	ALB									-									-
Continental Connection	Boston	BOS									-									-
Continental Connection	New York Newark	EWR		427							-		31,630							-

Table G-10 Passenger Operations by Market and Carrier for Rhode Island T.F Green Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Continental Connection	Plattsburgh	PLB									-									-
Continental Connection	Washington Dulles	IAD									-									-
Continental Express	Cleveland	CLE	699	1,217							-	34,936	60,836							-
Continental Express	New York Newark	EWR	1,482	1,028							-	86,552	51,407							-
Delta Connection	Atlanta	ATL		724	43						-		52,959	3,001						-
Delta Connection	Cincinnati	CVG		43							-		2,150							-
Delta Connection	Detroit	DTW		1,324	289	804	236	583	651	68	81.0%		78,701	18,671	60,218	17,033	43,369	47,975	4,606	79.7%
Delta Connection	Minneapolis	MSP		347							-		26,192							-
Delta Connection	New York J F Kennedy	JFK									-									-
Delta Connection	New York La Guardia	LGA	610						1,097	1,097	-	19,520						79,922	79,922	-
Delta Connection	Raleigh/Durham	RDU									-									-
Delta Connection	Washington National	DCA									-									-
Independence Air	Washington Dulles	IAD									-									-
Midway Airlines	Raleigh/Durham	RDU									-									-
Northwest Airlink	Detroit	DTW									-									-
Northwest Airlink	Minneapolis	MSP									-									-
OneJet	Pittsburgh	PIT									-									-
Southern Airways Express	Nantucket	ACK				96	270	344	375	31	388.9%				868	2,430	3,096	3,375	279	388.9%
United Express	Chicago O'Hare	ORD		455	605	942	382	375	474	99	50.3%		29,820	34,473	51,047	25,546	25,414	33,196	7,782	65.0%
United Express	Cleveland	CLE									-									-
United Express	New York Newark	EWR			1,356	1,043	462	609	1,139	530	109.2%			73,682	54,037	25,358	35,004	73,628	38,624	136.3%
United Express	Washington Dulles	IAD	1,468	1,569	837	1,084	620	839	731	(108)	67.5%	52,832	99,719	52,139	66,611	36,280	41,950	36,550	(5,400)	54.9%
US Airways Express	Albany	ALB	679								-	12,898								-
US Airways Express	Boston	BOS	48								-	909								-
US Airways Express	Charlotte	CLT		126							-		10,047							-
US Airways Express	Hyannis	HYA									-									-
US Airways Express	Nantucket	ACK									-									-
US Airways Express	New York La Guardia	LGA	2,298	1,222							-	84,116	45,225							-

Table G-10 Passenger Operations by Market and Carrier for Rhode Island T.F Green Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
US Airways Express	New York Newark	EWR	1,569								-	31,176								-
US Airways Express	Philadelphia	PHL	366	1,526							-	13,542	107,790							-
US Airways Express	Pittsburgh	PIT									-									-
US Airways Express	Plattsburgh	PLB	26								-	497								-
US Airways Express	Washington National	DCA		1,373							-		92,151							-
Subtotal			18,527	13,436	8,243	8,403	4,354	6,183	7,832	1,649	93.2%	546,963	713,356	471,048	529,014	273,719	391,131	510,269	119,138	96.5%
Total			44,635	28,409	19,359	21,004	10,650	12,866	17,656	4,790	84.1%	4,022,585	2,705,848	2,084,907	2,447,755	1,253,540	1,426,746	2,041,246	614,500	83.4%

Source: OAG Schedules.

Notes: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table G-11 Rhode Island T.F. Green International Airport (PVD) 2022 Key Highlights

Passenger and Operation Trends	• 2022 Passengers: 3.2 million (20.5 percent below 2019 levels) • 2022 Operations: 66, 800 (4.2 percent below 2019 levels) • 2018: PVD passenger count peaked at 4.3 million. • In 2022, PVD handled approximately 23,000 GA aircraft operations, exceeding 2021 and 2019 GA operation levels. • Commercial aviation continued to trail in recovery, primarily driven by its three largest commercial carriers, American Airlines, Southwest, and Delta having operated about 17 percent below pre-pandemic levels
Service Developments	• American Airlines, Southwest, and Delta provided over 70 percent of seat capacity at PVD. • PVD experienced a 143 percent rise in departing seat capacity over 2021, with all airlines, except Sun Country Airlines, doubling capacity. • Delta Air Lines and new ultra-low-cost carrier Breeze Airways launched the most new non-stop service at PVD. • Frontier Airlines added seasonal Cancun service, despite providing just 50 percent of 2018 seat capacity from PVD. • PVD served 31 non-stop destinations, up from 28 non-stop destinations in 2019. • Allegiant filled in Nashville service after Sun Country discontinued service in 2019. • At the time of this report, Air Canada has yet to resume Toronto-Pearson service.
Facility Improvements / Upcoming Airport Plans	• May 2021: PVD published its Master Plan, which includes an approved Airport Layout Plan. Implementation of the Master Plan is expected to occur over three phases driven by their forecast passenger annual levels (or PAL), having respective total costs of $291m, $400m, and $106m. Several of the largest foreseen project investments include: • Construction of Pier Concourse and Adjacent Apron Area ($202m) • Reconfiguration of Airport Connector Road; Expansion of Lot D; and Construction of Parking Garage ($93m) • Construction of Terminal expansion on South Side of Main Concourse ($67m) • Ground level Federal Inspection Station ($51m) • Construction of Parking Garage ($38m) • Construction of Cargo Facility Expansion and employee parking lot ($36m)

G.7 Manchester-Boston Regional Airport Supporting Documentation

Table G-12 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Jet Carriers																				
American	Charlotte	CLT							303	303	-							40,214	40,214	-
American	Philadelphia	PHL				155									18,005					
Boston-Maine Airways	Myrtle Beach	MYR									-									-
Boston-Maine Airways	Portsmouth	PSM									-									-
Boston-Maine Airways	Sanford	SFB									-									-
Continental	Cleveland	CLE	130								-	16,151								-
Continental	New York Newark	EWR	462								-	62,358								-
Delta	Atlanta	ATL	244	275	365	271	16					34,648	39,050	53,545	40,520	2,400				
Delta	Cincinnati	CVG									-									-
Delta	Detroit	DTW		796	122						-		89,289	14,414						-
Delta	New York La Guardia	LGA			4		2				-			596		220				-
Northwest	Detroit	DTW	1,609								-	194,058								-
Northwest	Minneapolis	MSP									-									-
Southwest	Baltimore	BWI	2,828	2,891	2,476	1,947	1,372	1,286	1,558	272	80.0%	387,397	393,093	363,524	286,174	201,796	197,594	244,106	46,512	85.3%
Southwest	Chicago Midway	MDW	706	1,144	948	822	398	353	547	194	66.6%	96,702	155,466	148,825	124,338	63,186	56,111	86,477	30,366	69.5%
Southwest	Denver	DEN									-									-
Southwest	Fort Lauderdale/Hollywood	FLL		9	4						-		1,194	633						-
Southwest	Kansas City	MCI	366								-	50,142								-
Southwest	Las Vegas	LAS		365	9						-		50,005	1,246						-
Southwest	Nashville	BNA	397								-	54,389								-
Southwest	Orlando	MCO	410	1,125	743	638	595	463	442	(21)	69.3%	56,111	154,145	113,888	100,116	97,885	71,521	66,214	(5,307)	66.1%
Southwest	Philadelphia	PHL		1,411							-		192,456							-
Southwest	Phoenix	PHX		322							-		44,114							-
Southwest	Tampa	TPA		782	479	439	266	81	66	(15)	15.0%		107,173	70,529	69,350	41,814	12,511	10,366	(2,145)	14.9%
Spirit	Fort Lauderdale/Hollywood	FLL						84	294	210	-						15,288	60,362	45,074	-

Table G-12 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Spirit	Fort Myers	RSW						26	126	100	-						3,770	20,897	17,127	-
Spirit	Myrtle Beach	MYR							182	182	-							33,124	33,124	-
Spirit	Orlando	MCO						86	378	292	-						15,652	74,372	58,720	-
Spirit	Tampa	TPA						19	69	50	-						3,458	12,558	9,100	-
United	Chicago O'Hare	ORD	1,403								-	221,523								-
United	Portland (ME)	PWM	57								-	7,241								-
US Airways	Baltimore	BWI	1,782								-	191,078								-
US Airways	Charlotte	CLT		365							-		52,560							-
US Airways	Orlando	MCO	52								-	5,605								-
US Airways	Philadelphia	PHL	1,821	365							-	222,331	33,132							-
US Airways	Pittsburgh	PIT	1,085								-	139,837								-
US Airways	Washington National	DCA	675								-	82,085								-
Subtotal			14,026	9,850	5,150	4,272	2,649	2,398	3,965	1,567	92.8%	1,821,657	1,311,677	767,200	638,505	407,301	375,905	648,690	272,785	101.6%
Regional/Commuter Carriers																				
Air Canada Express	Montreal Dorval	YUL									-									-
Air Canada Express	Toronto	YYZ	339	707							-	5,616	13,441							-
American Eagle	Charlotte	CLT			730	1,288	1,030	1,081	631	(450)	49.0%			54,688	92,149	74,655	80,660	47,065	(33,595)	51.1%
American Eagle	Chicago O'Hare	ORD				428	422	565	268	(297)	62.6%				26,964	27,430	37,718	18,630	(19,088)	69.1%
American Eagle	New York La Guardia	LGA	1,833								-	60,480								-
American Eagle	Philadelphia	PHL			2,237	1,759	962	1,139	1,012	(127)	57.5%			152,206	97,028	53,116	62,892	56,523	(6,369)	58.3%
American Eagle	Washington National	DCA			1,152	1,161	477	531	1,100	569	94.8%			74,008	80,532	29,373	38,979	78,980	40,001	98.1%
Boston-Maine Airways	Bangor	BGR									-									-
Boston-Maine Airways	Martha's Vineyard	MVY									-									-
Boston-Maine Airways	Nantucket	ACK									-									-
Boston-Maine Airways	New London/Groton	GON									-									-
Boston-Maine Airways	Portsmouth	PSM									-									-

Table G-12 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
Boston-Maine Airways	Saint John	YSJ									-									-
Continental Connection	Albany	ALB	80								-	1,515								-
Continental Connection	New York J F Kennedy	JFK									-									-
Continental Connection	New York Newark	EWR		141							-		9,483							-
Continental Connection	Plattsburgh	PLB									-									-
Continental Connection	Rochester	ROC	44								-	841								-
Continental Connection	Syracuse	SYR	22								-	421								-
Continental Connection	Westchester County	HPN									-									-
Continental Express	Cleveland	CLE	593	1,178							-	29,614	58,921							-
Continental Express	New York Newark	EWR	1,028	1,267							-	64,944	63,336							-
Delta Connection	Atlanta	ATL	488	90							-	24,400	6,300							-
Delta Connection	Bangor	BGR	244								-	12,200								-
Delta Connection	Cincinnati	CVG	1,673								-	83,657								-
Delta Connection	Detroit	DTW		499	912	1,043	312						32,795	51,960	75,566	22,827				
Delta Connection	New York J F Kennedy	JFK									-									-
Delta Connection	New York La Guardia	LGA	727		970	326	66					36,357		55,968	18,350	3,300				
Delta Connection	Minneapolis	MSP									-									-
Independence Air	Washington Dulles	IAD									-									-
Northwest Airlink	Detroit	DTW									-									-
Northwest Airlink	Minneapolis	MSP									-									-
United Express	Chicago O'Hare	ORD		1,040	779						-		67,675	42,976						-
United Express	Cleveland	CLE									-									-
United Express	New York Newark	EWR			1,304	244	4	148	693	545	283.7%			60,052	13,226	280	7,426	46,062	38,636	348.3%
United Express	Washington Dulles	IAD		1,104		763	251	429	3	(426)	0.4%		55,951		45,133	14,836	21,450	150	(21,300)	0.3%

Table G-12 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery
US Airways Express	Boston	BOS									-									-
US Airways Express	Charlotte	CLT		153							-		13,146							-
US Airways Express	New York La Guardia	LGA	2,583	1,381							-	96,936	49,420							-
US Airways Express	Philadelphia	PHL		2,116							-		140,277							-
US Airways Express	Pittsburgh	PIT									-									-
US Airways Express	Washington National	DCA		1,039							-		81,095							-
Subtotal			9,655	10,716	8,084	7,012	3,524	3,893	3,707	(186)	52.9%	416,980	591,840	491,858	448,948	225,817	249,125	247,410	(1,715)	55.1%
Total			23,681	20,566	13,234	11,283	6,173	6,291	7,672	1,381	68.0%	2,238,636	1,903,517	1,259,058	1,087,453	633,118	625,030	896,100	271,070	82.4%

Source: OAG Schedules.
Notes: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table G-13 Manchester-Boston Regional Airport (MHT) 2022 Key Highlights

Passenger and Operation Trends	• 2022 Passengers: 1.3 million (23.8 percent below 2019 levels) • 2022 Operations: 46,400 (9.3 percent below 2019 levels) • MHT seat capacity was 26.9 percent below 2019 level (Source: OAG). • Aircraft operations were 9.0 percent below2019 levels, driven by strong GA activity that exceeded 2019 levels by 20 percent (18.9k GA movements in 2022). • Commercial operations at MHT were 11 percent higher than during its COVID trough in 2020, the slowest recovery among all New England airports.
Service Developments	• Out of the 26.8k commercial flights at MHT in 2022, approximately 12.9k (48 percent) flights were operated using regional jets, e.g., United Express or American Eagle services. • In 2021, Spirit Airlines began service at MHT with non-stop flights to five beach destinations, boosting MHT's U/LCC seat capacity share. • Four airlines provided non-stop service to 11 U.S. markets from MHT, an increase over 2019's service to 10 U.S. markets. • Amazon Air launched daily cargo flights to its Cincinnati hub, supporting Amazon's cargo facility growth plan at MHT. • MHT processed more air cargo than all other New England regional airports combined. • June 2023: ULCC Avelo Airlines commenced non-stop service to Raleigh-Durham, connecting Manchester to North Carolina's Research Triangle region.
Facility Improvements / Upcoming Airport Plans	• In 2011, the City of Manchester finalized its new Airport Master Plan, outlining the development and enhancement of airport facilities and infrastructure until 2030. Noteworthy ongoing and recent airport improvement initiatives under the Airport Master Plan include, but are not limited to,: • Demolition of structures in the runway protection zone (RPZ) of Runway 6 to remove buildings with usages deemed non-compatible with RPZs, as defined by the FAA. Elements of the project include demolishing the Highlander Inn and Conference Center and associated buildings. • Upgrades to the terminal building heating, ventilation, and air conditioning (HVAC) systems to address certain deficiencies in the terminal cooling system and provide significant improvements to customer comfort levels within areas of the terminal building. • Parking Lot A access improvements • Overlay of a portion of Taxiway M • Reconstruction of Taxiway H pavement (approximately 1,200 feet) • Relocation of Taxiway B stub to meet design standards • Manchester Airport is expected to complete rehabilitation of two (2) runways, 17-35 and 6-24, by September 2023.

G.8 Portland International Jetport Supporting Documentation

Table G-14 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Jet Carriers																				
American	Charlotte	CLT			365	730	611	694	679	(15)	93.0%			45,504	97,818	81,303	101,088	108,484	7,396	110.9%
American	Chicago O'Hare	ORD						66	154	88	-						9,658	19,888	10,230	-
American	Philadelphia	PHL				410		3	303	300	74.0%				49,532		450	42,256	41,806	85.3%
American	Washington National	DCA			30				228	228	-			3,720				29,184	29,184	-
American	Dallas/Fort Worth	DFW					15	154	81	(73)	-					1,920	19,998	11,864	(8,134)	-
AirTran	Atlanta	ATL		92							-		10,764							-
AirTran	Baltimore	BWI		944							-		112,951							-
AirTran	Orlando	MCO		52							-		6,503							-
Cape Air	Boston	BOS				368	364	633	102	(531)	27.7%				3,312	3,276	5,697	918	(4,779)	27.7%
Continental	Cleveland	CLE									-									-
Continental	New York Newark	EWR									-									-
Delta	Atlanta	ATL	732	424	714	680	266	469	566	97	83.2%	103,944	60,167	107,000	104,422	41,274	75,066	94,661	19,595	90.7%
Delta	Cincinnati	CVG	1,089								-	154,658								-
Delta	Detroit	DTW				205	1	5	446	441	217.3%				22,581	157	550	55,581	55,031	246.1%
Delta	Minneapolis	MSP						42	104	62	-						6,119	13,828	7,709	-
Delta	New York La Guardia	LGA			30	74								3,300	9,024					
Frontier	Atlanta	ATL						29		(29)	-						5,394		(5,394)	-
Frontier	Denver	DEN				87									15,737					
Frontier	Fort Lauderdale/Hollywood	FLL							10	10	-							1,842	1,842	-
Frontier	Fort Myers	RSW				61	66	103	58	(45)	95.8%				12,617	12,186	21,244	10,740	(10,504)	85.1%
Frontier	Miami	MIA						21	1	(20)	-						3,864	186	(3,678)	-
Frontier	Myrtle Beach	MYR						11		(11)	-						2,046		(2,046)	-
Frontier	Orlando	MCO				174	79	205	145	(60)	83.5%				34,940	14,652	40,834	27,252	(13,582)	78.0%
Frontier	Philadelphia	PHL					7	33	26	(7)	-					1,302	6,138	4,818	(1,320)	-
Frontier	Raleigh/Durham	RDU				87		26	48	22	54.9%				15,737		4,836	8,992	4,156	57.1%
Frontier	Tampa	TPA				73	41	78	48	(30)	65.5%				13,191	7,548	15,628	8,904	(6,724)	67.5%
Independence Air	Washington Dulles	IAD									-									-

Table G-14 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
jetBlue	New York J F Kennedy	JFK		1,201	1,295	311		246	234	(12)	75.3%		128,936	130,314	31,086		24,600	23,400	(1,200)	75.3%
jetBlue	New York La Guardia	LGA							96	96	-							9,600	9,600	-
jetBlue	Orlando	MCO		212							-		21,214							-
Northwest	Detroit	DTW	523								-	52,105								-
Southwest	Baltimore	BWI			1,106	1,297	1,111	1,131	1,128	(3)	87.0%			158,358	188,717	162,649	176,389	168,952	(7,437)	89.5%
Southwest	Orlando	MCO			4						-			633						-
Southwest	Chicago Midway	MDW			9	17		144	242	98	1388.5%			1,246	2,771		24,048	36,750	12,702	1326.2%
Southwest	Nashville	BNA							13	13	-							1,859	1,859	-
Sun Country	Minneapolis	MSP					22	24	60	36	-					4,092	4,464	11,112	6,648	-
Trans World Airlines	Hartford	BDL	305								-	43,310								-
United	Chicago O'Hare	ORD	728			301		145	338	193	112.1%	88,996			38,151		18,518	44,593	26,075	116.9%
United	Denver	DEN				26		96	84	(12)	319.6%				3,943		14,376	13,944	(432)	353.7%
United	Manchester	MHT	366								-	53,802								-
United	New York Newark	EWR				162	4	23	278	255	171.5%				20,935	552	2,922	42,430	39,508	202.7%
United	Washington Dulles	IAD						240	160	(80)	-						34,716	20,623	(14,093)	-
US Airways	Charlotte	CLT		395							-		48,688							-
US Airways	Philadelphia	PHL	1,312								-	163,051								-
US Airways	Pittsburgh	PIT	1,081								-	137,472								-
US Airways	Washington National	DCA									-									-
Subtotal			6,135	3,320	3,553	5,065	2,587	4,621	5,632	1,011	111.2%	797,338	389,224	450,075	664,514	330,911	618,643	812,661	194,018	122.3%
Regional/Commuter Carriers																				
Air Canada Express	Montreal Dorval	YUL	344								-	4,734								-
Air Canada Express	Toronto	YYZ		481							-		9,142							-
America West	New York Newark	EWR	52								-	2,457								-
American Eagle	Boston	BOS	3,804								-	125,518								-
American Eagle	Charlotte	CLT			143	73	178	63	2	(61)	2.7%			11,666	5,068	13,528	4,777	152	(4,625)	3.0%
American Eagle	Chicago O'Hare	ORD				297	246	419	127	(292)	42.7%				22,594	18,384	31,766	9,652	(22,114)	42.7%
American Eagle	New York La Guardia	LGA	2,033			582	164	152		(152)		67,084			33,467	10,640	10,001		(10,001)	
American Eagle	Philadelphia	PHL			2,148	1,277	1,079	1,121	724	(397)	56.7%			141,789	78,745	68,831	77,332	47,130	(30,202)	59.9%
American Eagle	Washington National	DCA			1,613	1,721	819	860	1,118	258	65.0%			107,469	117,417	50,915	62,801	82,876	20,075	70.6%

Table G-14 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
American Eagle	Miami	MIA					8	30	20	(10)	-					608	2,280	1,520	(760)	-
Continental Connection	Albany	ALB									-									-
Continental Connection	Boston	BOS	204								-	3,871								-
Continental Connection	New York Newark	EWR		1,426							-		105,503							-
Continental Connection	Presque Isle	PQI									-									-
Continental Express	Cleveland	CLE	425	188							-	20,378	9,400							-
Continental Express	New York Newark	EWR	1,429	4							-	70,393	200							-
Delta Connection	Atlanta	ATL		350							-		25,532							-
Delta Connection	Boston	BOS									-									-
Delta Connection	Cincinnati	CVG									-									-
Delta Connection	Detroit	DTW		1,217	896	738	828	914	41	(873)	5.6%		62,320	59,315	54,368	61,260	66,956	3,074	(63,882)	5.7%
Delta Connection	New York J F Kennedy	JFK		270		979	206	563	819	256	83.7%		13,500		61,579	13,446	42,634	62,244	19,610	101.1%
Delta Connection	New York La Guardia	LGA	475	786	1,284	1,061	282	649	1,380	731	130.0%	15,191	41,440	76,325	70,234	17,946	46,465	100,871	54,406	143.6%
Delta Connection	Minneapolis	MSP							3	3	-							228	228	-
Elite Airways	Bar Harbor	BHB									-									-
Elite Airways	Halifax	YHZ									-									-
Elite Airways	Islip	ISP									-									-
Elite Airways	Melbourne	MLB				22									1,079					
Elite Airways	Sarasota/Bradenton	SRQ				74	52								3,714	2,640				
Elite Airways	Northeast Florida Regional Airport	UST							40	40	-							2,340	2,340	-
Elite Airways	Vero Beach	VRB				39	28	35	39	4	98.9%				1,971	1,640	2,430	2,270	(160)	115.1%
Elite Airways	Westchester County	HPN						104	6	(98)	-						7,260	420	(6,840)	-
Independence Air	Washington Dulles	IAD									-									-
Lufthansa German Airlines	Washington Dulles	IAD	31								-	1,550								-
Northwest Airlink	Detroit	DTW	484								-	33,366								-
Northwest Airlink	Minneapolis	MSP									-									-

Table G-14 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Starlink Aviation	Yarmouth	YQI		521							-		9,386							-
Swissair	Boston	BOS	31								-	1,023								-
United Express	Chicago O'Hare	ORD		1,249	1,029	612	587	552	496	(56)	81.0%		82,273	64,054	36,374	40,406	37,100	29,278	(7,822)	80.5%
United Express	Cincinnati	CVG						45		(45)	-						2,250		(2,250)	-
United Express	Cleveland	CLE						44		(44)	-						2,200		(2,200)	-
United Express	Columbus	CMH						60		(60)	-						3,000		(3,000)	-
United Express	Indianapolis	IND						60		(60)	-						3,000		(3,000)	-
United Express	Milwaukee	MKE						30		(30)	-						1,500		(1,500)	-
United Express	New York Newark	EWR			1,779	1,594	672	994	1,110	116	69.6%			108,900	83,131	41,554	60,370	77,212	16,842	92.9%
United Express	Pittsburgh	PIT						44		(44)	-						2,200		(2,200)	-
United Express	Washington Dulles	IAD	996	1,078	560	1,079	660	488	488		45.2%	49,779	64,767	35,213	62,337	39,968	28,232	28,660	428	46.0%
US Airways Express	Bangor	BGR	231								-	8,558								-
US Airways Express	Boston	BOS	2,229								-	42,359								-
US Airways Express	Charlotte	CLT		88							-		5,323							-
US Airways Express	New York La Guardia	LGA	1,218	1,647							-	43,901	78,477							-
US Airways Express	Philadelphia	PHL		1,947							-		133,521							-
US Airways Express	Pittsburgh	PIT									-									-
US Airways Express	Plattsburgh	PLB	48								-	909								-
US Airways Express	Presque Isle	PQI									-									-
US Airways Express	Washington National	DCA	1,089	1,043							-	33,976	83,302							-
US Airways Express	Westchester County	HPN	65								-	1,235								-
Subtotal			15,187	12,296	9,452	10,150	5,809	7,227	6,413	(814)	63.2%	526,282	724,086	604,731	632,078	381,766	494,554	447,927	(46,627)	70.9%
Total			21,322	15,615	13,005	15,215	8,396	11,848	12,045	197	79.2%	1,323,619	1,113,310	1,054,806	1,296,593	712,677	1,113,197	1,260,588	147,391	97.2%

Source: OAG Schedules.
Notes: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).
Ulendo Airlink has been updated to Elite Airways in Table F-6, compared to the same table for Portland International Jetport in the previous EDR report. Elite Airways's main base of operations is at PWM.

Table G-15 Portland International Jetport (PWM) 2022 Key Highlights

Passenger and Operation Trends	• 2022 Passengers: 1.99 million (8.9 percent below 2019 levels) • 2022 Operations: 53,000 (9.0 percent below 2019 levels) • Distribution of commercial and GA and operations remained consistent with 2019 shares, accounting for approximately 60 percent and 40 percent of total aircraft operations, respectively. • PWM served just under two million passengers, making it the third busiest New England regional airport after Bradley International and Rhode Island T.F. Green International airports.
Service Developments	• 2020: Sun Country Airlines began service at PWM, bringing a total of nine scheduled carriers offering non-stop service to 26 U.S. destinations. • Seat capacity was just 2.0 percent below 2019 capacity. • All eight carriers operating at PWM prior to the pandemic have resumed service. • Delta Air Lines, American Airlines and United Airlines remained the largest carriers at PWM -- American is the only legacy carrier that has not fully recovered to its 2019 seat capacity. • Southwest Airlines became the fourth largest carrier at PWM, increasing seat capacity by 9.4 percent. • 2023: Breeze Airways enters PWM, introducing non-stop service to Charleston (South Carolina), Islip (New York), Norfolk (Virginia), Pittsburgh (Pennsylvania), and Tampa (Florida).
Facility Improvements / Upcoming Airport Plans	• 2018: PWM unveiled its Sustainable Master Plan,[1] a comprehensive framework aimed at evaluating the airport's capabilities, forecasting aviation demand, and strategizing for timely facility enhancements that align with its surrounding environment. This Master Plan guides the airport's development, maintenance program, and operations for the next two decades, with a focus on new environmental goals. • The following outlines upcoming initiatives in the coming years: • Construction of Long-term Hold/De-Icing/Remain Overnight (RON) Apron • Runway 11 Taxiway Bypass and realignment of perimeter space • Tree removal to clear glide slope qualification surface • Construction of Air Cargo Taxiway (Phase 1 & 2) • Construction of Taxiway C Realignment (Phase 1 & 2) • Relocate Taxiway A East of Runway 18-36 • Construction Taxiway B from Runway 36 to 29 • Relocate service access road east of the cargo area

1 Portland International Airport. Sustainable Airport Master Plan. 2018. https://portlandjetport.org/sites/default/files/files/PWM_MasterPlan_R.pdf

G.9 Burlington International Airport Supporting Documentation

Table G-16 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Jet Carriers																				
AirTran	Baltimore	BWI									-									-
Allegiant Air	Sanford	SFB			104						-			17,880						-
American	Charlotte	CLT							125	125	-							16,066	16,066	-
American	Chicago O'Hare	ORD							79	79	-							10,112	10,112	-
American	Philadelphia	PHL							29	29	-							3,734	3,734	-
American	Washington National	DCA							52	52	-							6,656	6,656	-
Boutique Air	Boston	BOS						214		(214)	-						1,712		(1,712)	-
Continental	New York Newark	EWR									-									-
Delta	Atlanta	ATL			92	284	17		360	360	127.0%			13,708	35,086	2,108		48,201	48,201	137.4%
Delta	Minneapolis	MSP							46	46	-							6,372	6,372	-
Frontier	Denver	DEN				92	38	45	46	1	50.2%				16,509	7,016	8,214	8,532	318	51.7%
Frontier	Orlando	MCO				48	50	65	50	(15)	104.8%				8,589	9,272	12,378	9,754	(2,624)	113.6%
jetBlue	New York J F Kennedy	JFK	244	1,434	1,156	1,095	424	315	811	496	74.1%	39,528	180,286	115,600	109,500	45,048	31,500	81,410	49,910	74.3%
jetBlue	Orlando	MCO		330							-		33,014							-
Northwest	Detroit	DTW									-									-
Sun Country	Minneapolis	MSP							34	34	-							5,844	5,844	-
United	Chicago O'Hare	ORD	815		113	401	53	69	415	346	103.6%	105,509		13,777	51,273	7,716	8,694	54,779	46,085	106.8%
United	Denver	DEN				26		36	95	59	361.4%				3,769		5,344	14,714	9,370	390.4%
United	New York Newark	EWR				86		2	208	206	243.1%				11,453		252	30,589	30,337	267.1%
United	Portland (ME)	PWM									-									-
United	Washington Dulles	IAD						17	140	123	-						2,310	20,313	18,003	-
US Airways	Philadelphia	PHL	1,098								-	150,338								-
US Airways	Pittsburgh	PIT	732								-	103,568								-
US Airways	Washington National	DCA									-									-
Subtotal			2,889	1,764	1,465	2,030	582	763	2,490	1,727	122.6%	398,943	213,300	160,965	236,178	71,160	70,404	317,076	246,672	134.3%

Table G-16 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Regional/Commuter Carriers																				
America West	New York Newark	EWR	166								-	7,889								-
American Eagle	Boston	BOS	3,094								-	102,111								-
American Eagle	Charlotte	CLT			122	730	791	850	538	(312)	73.7%			9,516	54,750	58,488	63,672	39,535	(24,137)	72.2%
American Eagle	Chicago O'Hare	ORD				240	51	363	197	(166)	82.2%				15,102	3,568	26,299	14,708	(11,591)	97.4%
American Eagle	New York La Guardia	LGA									-									-
American Eagle	Philadelphia	PHL			1,921	1,531	966	1,132	915	(217)	59.7%			126,772	91,729	56,494	68,315	58,191	(10,124)	63.4%
American Eagle	Washington National	DCA			1,339	1,082	358	533	1,042	509	96.3%			86,015	81,694	27,208	37,206	78,148	40,942	95.7%
American Eagle	Dallas/Fort Worth	DFW						18	82	64	-						1,368	6,232	4,864	-
American Eagle	Miami	MIA						8	27	19	-						608	2,052	1,444	-
Continental Connection	Albany	ALB									-									-
Continental Connection	Boston	BOS	244								-	4,628								-
Continental Connection	Buffalo	BUF	4								-	84								-
Continental Connection	Hartford	BDL									-									-
Continental Connection	New York Newark	EWR		405							-		30,002							-
Continental Connection	Plattsburgh	PLB	213								-	4,039								-
Continental Connection	Plattsburgh	PBG									-									-
Continental Connection	Poughkeepsie	POU	66								-	1,262								-
Continental Connection	Washington Dulles	IAD									-									-
Continental Connection	Westchester County	HPN									-									-
Continental Express	Cleveland	CLE	322	366							-	16,064	18,286							-
Continental Express	New York Newark	EWR	1,458	1,020							-	70,203	51,000							-
Continental Express	Westchester County	HPN									-									-

Table G-16 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Delta Connection	Atlanta	ATL			273	142	72	240	4	(236)	2.8%			20,748	10,825	5,472	18,240	304	(17,936)	2.8%
Delta Connection	Boston	BOS									-									-
Delta Connection	Cincinnati	CVG									-									-
Delta Connection	Detroit	DTW		1,227	1,004	1,092	874	821	341	(480)	31.2%		61,417	57,053	63,857	53,377	52,123	24,970	(27,153)	39.1%
Delta Connection	New York J F Kennedy	JFK		1,336		1,036	203	296	736	440	71.0%		67,071		59,240	12,204	20,052	55,936	35,884	94.4%
Delta Connection	New York La Guardia	LGA	355		1,257	759	164	102	981	879	129.2%	11,351		76,339	49,916	11,797	7,260	70,802	63,542	141.8%
Independence Air	Washington Dulles	IAD									-									-
Lufthansa German Airlines	Washington Dulles	IAD	31								-	1,550								-
Northwest Airlink	Detroit	DTW									-									-
Northwest Airlink	Minneapolis	MSP									-									-
Porter Airlines	Toronto Island	YTZ			39						-			2,886						-
Swissair	Boston	BOS	31								-	1,023								-
United Express	Chicago O'Hare	ORD		1,353	1,144	814	570	721	432	(289)	53.1%		84,431	63,845	43,814	33,150	39,508	27,570	(11,938)	62.9%
United Express	Cleveland	CLE									-									-
United Express	New York Newark	EWR			1,569	1,507	479	512	819	307	54.4%			96,340	81,616	24,304	29,138	54,964	25,826	67.3%
United Express	Washington Dulles	IAD	1,477	1,130	738	1,156	674	844	910	66	78.7%	73,843	61,988	41,127	72,344	39,506	47,370	54,068	6,698	74.7%
US Airways Express	Boston	BOS	2,404								-	48,139								-
US Airways Express	Charlotte	CLT									-									-
US Airways Express	New York La Guardia	LGA	2,074	1,680							-	76,749	62,144							-
US Airways Express	Philadelphia	PHL		1,903							-		128,140							-
US Airways Express	Pittsburgh	PIT									-									-
US Airways Express	Plattsburgh	PLB	2,427								-	46,116								-
US Airways Express	Poughkeepsie	POU	718								-	13,639								-
US Airways Express	Saranac Lake	SLK	44								-	841								-
US Airways Express	Washington National	DCA	988	1,043							-	31,574	77,625							-
US Airways Express	Wilkes-Barre Scranton	AVP	22								-	415								-

Table G-16 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport

Carrier	Market	Code	Departures 2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	Departing Seats 2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Subtotal			16,138	11,461	9,405	10,089	5,202	6,440	7,024	584	69.6%	511,521	642,104	580,640	624,887	325,568	411,159	487,480	76,321	78.0%
Total			19,028	13,225	10,870	12,120	5,784	7,203	9,514	2,311	78.5%	910,464	855,404	741,605	861,065	396,728	481,563	804,556	322,993	93.4%

Source: OAG Schedules.
Notes: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.
Allegiant stopped reporting to OAG between 2009-2016, during that period statistics from the T100 database were referenced.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table G-17 Burlington International Airport (BTV) 2022 Key Highlights

Passenger and Operation Trends	• 2022 Passengers: 1.2 million (14.5 percent below 2019 levels) • 2022 Operations: 101,600 (38.6 percent above 2019 levels) • GA activity surged at BTV (particularly private jet and aircraft manufacturer test flights), totaling 72,400 aircraft operations, or a 77 percent increase over 2019 GA volumes. • Commercial activity grew YoY by 4,500 aircraft operations (or 23 percent), but remained 15 percent below 2019 levels. • BTV served more than one million passengers for the first time since 2019.
Service Developments	• Airlines continue to add capacity at BTV, but capacity remains below the 2019 level. • ULCC Sun Country Airlines (a new carrier at BTV) and Delta Air Lines offer travelers two nonstop options to Minneapolis-St. Paul. • 2023: Delta Air Lines, American Airlines, and United Airlines are the top three carriers at BTV, and provide 87 percent of capacity at the Airport.
Facility Improvements / Upcoming Airport Plans	• 2018-2021: BTV updated its Airport Master Plan, which had been approved in 2012. The updates encompass a comprehensive evaluation of existing facilities, growth forecasts, assessments of additional development or rehabilitation needs, exploration of future improvement alternatives, and the formulation of a $410m capital improvement plan (CIP). Upcoming major projects include: • $104.8m for airfield improvements to the South Apron, runway and taxiway rehabilitation, glycol treatment system, facilities improvements, navigation improvements, and terminal expansion • $54m for various noise mitigation measures • $11.9m for construction of an Inline Baggage Handling system • $4.4m for a new cargo area in South End Development (SED) • And more • BETA Technologies secured a 75-year lease with BTV, enabling BETA to construct a 355,000 square foot facility on airport grounds to design, produce, and assemble electric vertical take-off and landing (eVTOL) aircraft

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Table G-18 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Jet Carriers																				
Allegiant Airways	Fort Lauderdale/Hollywood	FLL						24	32	8	-						4,254	5,664	1,410	-
Allegiant Airways	Orlando/Sanford	SFB		181	180	209	205	210	192	(18)	91.9%		27,150	31,156	34,512	33,471	34,387	33,144	(1,243)	96.0%
Allegiant Airways	Punta Gorda	PGD									-									-
Allegiant Airways	St. Petersburg/Clearwater	PIE		107	134	165	179	177	155	(22)	93.7%		16,050	23,531	27,619	31,515	31,377	26,805	(4,572)	97.1%
American	Charlotte	CLT						73		(73)	-						10,950		(10,950)	-
American	Chicago O'Hare	ORD							4	4	-							512	512	-
American	Dallas/Fort Worth	DFW						81		(81)	-						10,368		(10,368)	-
American	Philadelphia	PHL						6	136	130	-						900	17,408	16,508	-
American	Washington National	DCA						4	88	84	-						512	11,264	10,752	-
Delta	Atlanta	ATL						15		(15)	-						1,980		(1,980)	-
Delta	Detroit	DTW			175						-			19,334						-
Delta	New York J F Kennedy	JFK									-									-
Pan American Airways	Allentown/Bethlehem	ABE									-									-
Pan American Airways	Baltimore	BWI									-									-
Pan American Airways	Pittsburgh	PIT	285								-	42,729								-
Pan American Airways	Portsmouth	PSM	389								-	58,414								-
Pan American Airways	Sanford	SFB									-									-
United	Chicago O'Hare	ORD				17									2,231					
Subtotal			674	288	489	392	384	590	607	17	154.9%	101,143	43,200	74,021	64,362	64,986	94,728	94,797	69	147.3%
Regional/Commuter Carriers																				
American Eagle	Boston	BOS	4,670								-	154,115								-
American Eagle	Charlotte	CLT				210	273	544	425	(119)	202.7%				15,729	20,374	41,344	30,705	(10,639)	195.2%
American Eagle	Chicago O'Hare	ORD				148	43	346	236	(110)	159.2%				9,400	2,795	26,296	17,122	(9,174)	182.2%

Table G-18 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
American Eagle	Miami	MIA						11		(11)	-						836		(836)	-
American Eagle	New York La Guardia	LGA	382			210	6					12,606			9,253	360				
American Eagle	Philadelphia	PHL			1,452	1,579	971	1,048	761	(287)	48.2%			91,163	83,467	55,101	66,672	45,984	(20,688)	55.1%
American Eagle	Washington National	DCA			771	984	435	688	935	247	95.0%			40,260	55,962	25,509	49,045	65,461	16,416	117.0%
Boston-Maine Airways	Halifax	YHZ									-									-
Boston-Maine Airways	Manchester	MHT									-									-
Boston-Maine Airways	Portsmouth	PSM									-									-
Boston-Maine Airways	Saint John	YSJ									-									-
Continental Connection	Albany	ALB									-									-
Continental Express	New York Newark	EWR									-									-
Delta Connection	Atlanta	ATL									-									-
Delta Connection	Boston	BOS						234	141	(93)	-						17,784	10,716	(7,068)	-
Delta Connection	Cincinnati	CVG	1,342								-	67,100								-
Delta Connection	Detroit	DTW		975	279	9	36	27		(27)			50,540	19,614	662	2,736	2,024		(2,024)	
Delta Connection	New York J F Kennedy	JFK		180			64	318	522	204	-		9,000			4,864	23,492	39,665	16,173	-
Delta Connection	New York La Guardia	LGA		537	976	1,192	243	167	1,130	963	94.8%		26,958	57,025	62,269	12,150	12,152	84,351	72,199	135.5%
Delta Connection	Minneapolis	MSP									-									-
Northwest Airlink	Boston	BOS	27								-	797								-
Northwest Airlink	Detroit	DTW									-									-
Northwest Airlink	Minneapolis	MSP									-									-
Pan American Airways	Portsmouth	PSM									-									-
Pan American Airways	Saint John	YSJ									-									-
United Express	Chicago O'Hare	ORD			215	306	81	295	17	(278)	5.6%			14,190	21,420	6,096	21,958	1,292	(20,666)	6.0%
United Express	New York Newark	EWR				870	188	177	604	427	69.4%				44,370	9,498	10,288	43,578	33,290	98.2%
United Express	Nantucket	ACK					20				-					1,000				-

Table G-18 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
United Express	Washington Dulles	IAD					397	635	62	(573)	-					21,050	31,770	3,100	(28,670)	-
US Airways Express	Boston	BOS	1,942								-	36,906								-
US Airways Express	New York La Guardia	LGA	35	1,017							-	1,295	44,051							-
US Airways Express	Philadelphia	PHL	428	1,156							-	15,836	68,510							-
US Airways Express	Pittsburgh	PIT									-									-
US Airways Express	Portland (ME)	PWM	231								-	8,558								-
US Airways Express	Presque Isle	PQI	299								-	6,224								-
US Airways Express	Washington National	DCA		31							-		1,529							-
Subtotal			9,357	3,896	3,693	5,508	2,757	4,490	4,833	343	87.7%	303,436	200,587	222,252	302,531	161,533	303,661	341,974	38,313	113.0%
Total			10,031	4,184	4,182	5,900	3,141	5,080	5,440	360	92.2%	404,579	243,787	296,273	366,893	226,519	398,389	436,771	38,382	119.0%

Source: OAG Schedules.

Notes: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.
Allegiant stopped reporting to OAG between 2009-2016, during that period statistics from the T100 database were referenced.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table G-19 Bangor International Airport (BGR) 2022 Key Highlights

Passenger and Operation Trends	• 2022 Passengers: 675,200 (11.1 percent above 2019 levels) • 2022 Operations: 42,100 (7.5 percent below 2019 levels) • BGR is one of two commercial service airports in New England to surpass 2019 passenger counts.
Service Developments	• BGR seat capacity exceeded 2019 levels by 20 percent, driven primarily by Delta Air Lines' increased service to the New York market. • American Airlines and Delta Air Lines are the largest carriers at BGR. • 2023: ULCC Allegiant Air launches two additional Florida routes to Ft. Lauderdale and Punta Gorda, now providing service on all four "sun routes" from BGR.
Facility Improvements / Upcoming Airport Plans	• At the time of this report, a major runway rehabilitation project is underway at BGR. • July 2022: Senator Susan Collins (R-ME) announces BGR will receive $14.2m for terminal building expansion and renovation. This enables the construction of a connector between the two-building terminal, replacement of one ground-level boarding gate with a new gate and jet bridge, expansion of the passenger security screening checkpoint and upgrades to aging building utilities.

G.11 Tweed-New Haven Regional Airport Supporting Documentation

Table G-20 Scheduled Passenger Operations by Market and Carrier for Tweed-New Haven Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	’21-’22 Change	’22 vs ’19 % Recovery	2000	2010	2015	2019	2020	2021	2022	’21-’22 Change	’22 vs ’19 % Recovery
Jet Carriers																				
Avelo Airlines	Baltimore	BWI							98	98	-							14,406	14,406	-
Avelo Airlines	Charleston	CHS							110	110	-							16,170	16,170	-
Avelo Airlines	Chicago Midway	MDW							118	118	-							17,346	17,346	-
Avelo Airlines	Fort Lauderdale/Hollywood	FLL						48	318	270	-						7,056		(7,056)	-
Avelo Airlines	Fort Myers	RSW						28	298	270	-						4,116		(4,116)	-
Avelo Airlines	Myrtle Beach	MYR							157	157	-							23,079	23,079	-
Avelo Airlines	Nashville	BNA							145	145	-							21,315	21,315	-
Avelo Airlines	Orlando	MCO						50	593	543	-						7,350		(7,350)	-
Avelo Airlines	Raleigh/Durham	RDU							147	147	-							21,609	21,609	-
Avelo Airlines	Sarasota/Bradenton	SRQ							187	187	-							27,909	27,909	-
Avelo Airlines	Savannah	SAV							103	103	-							15,141	15,141	-
Avelo Airlines	Tampa	TPA						31	264	233	-						4,557		(4,557)	-
Avelo Airlines	West Palm Beach	PBI						16	306	290	-						2,352		(2,352)	-
Avelo Airlines	Wilmington	ILM							65	65	-							9,555	9,555	-
Subtotal								173	2,909	2,736	-						25,431		(25,431)	-
Regional/Commuter Carriers																				
American Eagle	Charlotte	CLT				52	46								3,402	3,496				
American Eagle	Philadelphia	PHL			1,222	1,036	334	219		(219)				49,657	67,725	25,384	16,644		(16,644)	
Delta Connection	Cincinnati	CVG									-									-
Boston-Maine Airways	Baltimore	BWI									-									-
Boston-Maine Airways	Bedford	BED									-									-
Boston-Maine Airways	Elmira/Corning	ELM									-									-
Boston-Maine Airways	Portsmouth	PSM									-									-

Table G-20 Scheduled Passenger Operations by Market and Carrier for Tweed-New Haven Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Southern Airways Express	Nantucket	ACK				39									355					
US Airways Express	Philadelphia	PHL	1,773	1,608							-	65,612	59,491							-
US Airways Express	Washington National	DCA	937								-	34,658								-
Subtotal			2,710	1,608	1,222	1,128	380	219		(219)		100,270	59,491	49,657	71,482	28,880	16,644		(16,644)	
Total			2,710	1,608	1,222	1,128	380	392	2,909	2,517	258.0%	100,270	59,491	49,657	71,482	28,880	42,075		(42,075)	

Source: OAG Schedules.
Notes: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).
Boston-Maine Airways operated nonstop services in 2007

Table G-21 Tweed-New Haven Airport (HVN) 2022 Key Airport Highlights

Passenger and Operation Trends	• 2022 Passengers: 701,700 (631.4 percent above 2019 levels) • 2022 Operations: 26,400 (7.3 percent below 2019 levels) • 2021: Avelo Airlines established an East Coast base at HVN, profoundly impacting the airport's operations and the local economy – by 2023, Avelo will serve 18 non-stop destinations from HVN. • Avelo Airlines served 700,000 passengers at HVN – over seven times the Airport's 2019 passenger volume. • GA and military aircraft operations continued to trail 2019 levels by 20 and 31 percent, respectively.
Service Developments	• November 2021: ULCC Avelo Airlines commenced operations at HVN following American Airlines' and Cape Air's market exits earlier that year – HVN is Avelo's primary East Coast operational hub. • At the time of this report, Avelo remains the sole commercial airline operating at HVN. • 2021-2022: Avelo based six aircraft at HVN and expanded its HVN operation from five to fourteen non-stop destinations (Source: OAG). • 2023: Avelo service expansion to four new destinations boosted the Airport's seat capacity by 131,000 YoY (Source: OAG).
Facility Improvements / Upcoming Airport Plans	• The Tweed-New Haven Airport Authority approved a new 43-year lease and management agreement with Dulles-based Avports LLC that includes a $100 million capital improvement program at HVN and an expansion plan which includes a new four-gate, 74,000 square-foot terminal to support Avelo's operations. • Furthermore, the Airport's Master plan expects the construction of a new East Terminal and the extension of Runway 2-20 to 6,635 feet, alleviating airport limitations and facilitating Avelo's complete integration into HVN. The latest 5-year capital plan encompasses multiple projects as well: • Rehabilitation of the west terminal apron • Expansion of the Aircraft Rescue and Fire Fighting station • Acquisition of a snowplow, sweeper and equipment storage shed • Updates to the noise exposure map • Obstruction removal on and around the Airport • Residential sound insulation projects

G.12 Portsmouth International Airport Supporting Documentation

Table G-22 Scheduled Passenger Operations by Market and Carrier for Portsmouth International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Jet Carriers																				
Allegiant Airways	Fort Lauderdale/Hollywood	FLL			27						-			4,779						-
Allegiant Airways	Orlando/Sanford	SFB			95	135	135	147	130	(17)	96.3%			16,111	22,062	21,816	23,802	21,708	(2,094)	98.4%
Allegiant Airways	Punta Gorda	PGD			35	144	153	151	153	2	106.6%			5,909	25,412	27,081	26,751	27,081	330	106.6%
Allegiant Airways	Savannah	SAV				26									4,653					
Allegiant Airways	St. Petersburg/Clearwater	PIE						22	59	37	-						3,918	10,296	6,378	-
Allegiant Airways	Nashville	BNA						24	19	(5)	-						3,848	3,321	(527)	-
Allegiant Airways	Myrtle Beach	MYR				26	22		22	22	83.7%				4,653	3,894		3,894	3,894	83.7%
Boston-Maine Airways	Fort Lauderdale/Hollywood	FLL									-									-
Boston-Maine Airways	Hartford	BDL									-									-
Boston-Maine Airways	Newburgh	SWF									-									-
Boston-Maine Airways	Sanford	SFB									-									-
Frontier	Orlando	MCO				78									15,913					
Pan American Airways	Allentown/Bethlehem	ABE	93								-	13,950								-
Pan American Airways	Bangor	BGR	389								-	58,414								-
Pan American Airways	Gary	GYY	51								-	7,714								-
Pan American Airways	Manchester	MHT									-									-
Pan American Airways	New York Newark	EWR									-									-
Pan American Airways	Pittsburgh	PIT	261								-	39,171								-
Pan American Airways	Sanford	SFB	296								-	44,400								-

Table G-22 Scheduled Passenger Operations by Market and Carrier for Portsmouth International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Pan American Airways	Santo Domingo	SDQ									-									-
Pan American Airways	St. Petersburg/Clearwater	PIE									-									-
Pan American Airways	Worcester	ORH									-									-
Skybus	Columbus	CMH									-									-
Skybus	Greensboro	GSO									-									-
Skybus	Punta Gorda	PGD									-									-
Skybus	Saint Augustine	UST									-									-
Subtotal			1,091		157	409	310	344	383	39	93.7%	163,650		26,799	72,692	52,791	58,319	66,300	7,981	91.2%
Regional/Commuter Carriers																				
Boston-Maine Airways	Baltimore	BWI									-									-
Boston-Maine Airways	Bangor	BGR									-									-
Boston-Maine Airways	Bedford	BED									-									-
Boston-Maine Airways	Hyannis	HYA									-									-
Boston-Maine Airways	Manchester	MHT									-									-
Boston-Maine Airways	Martha's Vineyard	MVY									-									-
Boston-Maine Airways	Nantucket	ACK									-									-
Boston-Maine Airways	New Haven	HVN									-									-
Boston-Maine Airways	New London/Groton	GON									-									-
Boston-Maine Airways	Saint John	YSJ									-									-
Boston-Maine Airways	Trenton	TTN									-									-

Table G-22 Scheduled Passenger Operations by Market and Carrier for Portsmouth International Airport

Carrier	Market	Code	Departures									Departing Seats								
			2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 %. Recovery	2000	2010	2015	2019	2020	2021	2022	'21-'22 Change	'22 vs '19 % Recovery
Boston-Maine Airways	Westchester County	HPN									-									-
Pan American Airways	Atlantic City Pomona Field	ACY									-									-
Pan American Airways	Baltimore	BWI									-									-
Pan American Airways	Bangor	BGR									-									-
Pan American Airways	Bedford	BED									-									-
Pan American Airways	Martha's Vineyard	MVY									-									-
Pan American Airways	Saint John	YSJ									-									-
Subtotal											-									-
Total			1,091		157	409	310	344	383	39	93.7%	163,650		26,799	72,692	52,791	58,319	66,300	7,981	91.2%

Source: OAG Schedules.

Notes: Destinations listed in the table without scheduled nonstop departure services in 2022 may have had scheduled services during specific intermittent annual periods not displayed above.

Allegiant stopped reporting to the OAG in 2009, Allegiant 2009-2016 statistics from the T100 database; 2017-2019 statistics from OAG, which recommenced reporting.

All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).

Boston-Maine Airways operated Portsmouth to Hanscom Field commuter services until 2008. When Pan American flights (as "Pan Am III") ceased operations, Boston-Maine took over its operations as Pan American under the Pan American Clipper Connection brand starting in 2005.

Between 2009 and 2012, no airlines provided nonstop scheduled services.

Table G-23 Portsmouth International Airport (PSM) 2022 Key Highlights

Passenger and Operation Trends	• 2022 Passengers: 161,300 (30.8 percent below 2019 levels) • 2022 Operations: 61,700 (48.5 percent above 2019 levels) • Continued growth in GA operations and corporate travel demand further increased PSM's aircraft operations, which is nearly 50 percent higher than in 2019.
Service Developments	• ULCC Allegiant Air is the sole carrier at the airport with over 380 scheduled annual departures. • Allegiant surpassed its pre-pandemic seat capacity, yet overall available seat capacity at PSM remained below 2019 capacity due to discontinued Frontier Airlines service to Orlando, Florida. • 2021: Allegiant commenced non-stop summer seasonal flights to Nashville. • Allegiant provided year-round Florida flights to Punta Gorda and Orlando-Sanford. • Allegiant also resumed Myrtle Beach service, bringing the number of non-stop destinations from PSM to five.
Facility Improvements / Upcoming Airport Plans	• February 2023: Phase 1 of the Terminal Expansion is completed. • Spring 2023: Phase 2 of the Terminal Expansion commences with a $7m grant awarded from the FAA to expand and upgrade its Arrivals Hall and baggage claims area. • The Terminal Expansion project will add 5,200 square feet of terminal space, improving arrival capacity, alleviating congestion, increasing accessibility, and supporting future airport growth. • 65-year-old electric utilities will be replaced and LED lighting will be added throughout the terminal.

H. Ground Access Supporting Documentation

This appendix provides information in support of Chapter 6, *Ground Access*:

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H.1 Ridership

Table H-1 Logan Express Bus Service Ridership

Service Year	Ridership			Percent Change		
	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%)
1998	337,007	33,971	370,978	6.5%	13.7%	7.2%
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%
20111	272,301	68,228	340,529	0.0%	9.6%	1.8%
2012	279,603	82,951	362,554	2.7%	21.6%	6.5%
2013	295,654	84,008	379,662	5.7%	1.3%	4.7%
2014	303,646	87,488	391,134	2.7%	4.1%	3.0%
2015	345,680	82,943	428,623	13.8%	(5.2%)	9.6%
2016	406,253	92,642	498,895	17.5%	11.7%	16.4%
2017	434,906	99,639	534,545	7.1%	7.6%	7.2%
2018	463,377	114,151	577,528	6.5%	14.6%	8.0%
2019	486,507	129,704	616,211	5.0%	13.6%	6.7%

Table H-1 Logan Express Bus Service Ridership

Service Year	Ridership			Percent Change		
	Air Passengers	Employees	Total	Air Passengers	Employees	Total
2020	125,126	57,704	182,830	(74.3%)	(55.5%)	(70.3%)
2021	227,996	56,974	284,970	82.2%	(1.3%)	55.9%
2022	424,471	89,475	513,946	86.2%	57.0%	80.4%
Braintree						
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%)
1998	300,005	156,105	456,110	0.0%	15.3%	4.8%
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%
2011[1]	233,521	285,515	519,036	0.9%	13.6%	7.5%
2012	247,346	314,542	561,888	5.9%	10.2%	8.3%
2013	268,154	320,329	588,483	8.4%	1.8%	4.7%
2014	296,975	313,334	610,309	10.7%	(2.2%)	3.7%
2015	313,576	311,695	625,271	5.6%	(0.5%)	2.5%
2016	329,043	326,115	655,158	4.9%	4.6%	4.8%
2017	345,401	349,435	694,836	5.0%	7.2%	6.1%
2018	370,654	371,813	742,467	7.3%	6.4%	6.9%

Table H-1 Logan Express Bus Service Ridership

Service Year	Ridership			Percent Change		
	Air Passengers	Employees	Total	Air Passengers	Employees	Total
2019	407,090	413,405	820,495	9.8%	11.2%	10.5%
2020	110,171	158,762	268,933	(72.9%)	(61.6%)	(67.2%)
2021	221,821	164,818	386,639	101.3%	3.8%	43.8%
2022	373,958	350,580	724,538	68.6%	112.7%	87.4%
Woburn[2]						
1992[3]	3,052	91	3,143	N/A	N/A	-
1993	59,635	5,027	64,662	N/A	N/A	-
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%
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%
2011[1]	118,232	151,029	269,261	2.6%	18.8%	11.1%
2012	126,549	188,747	315,296	7.0%	25.0%	17.1%
2013	140,407	192,289	332,696	11.0%	1.9%	5.5%
2014	156,045	194,341	350,386	11.1%	1.1%	5.3%
2015	163,469	191,242	354,711	4.8%	(1.6%)	1.2%
2016	170,704	197,568	368,272	4.4%	3.3%	3.8%
2017	176,485	209,194	385,679	3.4%	5.9%	4.7%

Table H-1 Logan Express Bus Service Ridership

Service Year	Ridership			Percent Change		
	Air Passengers	Employees	Total	Air Passengers	Employees	Total
2018	178,398	226,698	405,096	1.1%	8.4%	5.0%
2019	184,031	240,047	424,078	3.2%	5.9%	4.7%
2020	48,406	89,153	137,559	(73.7%)	(62.9%)	(67.6%)
2021[7]	64,885	44,270	109,155	34.0%	(50.3%)	(20.6%)
2022	165,419	168,587	334,006	154,9%	280.8%	206.0%
Peabody						
2001[4]	8,151	3,097	11,248	N/A	N/A	N/A
2002	28,626	20,629	49,255	N/A	N/A	N/A
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%)
2011[1]	25,555	31,741	57,296	0.0%	21.0%	10.7%
2012	27,542	37,909	65,451	7.8%	19.4%	14.2%
2013	28,790	38,067	66,857	4.5%	0.4%	2.1%
2014	31,485	36,848	68,333	9.4%	(3.2%)	2.2%
2015	37,478	36,125	73,603	19.0%	(2.0%)	7.7%
2016	40,872	36,143	77,015	9.1%	0.0%	4.6%
2017	46,117	37,233	83,350	12.8%	3.0%	8.2%
2018	50,821	37,953	88,774	10.2%	1.9%	6.5%
2019	53,635	40,928	94,563	5.5%	7.8%	6.5%
2020[6]	9,697	9,363	19,060	(81.9%)	(77.1%)	(79.8%)
2021[6]	0	0	0	N/A	N/A	N/A
2022[6]	55,722	30,332	86,054	N/A	N/A	N/A

Table H-1 Logan Express Bus Service Ridership

Service Year	Ridership			Percent Change		
	Air Passengers	Employees	Total	Air Passengers	Employees	Total
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%
2011[1]	649,609	536,513	1,186,122	0.8%	14.9%	6.7%
2012	681,040	624,149	1,305,189	4.8%	16.3%	10.0%
2013	733,005	634,693	1,367,698	8.0%	2.0%	5.0%
2014	788,151	632,011	1,420,162	7.5%	(0.4%)	3.8%
2015	860,203	622,005	1,482,208	9.1%	-1.6%	4.4%
2016	946,872	652,468	1,599,340	10.1%	4.9%	7.9%
2017	1,002,909	695,504	1,698,410	5.9%	6.6%	6.2%
2018	1,063,250	750,615	1,813,865	6.0%	7.9%	6.8%
2019	1,131,263	824,084	1,955,347	6.4%	9.8%	7.8%
2020	347,440	314,982	662,422	(69.3%)	(61.8%)	(66.1%)
2021	541,702	266,062	780,764	55.9%	(15.5%)	17.9%

Table H-1 Logan Express Bus Service Ridership

Service Year	Ridership			Percent Change		
	Air Passengers	Employees	Total	Air Passengers	Employees	Total
2022	1,055,215	638,974	1,694,189	94.8%	140.2%	117.0%

Source: Massport.
Notes: January 23, 2008: I-90/Ted Williams Tunnel opens to all traffic.
N/A Not applicable.
1 Changes to employee parking and bus fares were implemented in October 2011.
2 Woburn Express moved from Mishawum Station to the Anderson RegioN/Al 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. The I-90 Ted Williams Tunnel closures in 2006 resulted in atypical ridership.
6 Peabody Logan Express service was suspended from March 2020 to February 2022.
7 Reflects a partial year of operation. Woburn Logan Express service resumed in June 2021.

Table H-2 Logan Express Back Bay Service Ridership[1]

Service Year	Ridership	Percent Change
2014	152,892	N/A
2015	290,796	N/A
2016	216,329	(25.6%)
2017	137,326	(36.5%)
2018	118,663	(13.6%)
2019	250,477	111.1%
2020[2]	54,040	N/A
2021[2]	0	N/A
2022[2]	35,645	N/A

Source: Massport.
Notes:
N/A Not applicable.
Back Bay Logan Express service commenced in April 2014. Only total ridership available.
Back Bay Logan Express service was suspended from March 2020 to October 2022.

Table H-3 Water Transportation Services Ridership to and from Logan Airport

Service Year	Rowes Wharf/Fan Pier Water Shuttle	Private Water Taxi (on-demand)	Harbor Express (Hingham-Hull-Boston Logan)[1]	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[2]	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
2011	NS	58,879	33,403	NS	92,282
2012	NS	60,840	30,337	NS	91,177
2013	NS	70,378	21,952	NS	92,303
2014	NS	67,479	19,340	NS	86,819
2015	NS	70,798	7,748	NS	78,546
2016	NS	74,788	7,757	NS	82,545
2017	NS	83,689	7,424	NS	91,113
2018	NS	77,813	6,609	NS	84,422

Table H-3 Water Transportation Services Ridership to and from Logan Airport

Service Year	Rowes Wharf/Fan Pier Water Shuttle	Private Water Taxi (on-demand)	Harbor Express (Hingham-Hull-Boston Logan)[1]	Boston Logan Water Shuttle (Long Wharf)	Total
2019	NS	61,071	7,467	NS	68,538
2020	NS	4,080	938	NS	5,018
2021	NS	19,363	1,760	NS	21,123
2022	NS	23,214	5,613	NS	28,827

Source: Massport.
Notes: Figures from 2003 – 2007 have been revised from previous documents.
NS Operation not in service.
1 Service to Quincy was discontinued in 2013 and now operates between Hingham/Hull/Boston (Long Wharf)/Logan.
2 Rowes Wharf Water Shuttle operated from January to June only in 2003.
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.

Table H-4 Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers

Year	Entrances	Exits	Total Turnstile Count[1]	Percent Change
1990	N/A	N/A	2,854,317	-
1991	N/A	N/A	2,515,293	(11.9%)
1992	N/A	N/A	2,626,572	4.2%
1993	N/A	N/A	2,604,980	(0.8%)
1994	N/A	N/A	3,108,734	19.3%
1995	N/A	N/A	3,040,868	(2.2%)
1996	N/A	N/A	2,974,850	(2.2%)
1997[2]	N/A	N/A	2,774,268	(6.7%)
1998	N/A	N/A	2,850,367	2.7%
1999	N/A	N/A	2,974,045	4.3%
2000	N/A	N/A	3,019,086	1.5%
2001	N/A	N/A	2,896,638	(4.1%)
2002	N/A	N/A	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%

Table H-4 Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers

Year	Entrances	Exits	Total Turnstile Count[1]	Percent Change
2005	N/A	N/A	N/A	N/A
2006	N/A	N/A	N/A	N/A
2007[4]	1,412,055	--	2,524,079	--
2008[5]	2,212,111	--	3,647,394	56.7%
2009[5]	2,329,370	--	3,750,549	5.3%
2010[5]	2,270,241	--	3,629,193	(2.5%)
2011	2,277,311	N/A	N/A	0.3%
2012	2,442,085	N/A	N/A	7.2%
2013	2,597,306	N/A	N/A	6.3%
2014	2,378,965	N/A	N/A	(8.4%)[6]
2015	2,122,597	N/A	N/A	(10.8%)[6]
2016	2,240,744	N/A	N/A	5.6%
2017	2,197,783	N/A	N/A	(1.9%)
2018	2,295,250	N/A	N/A	4.4%
2019	1,635,147	N/A	N/A	(28.8%)
2020	1,041,968	N/A	N/A	(36.3%)
2021	1,361,036	N/A	N/A	30.6%
2022	1,754,144	N/A	N/A	28.9%

Source: MBTA.

Notes: Total Turnstile count figures include both Logan Airport bound (turnstile exits) and non-Logan Airport bound (turnstile entrances) passengers.

N/A Data not available

1 As stated in the *Logan Airport 1999 ESPR*, Massport believes that ridership estimates through 2005 from the old Airport Station were 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, as some exits occur through exit doors rather than turnstiles.

6 Due to the closure of Government Center Station in 2014, it is possible that passengers who would normally take the Blue Line to the Green Line switched to alternate modes for their trips.

Table H-5 Annual Taxi Dispatches (Tickets Sold)

Year	Total (yearly tickets sold)	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%
2011	1,937,743	6.0%
2012	2,022,239	4.4%
2013	2,131,371	5.0%
2014	2,237,793	5.0%
2015	2,302,059	2.9%
2016	2,420,391	5.1%
2017	1,975,174	(18.4%)
2018	1,697,831	(14.0%)
2019	1,573,627	(7.3%)
2020	316,351	(-79.9%)
2021	525,858	66.2%
2022	985,197	87.4%

Source: Massport

H.2 Parking Rates and Availability

Table H-6 On-Airport Commercial Parking Rates, 2010-2022 (Terminal Area Facilities[1])

Duration	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0 to 30 minutes	$3	$3	$3	$3	$3	$3	$3	N/A	N/A	N/A	N/A	N/A	N/A
31 minutes to 1 hour	$6	$6	$6	$6	$6	$6	$6	N/A	N/A	N/A	N/A	N/A	N/A
0 minutes to 1 hour							N/A	$7	$7	$8	$8	$8	$8
1 to 1.5 hours	$9	$9	$9	$9	$11	$10	$12	N/A	N/A	N/A	N/A	N/A	N/A
1.5 to 2 hours	$12	$12	$12	$12	$14	$14	$17	N/A	N/A	N/A	N/A	N/A	N/A
1 to 2 hours							N/A	$19	$19	$21	$21	$21	$21
2 to 3 hours	$15	$15	$17	$17	$19	$19	$22	$24	$24	$26	$26	$26	$26
3 to 4 hours	$18	$18	$21	$21	$23	$23	$26	$28	$28	$30	$30	$30	$30
4 to 7 hours	$22	$22	$25	$25	$27	$27	$30	$32	$32	$34	$34	$34	$34
7 to 24 hours (Daily)	$24	$24	$27	$27	$29	$29	$32	$35	$35	$38	$38	$38	$38
Additional days 0 to 6 hours	$12	$12	$14	$14	$15	$15	$16	$18	$18	$19	$19	$19	$19
Additional day(s) 6 to 24 hours	$24	$24	$27	$27	$29	$29	$32	$35	$35	$38	$38	$38	$38

Source: Massport.
Notes:
N/A Data not available
1 Central/West Parking Garage, Terminal B Garage, Terminal E Lots

Table H-7 On-Airport Commercial Parking Rates, 2010-2022 (Economy Parking)

Duration	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Daily Rate	$18	$18	$18	$18	$20	$20	$23	$26	$26	$29	$29	$29	$29
Additional days 0 to 6 hours	$9	$9	$9	$9	$10	$10	$12	$13	$13	$15	$15	$15	$15
Additional days 6 to 24 hours	$18	$18	$18	$18	$20	$20	$23	$26	$26	$29	$29	$29	$29
Weekly Rate (6-7 days)	$108	$108	$108	$108	$120	$120	$138	N/A	N/A	N/A	N/A	N/A	N/A

Source: Massport.
Notes:
N/A Data not available

Table H-8 Logan Airport Employee Parking Supply – Number of Spaces

Location	Mar 2014	Sept 2014	Mar 2015	Sept 2015	Mar 2016	Sept 2016	Mar 2017	Oct 2017	Mar 2018	Oct 2018	Mar 2019	Oct 2019	Mar 2020	Sept 2020	Mar 2021	Sept 2021	Mar 2022	Sept 2022
Terminal Area	857	868	868	865	865	865	865	865	865	865	865	901	900	906	900	894	894	894
North Service Area	883	883	881	876	876	876	876	876	876	876	876	833	812	812	812	663	701	701
Southwest Service Area	4	4	14	16	16	16	16	16	16	16	16	16	16	16	12	12	12	12
South Service Area	681	681	674	665	665	665	665	665	665	665	665	695	702	702	702	649	649	649
Airside (Fire/Rescue)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total spaces in service	2,425	2,436	2,437	2,422	2,422	2,422	2,422	2,422	2,422	2,422	2,422	2,445	2,430	2,436	2,426	2,218	2,256	2,256
Total spaces out of service	248	237	236	251	26	26	26	26	26	26	26	3	18	12	22	230	192	192
Total employee spaces	2,673	2,673	2,673	2,673	2,448	2,448	2,448	2,448	2,448	2,448	2,448	2,448	2,448	2,448	2,448	2,448	2,448	2,448

Source: Logan Airport Parking Space Inventory submitted to Massachusetts Department of Environmental Protection (MassDEP), March and September 2014-2022 (September 2017 was revised in October 2017).

Table H-9 Logan Airport Commercial Parking Supply – Number of Spaces

Location	Mar 2014	Sept 2014	Mar 2015	Sept 2015	Mar 2016	Sept 2016	Mar 2017	Oct 2017	Mar 2018	Sept 2018	Mar 2019	Sept 2019	Mar 2020	Sept 2020	Marc 2021	Sept 2021	Mar 2022	Sept 2022
Terminal Area																		
Central Garage and West Garage	10,267	10,267	10,267	10,340	11,954	11,954	11,954	11,954	11,954	11,954	11,954	10,964	11,038	11,038	9,053	9,108	11,093	11,093
Terminal B Garage	2,254	2,254	2,254	2,201	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212	227	0	2,212	2,212	2,212
Terminal E Lot 1	275	275	243	237	237	237	237	237	237	237	237	237	237	237	0	0	0	0
Terminal E Lot 2	248	248	248	249	249	249	249	249	249	249	249	203	0	203	0	0	0	0
Terminal E Lot 3 (Gulf Lot)	219	219	219	217	217	217	217	217	217	217	217	93	93	93	0	0	0	0
SigN/Ature (General Aviation)	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Logan Airport Hilton	235	235	35	35	235	235	235	235	235	235	235	63	106	110	110	110	110	110
North Service Area																		
Economy Garage	2,809	2,809	2,809	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	0	0	2,864	2,864
Overflow Green Lot (Wood Island)	0	0	235	242	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Service Area																		
Harborside Hyatt Conference Center and Hotel	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270
Overflow Blue Lot (Harborside Dr.)	0	0	315	339	367	367	367	367	367	0	0	0	0	0	0	0	0	0

Table H-9 Logan Airport Commercial Parking Supply – Number of Spaces

Location	Mar 2014	Sept 2014	Mar 2015	Sept 2015	Mar 2016	Sept 2016	Mar 2017	Oct 2017	Mar 2018	Sept 2018	Mar 2019	Sept 2019	Mar 2020	Sept 2020	Marc 2021	Sept 2021	Mar 2022	Sept 2022
Southwest Service Area																		
Overflow Red Lot (Tomahawk Dr.)	0	0	282	282	0	0	0	0	0	0	0	100	100	100	0	0	0	0
Massport In-Service Parking Supply (lined spaces)	16,072	16,072	16,872	16,971	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	16,544	16,444	16,679	16,679	16,641	16,641
Total spaces in service[1]	16,612	16,612	17,212	17,311	18,640	18,640	18,640	18,640	18,640	18,273	18,273	17,041	16,955	15,177	9,468	11,735	16,584	16,584
Total spaces out of service	1,803	1,803	1,203	1,104	-	-	-	5,000	5,000	5,367	5,367	6,599	6,685	8,463	14,172	11,905	7,056	7,056
Total commercial spaces	18,415	18,415	18,415	18,415	18,640	18,640	18,640	23,640	23,640	23,640	23,640	23,640	23,640	23,640	23,640	23,640	23,640	23,640

Source: Logan Airport Parking Space Inventory submitted to MassDEP, March and September 2014 - 2021 (September 2017 was revised in October 2017).

1 Total spaces in service includes Signature (General Aviation), Logan Airport Hilton, Harborside Hyatt Conference Center and Hotel, and overflow lots (Overflow Green Lot, Overflow Red Lot, etc.) from previous years

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H.3 Roadways and Vehicle Miles Traveled

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
1	344	7	30	1,212	1,180	8,300	18,840	79	77	541	1,228
2	496	7	32	716	642	4,514	10,246	67	60	424	962
3	1,347	14	14	461	724	5,092	11,559	118	185	1,299	2,949
4	1,166	18	18	801	1,141	8,027	18,221	177	252	1,773	4,024
5	378	18	18	1,262	1,865	13,120	29,780	90	134	940	2,133
6	441	13	13	582	712	5,010	11,372	49	59	419	950
7	896	29	25	682	1,147	8,069	18,315	116	195	1,370	3,109
8	644	5	31	1,468	1,405	9,887	22,443	179	172	1,207	2,739
9	1,214	5	22	735	860	6,051	13,736	169	198	1,391	3,158
10	1,303	27	30	713	570	4,009	9,101	176	141	990	2,246
11	421	30	32	453	414	2,910	6,605	36	33	232	527
12	236	26	27	138	221	1,554	3,528	6	10	69	157
13	1,311	22	23	138	231	1,629	3,697	34	57	404	918
14	750	5	31	1,928	1,821	12,814	29,086	274	259	1,820	4,132
15	441	30	27	1,094	1,643	11,557	26,233	91	137	965	2,190
16	1,724	5	22	-	11	74	169	-	4	24	55
17	644	6	6	591	635	4,464	10,133	72	77	544	1,235
18	354	28	30	714	549	3,861	8,763	48	37	259	588
19	687	33	17	2	19	132	300	0	2	17	39
20	94	16	16	386	472	3,323	7,544	7	8	59	135
21	877	6	6	14	21	149	338	2	3	25	56
22	79	13	18	14	21	149	338	0	0	2	5
23	81	5	28	-	11	74	169	-	0	1	3
24	79	5	5	15	21	149	338	0	0	2	5

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
25	87	9	9	16	20	141	319	0	0	2	5
26	209	10	9	16	20	141	319	1	1	6	13
27	187	5	5	15	21	149	338	1	1	5	12
28	124	5	5	31	41	289	657	1	1	7	15
29	226	25	26	154	195	1,372	3,115	7	8	59	133
30	1,070	5	5	170	476	3,348	7,600	34	96	678	1,539
31	385	32	32	85	114	802	1,820	6	8	58	133
32	516	31	32	69	80	562	1,276	7	8	55	125
34	181	5	31	44	340	2,389	5,423	2	12	82	186
35	248	31	32	113	419	2,951	6,699	5	20	139	314
36	89	5	31	45	338	2,381	5,404	1	6	40	91
37	102	31	32	69	80	562	1,276	1	2	11	25
38	110	32	31	126	140	984	2,233	3	3	20	46
39	219	29	30	28	34	240	544	1	1	10	23
40	232	8	8	40	45	314	713	2	2	14	31
41	177	33	31	9	7	50	113	0	0	2	4
42	205	29	31	12	11	74	169	0	0	3	7
43	597	31	32	29	34	240	544	3	4	27	62
44	587	32	31	77	88	620	1,407	9	10	69	156
45	96	33	33	73	85	595	1,351	1	2	11	25
46	112	33	33	8	4	25	56	0	0	1	1
47	859	32	33	12	8	58	131	2	1	9	21
48	94	15	16	90	163	1,149	2,608	2	3	20	46
49	420	26	23	102	172	1,207	2,740	8	14	96	218
50	353	32	33	5	6	41	94	0	0	3	6
51	717	26	23	107	177	1,248	2,834	15	24	169	385
52	403	33	33	36	190	1,339	3,040	3	15	102	232

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
53	321	34	33	6	7	50	113	0	0	3	7
54	612	29	28	42	197	1,389	3,153	5	23	161	365
55	194	26	23	383	526	3,704	8,407	14	19	136	308
56	101	30	27	137	161	1,133	2,571	3	3	22	49
57	97	33	18	149	241	1,695	3,847	3	4	31	71
58	103	5	5	-	-	-	-	-	-	-	-
59	105	5	5	-	-	-	-	-	-	-	-
60	331	26	23	449	671	4,720	10,715	28	42	295	671
61	224	9	6	35	66	463	1,051	1	3	20	44
62	218	17	18	139	149	1,050	2,383	6	6	43	99
63	242	22	23	-	5	33	75	-	0	2	3
64	232	5	5	22	56	397	901	1	2	17	40
65	593	26	23	553	753	5,299	12,028	62	85	595	1,352
66	465	5	5	7	-	-	-	1	-	-	-
67	483	5	5	5	-	-	-	0	-	-	-
68	487	5	5	-	-	-	-	-	-	-	-
69	361	5	5	-	-	-	-	-	-	-	-
90	582	9	8	317	548	3,852	8,744	35	60	425	964
103	85	19	16	15	18	124	281	0	0	2	5
104	85	5	5	-	-	-	-	-	-	-	-
105	95	5	5	-	-	-	-	-	-	-	-
106	95	5	5	-	-	-	-	-	-	-	-
107	260	21	20	172	143	1,009	2,289	8	7	50	113
108	389	30	31	73	81	570	1,295	5	6	42	95
109	114	17	17	131	231	1,629	3,697	3	5	35	80
110	169	5	8	131	231	1,629	3,697	4	7	52	118
111	261	5	5	-	-	-	-	-	-	-	-
112	237	5	28	131	231	1,629	3,697	6	10	73	166

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
113	565	15	17	36	42	298	676	4	5	32	72
114	609	32	32	24	27	190	432	3	3	22	50
115	451	28	27	321	376	2,645	6,005	27	32	226	513
116	399	23	22	38	47	331	751	3	4	25	57
117	283	23	22	49	54	380	863	3	3	20	46
118	295	28	27	322	369	2,596	5,892	18	21	145	329
119	240	13	12	235	283	1,992	4,522	11	13	91	206
120	365	33	32	52	65	455	1,032	4	5	31	71
121	356	17	15	90	98	686	1,557	6	7	46	105
122	486	18	18	71	79	554	1,257	7	7	51	116
123	486	20	22	137	110	777	1,764	13	10	71	162
124	280	33	33	47	38	265	600	2	2	14	32
125	280	30	23	70	55	389	882	4	3	21	47
126	631	21	20	173	143	1,009	2,289	21	17	121	274
127	652	30	31	73	81	570	1,295	9	10	70	160
128	257	19	23	68	56	397	901	3	3	19	44
129	257	16	18	23	41	289	657	1	2	14	32
130	422	5	5	-	-	-	-	-	-	-	-
131	493	14	14	13	11	74	169	1	1	7	16
132	361	20	20	200	170	1,199	2,721	14	12	82	186
133	236	30	26	67	81	570	1,295	3	4	25	58
134	1,521	22	22	323	402	2,827	6,418	93	116	814	1,848
135	1,542	30	26	48	71	496	1,126	14	21	145	329
136	384	5	5	-	-	-	-	-	-	-	-
137	354	5	5	6	-	-	-	0	-	-	-
138	225	5	5	6	-	-	-	0	-	-	-

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
139	96	5	5	6	-	-	-	0	-	-	-
140	295	30	26	48	71	496	1,126	3	4	28	63
142	257	27	24	269	291	2,050	4,654	13	14	100	226
144	518	11	13	35	156	1,100	2,496	3	15	108	245
145	195	11	13	80	160	1,124	2,552	3	6	42	94
146	463	11	13	79	159	1,116	2,533	7	14	98	222
147	230	11	13	53	107	752	1,708	2	5	33	74
148	794	11	13	53	107	752	1,708	8	16	113	257
149	661	5	5	-	-	-	-	-	-	-	-
150	281	5	5	-	-	-	-	-	-	-	-
151	360	5	5	-	-	-	-	-	-	-	-
152	88	7	6	-	-	-	-	-	-	-	-
153	66	24	24	-	-	-	-	-	-	-	-
154	173	5	5	-	-	-	-	-	-	-	-
155	258	17	17	30	170	1,199	2,721	1	8	59	133
156	645	15	15	9	105	736	1,670	1	13	90	204
157	218	13	14	21	66	463	1,051	1	3	19	43
158	185	6	5	33	240	1,686	3,828	1	8	59	134
159	354	14	15	54	304	2,141	4,860	4	20	144	326
160	470	5	5	-	-	-	-	-	-	-	-
161	94	5	5	9	105	736	1,670	0	2	13	30
162	50	5	5	-	-	-	-	-	-	-	-
163	66	5	5	9	103	727	1,651	0	1	9	21
164	367	33	33	-	-	-	-	-	-	-	-
165	124	26	26	-	-	-	-	-	-	-	-
166	84	26	26	-	-	-	-	-	-	-	-

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
167	230	5	5	-	-	-	-	-	-	-	-
168	380	15	15	-	-	-	-	-	-	-	-
169	293	33	33	93	486	3,423	7,769	5	27	190	432
170	205	33	33	-	-	-	-	-	-	-	-
171	78	5	5	-	-	-	-	-	-	-	-
172	180	16	17	-	-	-	-	-	-	-	-
173	48	5	5	-	-	-	-	-	-	-	-
174	502	12	12	43	235	1,653	3,753	4	22	157	357
175	640	12	12	51	253	1,777	4,034	6	31	215	489
176	319	31	29	326	994	6,994	15,875	20	60	422	958
177	286	12	12	326	994	6,994	15,875	18	54	379	860
178	353	33	32	283	760	5,349	12,141	19	51	358	813
179	348	12	12	899	596	4,191	9,514	59	39	276	626
180	366	26	25	525	895	6,299	14,299	36	62	437	991
181	453	6	5	108	217	1,529	3,472	9	19	131	298
182	119	6	5	122	235	1,653	3,753	3	5	37	84
183	50	6	5	108	217	1,529	3,472	1	2	14	33
184	54	6	5	75	103	727	1,651	1	1	7	17
185	62	6	5	75	103	727	1,651	1	1	9	19
186	39	6	5	75	143	1,009	2,289	1	1	7	17
187	338	9	8	14	18	124	281	1	1	8	18
188	58	5	5	-	-	-	-	-	-	-	-
189	143	5	5	-	-	-	-	-	-	-	-
190	148	13	13	14	18	124	281	0	1	3	8
191	120	5	5	-	-	-	-	-	-	-	-
192	540	5	5	-	40	281	638	-	4	29	65

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
193	138	15	14	50	249	1,753	3,978	1	7	46	104
194	932	17	17	44	224	1,579	3,584	8	40	279	632
195	79	26	28	33	114	802	1,820	1	2	12	27
196	49	26	28	45	269	1,893	4,297	0	2	17	40
197	83	31	31	44	269	1,893	4,297	1	4	30	68
198	692	31	31	44	256	1,802	4,091	6	34	236	536
199	70	5	9	28	159	1,116	2,533	0	2	15	34
200	158	5	5	-	-	-	-	-	-	-	-
201	160	5	5	-	-	-	-	-	-	-	-
202	335	23	23	-	-	-	-	-	-	-	-
203	30	5	5	-	-	-	-	-	-	-	-
204	2,022	5	5	75	143	1,009	2,289	29	55	386	876
205	71	13	15	34	214	1,505	3,415	0	3	20	46
206	135	13	15	34	213	1,496	3,396	1	5	38	87
207	859	13	13	298	704	4,952	11,240	48	115	805	1,828
208	284	9	9	287	499	3,513	7,975	15	27	189	429
209	80	18	18	-	-	-	-	-	-	-	-
210	71	11	11	-	-	-	-	-	-	-	-
211	390	26	25	765	1,384	9,739	22,105	56	102	719	1,632
212	402	26	25	765	1,383	9,730	22,086	58	105	741	1,682
213	1,344	5	5	1,093	1,641	11,549	26,215	278	418	2,941	6,675
214	449	13	16	1,194	1,302	9,160	20,792	101	111	779	1,767
215	1,110	13	13	21	80	562	1,276	4	17	118	268
216	1,211	12	13	562	631	4,439	10,077	129	145	1,018	2,312
217	1,050	13	13	114	142	1,000	2,271	23	28	199	452
218	581	29	25	466	803	5,646	12,816	51	88	621	1,410

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
219	1,063	12	13	462	436	3,067	6,962	93	88	618	1,402
220	415	13	16	517	531	3,737	8,482	41	42	294	667
221	39	24	27	53	96	678	1,539	0	1	5	11
222	1,920	24	27	-	-	-	-	-	-	-	-
223	1,564	19	21	925	1,241	8,730	19,816	274	368	2,586	5,869
224	377	30	31	364	793	5,580	12,666	26	57	399	905
225	551	30	31	138	250	1,761	3,997	14	26	184	417
226	788	24	30	175	280	1,968	4,466	26	42	294	667
227	1,303	24	30	293	645	4,539	10,302	72	159	1,120	2,542
228	580	8	30	1,267	1,215	8,548	19,403	139	134	939	2,133
229	1,653	6	30	662	729	5,126	11,634	207	228	1,605	3,642
230	2,058	30	31	605	486	3,423	7,769	236	189	1,334	3,028
231	1,300	5	21	305	682	4,795	10,884	75	168	1,180	2,679
232	736	5	26	951	1,381	9,714	22,049	133	192	1,354	3,072
233	488	29	30	606	492	3,464	7,863	56	45	320	727
234	449	31	31	288	315	2,216	5,029	24	27	188	428
235	310	16	15	226	235	1,653	3,753	13	14	97	220
236	310	12	13	62	80	562	1,276	4	5	33	75
237	105	6	7	138	250	1,761	3,997	3	5	35	80
238	697	28	28	-	-	-	-	-	-	-	-
239	186	20	19	54	125	876	1,989	2	4	31	70
240	145	25	25	49	195	1,372	3,115	1	5	38	86
241	578	25	25	102	320	2,249	5,104	11	35	246	559
242	125	22	22	-	-	-	-	-	-	-	-
243	564	22	22	-	-	-	-	-	-	-	-
244	88	22	22	-	-	-	-	-	-	-	-

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
245	48	13	13	-	-	-	-	-	-	-	-
246	175	29	28	88	280	1,968	4,466	3	9	65	148
247	65	8	8	64	125	876	1,989	1	2	11	25
248	39	29	28	153	404	2,844	6,455	1	3	21	47
249	128	29	28	153	404	2,844	6,455	4	10	69	156
250	484	5	5	-	-	-	-	-	-	-	-
251	498	5	5	-	-	-	-	-	-	-	-
252	308	5	5	-	-	-	-	-	-	-	-
253	54	5	5	-	-	-	-	-	-	-	-
254	51	5	5	-	-	-	-	-	-	-	-
255	290	28	28	64	125	876	1,989	4	7	48	109
256	377	28	28	102	148	1,042	2,364	7	11	74	169
257	215	28	28	64	125	876	1,989	3	5	36	81
258	321	25	25	15	40	281	638	1	2	17	39
259	203	25	25	28	45	314	713	1	2	12	27
260	362	25	25	29	34	240	544	2	2	16	37
261	219	23	23	23	28	198	450	1	1	8	19
262	218	8	8	7	6	41	94	0	0	2	4
263	69	26	28	29	35	248	563	0	0	3	7
264	69	26	27	-	-	-	-	-	-	-	-
265	2,458	29	30	92	62	438	995	43	29	204	463
266	752	29	30	240	404	2,844	6,455	34	58	405	919
267	1,323	29	30	324	504	3,547	8,050	81	126	889	2,016
268	1,252	29	31	79	217	1,529	3,472	19	51	362	823
269	302	14	14	28	27	190	432	2	2	11	25
270	1,005	21	21	109	289	2,034	4,616	21	55	387	879

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
271	954	16	16	387	472	3,323	7,544	70	85	600	1,363
272	656	27	26	529	699	4,919	11,165	66	87	611	1,387
273	485	14	10	548	750	5,274	11,972	50	69	485	1,100
274	1,244	23	24	394	387	2,720	6,174	93	91	641	1,455
275	419	19	19	239	266	1,868	4,241	19	21	148	337
276	649	23	24	384	372	2,621	5,949	47	46	322	731
277	2,473	14	15	99	58	405	919	46	27	190	431
278	573	32	32	281	360	2,530	5,742	31	39	275	623
279	458	26	22	243	411	2,893	6,568	21	36	251	569
280	295	25	23	219	315	2,216	5,029	12	18	124	281
281	440	22	22	175	227	1,596	3,622	15	19	133	302
282	76	22	22	121	103	727	1,651	2	1	11	24
283	697	22	22	241	343	2,414	5,479	32	45	318	723
284	690	16	15	167	411	2,893	6,568	22	54	378	858
285	91	16	15	199	307	2,158	4,898	3	5	37	84
286	464	16	15	425	541	3,803	8,632	37	48	334	759
287	229	19	18	397	516	3,629	8,238	17	22	158	358
288	500	8	7	397	516	3,629	8,238	38	49	343	779
289	738	5	27	1,884	2,929	20,610	46,781	263	409	2,881	6,539
290	488	5	26	1,722	2,573	18,105	41,095	159	238	1,672	3,796
291	494	27	31	432	888	6,250	14,186	40	83	585	1,328
292	689	5	28	1,020	1,457	10,251	23,269	133	190	1,337	3,035
293	325	29	30	1,314	1,073	7,548	17,132	81	66	465	1,055
294	396	20	20	315	224	1,579	3,584	24	17	119	269
295	1,017	30	31	997	848	5,969	13,548	192	163	1,150	2,610
296	162	13	11	127	356	2,505	5,686	4	11	77	175

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
297	140	13	11	127	356	2,505	5,686	3	9	66	151
298	1,119	12	13	316	226	1,587	3,603	67	48	336	763
299	1,036	23	21	16	270	1,901	4,316	3	53	373	847
300	518	20	20	24	86	603	1,370	2	8	59	134
301	749	5	5	86	168	1,182	2,683	12	24	168	381
302	652	13	13	316	223	1,571	3,565	39	28	194	440
303	547	5	5	20	220	1,546	3,509	2	23	160	363
304	406	5	5	38	36	256	582	3	3	20	45
305	442	5	5	6	21	149	338	1	2	12	28
306	207	11	11	44	56	397	901	2	2	16	35
307	70	6	5	64	276	1,943	4,410	1	4	26	58
308	319	5	5	-	-	-	-	-	-	-	-
309	281	5	5	48	68	479	1,088	3	4	25	58
310	879	33	31	45	246	1,728	3,922	7	41	288	653
311	211	33	31	47	248	1,744	3,959	2	10	70	158
312	549	33	31	45	246	1,728	3,922	5	26	180	408
313	717	12	16	427	558	3,927	8,913	58	76	533	1,210
314	879	27	27	45	143	1,009	2,289	7	24	168	381
315	215	21	21	398	966	6,795	15,425	16	39	277	628
316	543	15	15	-	-	-	-	-	-	-	-
317	180	14	13	277	530	3,728	8,463	9	18	127	289
318	221	9	7	646	585	4,117	9,345	27	24	172	391
319	215	8	5	206	479	3,373	7,656	8	20	137	312
320	552	12	12	32	4	25	56	3	0	3	6
321	628	12	12	532	286	2,009	4,560	63	34	239	543
322	209	16	13	144	173	1,215	2,758	6	7	48	109

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
323	58	16	8	144	173	1,215	2,758	2	2	13	30
324	387	12	12	-	-	-	-	-	-	-	-
325	406	5	7	87	35	248	563	7	3	19	43
326	231	6	6	132	357	2,513	5,705	6	16	110	250
327	463	32	29	63	114	802	1,820	6	10	70	160
328	79	18	18	-	-	-	-	-	-	-	-
329	103	18	18	-	-	-	-	-	-	-	-
330	323	13	13	-	-	-	-	-	-	-	-
331	179	12	12	-	-	-	-	-	-	-	-
332	993	5	8	4	1	8	19	1	0	2	4
333	384	10	10	-	-	-	-	-	-	-	-
334	366	21	26	565	284	2,001	4,541	39	20	139	314
335	583	31	31	-	-	-	-	-	-	-	-
336	453	32	31	45	246	1,728	3,922	4	21	148	336
337	94	21	21	-	-	-	-	-	-	-	-
338	671	5	5	-	-	-	-	-	-	-	-
339	311	14	15	145	471	3,315	7,525	9	28	195	443
340	273	20	20	-	-	-	-	-	-	-	-
341	66	16	16	-	-	-	-	-	-	-	-
342	48	22	22	-	-	-	-	-	-	-	-
343	370	13	14	19	53	372	844	1	4	26	59
344	513	11	10	97	115	810	1,839	9	11	79	179
345	25	5	5	-	-	-	-	-	-	-	-
346	121	5	5	-	-	-	-	-	-	-	-
347	303	5	5	18	53	372	844	1	3	21	48
348	146	23	23	-	-	-	-	-	-	-	-

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
349	67	10	13	359	290	2,042	4,635	5	4	26	59
350	446	5	5	73	80	562	1,276	6	7	47	108
351	335	9	6	57	113	794	1,801	4	7	50	114
352	430	5	5	114	72	504	1,145	9	6	41	93
353	360	5	5	174	142	1,000	2,271	12	10	68	155
354	50	6	5	112	166	1,166	2,646	1	2	11	25
355	88	5	8	73	81	570	1,295	1	1	10	22
356	113	5	8	949	846	5,952	13,511	20	18	127	289
358	463	28	29	99	293	2,058	4,672	9	26	180	409
359	229	12	12	13	11	74	169	1	0	3	7
360	245	13	13	15	11	74	169	1	1	3	8
361	248	16	17	40	47	331	751	2	2	16	35
362	199	8	9	39	43	306	694	1	2	12	26
363	230	19	19	292	323	2,273	5,160	13	14	99	225
364	256	17	13	153	347	2,439	5,536	7	17	118	269
365	201	23	23	18	21	149	338	1	1	6	13
366	201	10	10	88	103	727	1,651	3	4	28	63
367	752	12	13	677	772	5,431	12,329	96	110	773	1,755
368	410	12	13	565	286	2,009	4,560	44	22	156	355
369	307	6	10	549	291	2,050	4,654	32	17	119	271
370	96	14	13	281	750	5,274	11,972	5	14	96	217
371	712	22	12	398	964	6,779	15,387	54	130	914	2,074
372	430	27	24	291	442	3,108	7,056	24	36	253	574
373	2,331	30	26	68	216	1,521	3,453	30	95	672	1,524
374	301	5	5	78	222	1,562	3,547	4	13	89	202
375	269	5	5	95	114	802	1,820	5	6	41	93

Table H-10 2022 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
376	751	7	7	111	391	2,753	6,249	16	56	391	888
377	835	7	7	79	154	1,083	2,458	12	24	171	389
378	758	5	5	267	394	2,769	6,286	38	57	398	903
379	313	12	12	651	780	5,489	12,460	39	46	325	738
380	671	5	5	258	228	1,604	3,640	33	29	204	463
LOGAN AIRPORT VMT								**2,904**	**3,394**	**24,072**	**52,794**

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
1	344		22	1,163	1,429	10,236	23,209	76	93	667	1,512
2	496		27	692	850	6,089	13,805	65	80	572	1,297
3	1,347		13	597	734	5,258	11,921	152	187	1,341	3,041
4	1,166		18	1,061	1,304	9,340	21,179	234	288	2,062	4,677
5	378		17	1,658	2,038	14,598	33,100	119	146	1,046	2,371
6	441		12	606	745	5,336	12,100	51	62	446	1,011
7	896		20	1,052	1,293	9,262	21,000	179	220	1,572	3,565
8	644		24	1,558	1,915	13,717	31,102	190	234	1,674	3,796
9	1,214		19	662	813	5,823	13,204	152	187	1,339	3,035
10	1,303		21	1,006	1,237	8,861	20,091	248	305	2,187	4,959
11	421		25	294	361	2,586	5,863	23	29	206	468
12	236		26	146	179	1,282	2,907	7	8	57	130
13	1,311		20	167	205	1,468	3,329	41	51	364	826
14	750		22	1,854	2,279	16,324	37,014	263	324	2,319	5,258
15	441		19	1,273	1,564	11,203	25,402	106	131	935	2,121
16	1,724		21	21	26	186	422	7	8	61	138
17	644		5	439	540	3,868	8,770	54	66	471	1,069
18	354		20	893	1,097	7,858	17,817	60	74	527	1,195
19	687		17	120	147	1,053	2,387	16	19	137	310
20	94		25	378	464	3,324	7,536	7	8	59	134
21	877		5	24	30	215	487	4	5	36	81
22	79		18	24	30	215	487	0	0	3	7
23	81		17	16	20	143	325	0	0	2	5
24	79		5	20	24	172	390	0	0	3	6
25	87		8	28	35	251	568	0	1	4	9
26	209		6	28	35	251	568	1	1	10	23

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
27	187		5	24	29	208	471	1	1	7	17
28	124		5	49	60	430	974	1	1	10	23
29	226		21	231	284	2,034	4,613	10	12	87	197
30	1,070		5	338	416	2,980	6,756	68	84	604	1,369
31	385		22	175	215	1,540	3,492	13	16	112	254
32	516		5	55	68	487	1,104	5	7	48	108
34	181		5	234	288	2,063	4,678	8	10	71	160
35	248		5	290	356	2,550	5,782	14	17	120	271
36	89		5	255	313	2,242	5,084	4	5	38	86
37	102		5	34	42	301	682	1	1	6	13
38	110		5	82	101	723	1,640	2	2	15	34
39	219		23	18	22	158	357	1	1	7	15
40	232		8	24	30	215	487	1	1	9	21
41	177		19	6	7	50	114	0	0	2	4
42	205		28	7	8	57	130	0	0	2	5
43	597		5	10	12	86	195	1	1	10	22
44	587		5	51	63	451	1,023	6	7	50	114
45	96		32	47	58	415	942	1	1	8	17
46	112		14	13	16	115	260	0	0	2	6
47	859		30	17	21	150	341	3	3	24	55
48	94		16	234	288	2,063	4,678	4	5	37	83
49	420		16	251	308	2,206	5,002	20	25	176	398
50	353		33	3	4	29	65	0	0	2	4
51	717		16	253	311	2,228	5,051	34	42	302	686
52	403		20	235	289	2,070	4,694	18	22	158	358
53	321		29	3	4	29	65	0	0	2	4

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
54	612		9	234	287	2,056	4,661	27	33	238	540
55	194		16	461	567	4,061	9,209	17	21	149	338
56	101		-	-	-	-	-	-	-	-	-
57	97		13	43	53	380	861	1	1	7	16
58	103		-	-	-	-	-	-	-	-	-
59	105		-	-	-	-	-	-	-	-	-
60	331		16	552	679	4,864	11,028	35	43	304	690
61	224		5	112	138	988	2,241	5	6	42	95
62	218		20	124	152	1,089	2,469	5	6	45	102
63	242		23	12	15	107	244	1	1	5	11
64	232		5	35	43	308	698	2	2	14	31
65	593		16	564	693	4,964	11,255	63	78	558	1,265
66	465		23	6	7	50	114	1	1	4	10
67	483		21	4	5	36	81	0	0	3	7
68	487		-	-	-	-	-	-	-	-	-
69	361		-	-	-	-	-	-	-	-	-
90	582		5	423	520	3,725	8,446	47	57	411	931
103	85		30	9	11	79	179	0	0	1	3
104	85		-	-	-	-	-	-	-	-	-
105	95		-	-	-	-	-	-	-	-	-
106	95		-	-	-	-	-	-	-	-	-
107	260		18	254	312	2,235	5,067	13	15	110	250
108	389		20	182	224	1,605	3,638	13	17	118	268
109	114		16	151	186	1,332	3,021	3	4	29	65
110	169		17	152	187	1,339	3,037	5	6	43	97
111	261		-	-	-	-	-	-	-	-	-

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
112	237		16	151	186	1,332	3,021	7	8	60	136
113	565		10	110	135	967	2,193	12	14	104	235
114	609		29	108	133	953	2,160	12	15	110	249
115	451		19	242	297	2,127	4,824	21	25	182	412
116	399		18	26	32	229	520	2	2	17	39
117	283		18	121	149	1,067	2,420	6	8	57	130
118	295		19	335	412	2,951	6,691	19	23	165	374
119	240		13	155	190	1,361	3,086	7	9	62	140
120	365		25	133	164	1,175	2,664	9	11	81	184
121	356		16	192	236	1,690	3,833	13	16	114	259
122	486		15	134	165	1,182	2,680	12	15	109	247
123	486		17	152	187	1,339	3,037	14	17	123	279
124	280		28	80	98	702	1,592	4	5	37	84
125	280		21	88	108	774	1,754	5	6	41	93
126	631		18	255	313	2,242	5,084	30	37	268	608
127	652		20	182	224	1,605	3,638	22	28	198	449
128	257		28	64	79	566	1,283	3	4	28	62
129	257		18	54	66	473	1,072	3	3	23	52
130	422		-	-	-	-	-	-	-	-	-
131	493		24	11	13	93	211	1	1	9	20
132	361		21	273	335	2,400	5,441	19	23	164	372
133	236		27	167	205	1,468	3,329	7	9	66	149
134	1,521		24	421	517	3,703	8,397	121	149	1,066	2,418
135	1,542		27	164	201	1,440	3,265	48	59	421	954
136	384		-	-	-	-	-	-	-	-	-
137	354		17	11	14	100	227	1	1	7	15

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
138	225		13	15	19	136	309	1	1	6	13
139	96		14	15	19	136	309	0	0	2	6
140	295		27	164	202	1,447	3,281	9	11	81	183
142	257		25	415	510	3,653	8,283	20	25	178	403
144	518		12	336	413	2,958	6,708	33	40	290	658
145	195		12	155	191	1,368	3,102	6	7	51	115
146	463		12	156	192	1,375	3,118	14	17	121	273
147	230		12	6	7	50	114	0	0	2	5
148	834		18	827	1,016	7,278	16,501	131	161	1,150	2,607
149	661		-	-	-	-	-	-	-	-	-
150	281		-	-	-	-	-	-	-	-	-
151	360		-	-	-	-	-	-	-	-	-
152	88		-	-	-	-	-	-	-	-	-
153	66		-	-	-	-	-	-	-	-	-
154	173		5	-	-	-	-	-	-	-	-
155	258		14	310	381	2,729	6,188	15	19	134	303
156	645		15	186	229	1,640	3,719	23	28	200	454
157	218		11	124	152	1,089	2,469	5	6	45	102
158	185		11	424	521	3,732	8,462	15	18	131	297
159	354		10	548	673	4,821	10,930	37	45	323	733
160	470		-	-	-	-	-	-	-	-	-
161	94		5	186	228	1,633	3,703	3	4	29	66
162	50		-	-	-	-	-	-	-	-	-
163	66		5	186	228	1,633	3,703	2	3	21	47
164	91		28	2	3	21	49	0	0	0	1
165	684		28	227	279	1,998	4,531	29	36	259	587

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
166	52		13	32	39	279	633	0	0	3	6
167	89		9	48	59	423	958	1	1	7	16
168	380		5	9	11	79	179	1	1	6	13
169	293		13	9	11	79	179	1	1	4	10
170	425		13	539	663	4,749	10,768	43	53	382	866
171	78		-	-	-	-	-	-	-	-	-
172	180		-	-	-	-	-	-	-	-	-
173	483		32	508	624	4,470	10,135	46	57	409	926
174	358		27	835	1,026	7,349	16,664	57	70	499	1,130
175	111		32	359	441	3,159	7,162	8	9	67	151
176	371		10	432	531	3,804	8,624	30	37	267	606
177	626		28	382	470	3,367	7,633	45	56	399	905
178	405		6	433	532	3,811	8,640	33	41	293	663
179	348		32	382	470	3,367	7,633	25	31	222	503
180	366		7	861	1,058	7,578	17,183	60	73	525	1,191
181	985		5	123	151	1,082	2,452	23	28	202	457
182	748		5	65	80	573	1,299	9	11	81	184
183	737		5	90	110	788	1,787	13	15	110	249
184	101		5	51	63	451	1,023	1	1	9	20
185	62		5	71	87	623	1,413	1	1	7	17
186	454		5	20	24	172	390	2	2	15	34
187	254		13	188	231	1,655	3,752	9	11	80	180
188	169		11	47	58	415	942	2	2	13	30
189	427		5	47	58	415	942	4	5	34	76
190	538		12	227	279	1,998	4,531	23	28	203	461
191	708		5	269	331	2,371	5,376	36	44	318	721

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
192	232		5	45	55	394	893	2	2	17	39
193	305		12	284	349	2,500	5,668	16	20	144	327
194	356		14	114	140	1,003	2,274	8	9	68	153
195	334		28	163	200	1,433	3,248	10	13	91	206
196	573		28	124	152	1,089	2,469	13	17	118	268
197	231		12	98	120	860	1,949	4	5	38	85
198	238		12	310	381	2,729	6,188	14	17	123	279
199	475		12	63	78	559	1,267	6	7	50	114
200	158		-	-	-	-	-		-	-	-
201	160		-	-	-	-	-		-	-	-
202	335		-	-	-	-	-		-	-	-
203	30		-	-	-	-	-		-	-	-
204	211		20	87	107	766	1,738	3	4	31	70
205	-		-	-	-	-	-	-	-	-	-
206	135		12	423	520	3,725	8,446	11	13	96	217
207	859		13	350	430	3,080	6,984	57	70	501	1,136
208	284		9	287	353	2,529	5,733	15	19	136	308
209	80		-	-	-	-	-		-	-	-
210	71		-	-	-	-	-		-	-	-
211	390		7	997	1,225	8,775	19,896	74	90	648	1,469
212	402		7	998	1,227	8,789	19,928	76	93	669	1,518
213	1,344		8	1,273	1,565	11,210	25,418	324	399	2,854	6,472
214	449		31	1,215	1,493	10,694	24,248	103	127	909	2,061
215	1,110		12	98	121	867	1,965	21	25	182	413
216	1,211		32	508	624	4,470	10,135	117	143	1,025	2,325
217	1,050		31	166	204	1,461	3,313	33	41	291	659

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
218	581		20	766	942	6,747	15,299	84	104	742	1,683
219	1,063		32	417	512	3,667	8,316	84	103	739	1,675
220	415		32	541	665	4,763	10,801	43	52	374	849
221	39		31	124	152	1,089	2,469	1	1	8	18
222	1,920		31	52	64	458	1,039	19	23	167	378
223	1,564		23	1,181	1,451	10,393	23,566	350	430	3,078	6,980
224	377		23	768	944	6,762	15,332	55	67	483	1,096
225	551		23	172	212	1,519	3,443	18	22	159	359
226	788		11	182	224	1,605	3,638	27	33	240	543
227	1,303		11	665	817	5,852	13,269	164	202	1,444	3,274
228	580		28	1,389	1,707	12,227	27,724	153	188	1,344	3,047
229	1,653		27	612	752	5,387	12,214	192	235	1,686	3,824
230	2,058		29	778	956	6,848	15,527	303	373	2,669	6,052
231	1,300		5	519	638	4,570	10,362	128	157	1,125	2,551
232	736		11	1,277	1,570	11,246	25,499	178	219	1,567	3,553
233	488		23	828	1,018	7,292	16,534	77	94	674	1,528
234	449		29	260	319	2,285	5,181	22	27	194	441
235	310		14	155	190	1,361	3,086	9	11	80	181
236	310		8	106	130	931	2,111	6	8	55	124
237	105		5	173	213	1,526	3,459	3	4	30	69
238	697		26	1	1	7	16	0	0	1	2
239	186		17	57	70	501	1,137	2	2	18	40
240	145		15	182	224	1,605	3,638	5	6	44	100
241	578		15	240	295	2,113	4,791	26	32	232	525
242	125		-	-	-	-	-	-	-	-	-
243	-		-	-	-	-	-	-	-	-	-

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
244	1,792		26	1	1	7	16	0	0	2	5
245	175		10	231	284	2,034	4,613	8	9	67	153
246	175		10	231	284	2,034	4,613	8	9	67	153
247	65		7	64	79	566	1,283	1	1	7	16
248	39		10	296	364	2,607	5,912	2	3	19	43
249	128		10	295	362	2,593	5,879	7	9	63	142
250	484		10	271	333	2,385	5,408	25	31	219	496
251	498		5	2	3	21	49	0	0	2	5
252	308		-	-	-	-	-	-	-	-	-
253	54		-	-	-	-	-	-	-	-	-
254	51		11	296	364	2,607	5,912	3	3	25	57
255	290		26	66	81	580	1,316	4	4	32	72
256	377		26	85	104	745	1,689	6	7	53	121
257	215		26	65	80	573	1,299	3	3	23	53
258	321		15	10	12	86	195	1	1	5	12
259	203		15	34	42	301	682	1	2	12	26
260	362		15	34	42	301	682	2	3	21	47
261	219		19	16	20	143	325	1	1	6	14
262	218		8	5	6	43	97	0	0	2	4
263	69		26	13	16	115	260	0	0	2	3
264	69		-	-	-	-	-	-	-	-	-
265	2,458		27	73	90	645	1,462	34	42	300	681
266	752		27	269	331	2,371	5,376	38	47	338	766
267	1,323		27	322	396	2,837	6,432	81	99	711	1,611
268	1,252		18	338	416	2,980	6,756	80	99	706	1,601
269	302		24	20	24	172	390	1	1	10	22

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
270	1,005		5	484	595	4,262	9,664	92	113	811	1,839
271	954		25	378	464	3,324	7,536	68	84	600	1,361
272	656		23	495	608	4,355	9,875	62	76	541	1,227
273	485		6	517	635	4,548	10,313	48	58	418	947
274	1,244		23	279	343	2,457	5,571	66	81	579	1,313
275	419		19	151	185	1,325	3,005	12	15	105	239
276	649		23	273	335	2,400	5,441	34	41	295	669
277	2,473		16	80	98	702	1,592	37	46	329	746
278	573		13	247	304	2,178	4,937	27	33	236	536
279	458		20	231	284	2,034	4,613	20	25	176	400
280	295		22	185	227	1,626	3,687	10	13	91	206
281	440		20	168	206	1,476	3,346	14	17	123	279
282	76		20	111	136	974	2,209	2	2	14	32
283	697		20	257	316	2,263	5,132	34	42	299	677
284	690		14	509	625	4,477	10,151	66	82	585	1,326
285	91		14	457	562	4,026	9,128	8	10	69	157
286	464		14	612	752	5,387	12,214	54	66	473	1,074
287	229		18	579	711	5,093	11,548	25	31	221	501
288	500		8	578	710	5,086	11,531	55	67	481	1,091
289	738		15	2,474	3,041	21,783	49,390	346	425	3,045	6,904
290	488		18	2,224	2,733	19,576	44,388	205	252	1,808	4,100
291	494		16	481	591	4,233	9,599	45	55	396	899
292	689		27	1,593	1,958	14,025	31,801	208	255	1,829	4,147
293	325		20	1,830	2,249	16,109	36,527	113	138	992	2,249
294	396		20	360	442	3,166	7,179	27	33	238	539
295	1,017		13	1,468	1,804	12,922	29,299	283	348	2,489	5,644

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
296	162		5	256	315	2,256	5,116	8	10	69	157
297	140		5	256	315	2,256	5,116	7	8	60	136
298	1,119		12	277	341	2,443	5,538	59	72	518	1,173
299	1,036		12	242	298	2,135	4,840	48	58	419	950
300	518		19	43	53	380	861	4	5	37	85
301	749		5	70	86	616	1,397	10	12	87	198
302	652		13	358	440	3,152	7,146	44	54	389	882
303	547		5	210	258	1,848	4,190	22	27	191	434
304	406		13	17	21	150	341	1	2	12	26
305	442		5	18	22	158	357	2	2	13	30
306	207		5	35	43	308	698	1	2	12	27
307	70		10	245	301	2,156	4,889	3	4	29	65
308	319		5	78	96	688	1,559	5	6	42	94
309	281		5	27	33	236	536	1	2	13	29
310	879		18	832	1,022	7,321	16,599	139	170	1,219	2,764
311	211		14	2,575	3,165	22,671	51,404	103	126	904	2,051
312	549		14	478	587	4,205	9,534	50	61	437	992
313	717		24	810	995	7,127	16,160	110	135	968	2,194
314	879		15	378	464	3,324	7,536	63	77	553	1,255
315	618		25	477	586	4,197	9,517	56	69	491	1,114
316	395		12	49	60	430	974	4	4	32	73
317	180		13	538	661	4,735	10,736	18	23	161	366
318	221		13	618	759	5,437	12,327	26	32	227	515
319	215		8	72	88	630	1,429	3	4	26	58
320	286		6	618	759	5,437	12,327	34	41	295	668
321	549		11	476	585	4,190	9,501	50	61	436	988

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
322	1,063		9	332	408	2,922	6,626	67	82	588	1,334
323	1,074		8	330	406	2,908	6,594	67	83	591	1,341
324	568		16	72	88	630	1,429	8	9	68	154
325	484		6	72	89	638	1,445	7	8	59	133
326	487		11	72	88	630	1,429	7	8	58	132
327	578		5	71	87	623	1,413	8	10	68	155
328	414		20	9	11	79	179	1	1	6	14
329	336		20	330	405	2,901	6,578	21	26	184	418
330	802		5	177	217	1,554	3,524	27	33	236	535
331	675		22	190	233	1,669	3,784	24	30	213	484
332	379		5	254	312	2,235	5,067	18	22	160	364
333	379		5	101	124	888	2,014	7	9	64	145
334	525		8	521	640	4,584	10,394	52	64	456	1,034
335	325		18	472	580	4,155	9,420	29	36	256	579
336	325		18	478	587	4,205	9,534	29	36	259	586
337	150		13	36	173	1,239	2,810	1	5	35	80
338	671		5	113	139	996	2,258	14	18	127	287
339	311		9	65	80	573	1,299	4	5	34	76
340	304		5	693	852	6,103	13,838	40	49	352	797
341	152		12	331	407	2,915	6,610	10	12	84	190
342	328		5	174	214	1,533	3,476	11	13	95	216
343	141		10	296	364	2,607	5,912	8	10	70	158
344	-		-	-	-	-	-	-	-	-	-
345	327		5	26	32	229	520	2	2	14	32
346	303		5	68	83	595	1,348	4	5	34	77
347	303		5	49	60	430	974	3	3	25	56

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
348	146		-	-	-	-	-		-	-	-
349	67		15	399	490	3,510	7,958	5	6	44	101
350	446		5	77	95	680	1,543	7	8	57	130
351	335		5	145	178	1,275	2,891	9	11	81	184
352	430		5	164	201	1,440	3,265	13	16	117	266
353	360		5	158	194	1,390	3,151	11	13	95	215
354	-		-	-	-	-	-	-	-	-	-
355	88		12	77	95	680	1,543	1	2	11	26
356	113		18	360	442	3,166	7,179	8	9	68	154
358	463		5	144	177	1,268	2,875	13	16	111	252
359	229		12	28	34	244	552	1	1	11	24
360	245		12	30	37	265	601	1	2	12	28
361	248		16	20	25	179	406	1	1	8	19
362	199		8	26	32	229	520	1	1	9	20
363	230		19	198	243	1,741	3,947	9	11	76	172
364	256		10	199	245	1,755	3,979	10	12	85	193
365	201		23	12	15	107	244	0	1	4	9
366	201		10	55	68	487	1,104	2	3	19	42
367	752		32	674	828	5,931	13,448	96	118	844	1,914
368	410		5	360	443	3,173	7,195	28	34	247	559
369	-		-	-	-	-	-	-	-	-	-
370	96		20	316	388	2,779	6,302	6	7	50	114
371	712		22	62	76	544	1,234	8	10	73	166
372	430		25	415	510	3,653	8,283	34	42	297	674
373	2,331		27	164	202	1,447	3,281	72	89	639	1,449
374	-		-	-	-	-	-	-	-	-	-

Table H-11 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link	Link	AM Link	PM Link	Volume				VMT			
Name	Distance (ft)	Speed (mph)	Speed (mph)	AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
375			-	-	-	-	-				
376	751		7	142	175	1,254	2,842	20	25	178	404
377	835		7	77	95	680	1,543	12	15	108	244
378	758		5	224	275	1,970	4,466	32	40	283	642
379	313		13	351	431	3,087	7,000	21	26	183	415
380	671		8	149	183	1,311	2,972	19	23	167	378
LOGAN AIRPORT VMT								**10,619**	**13,054**	**93,509**	**212,022**

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H.4 Traffic Roadway Network

H.4.1 Existing Traffic Roadway Network

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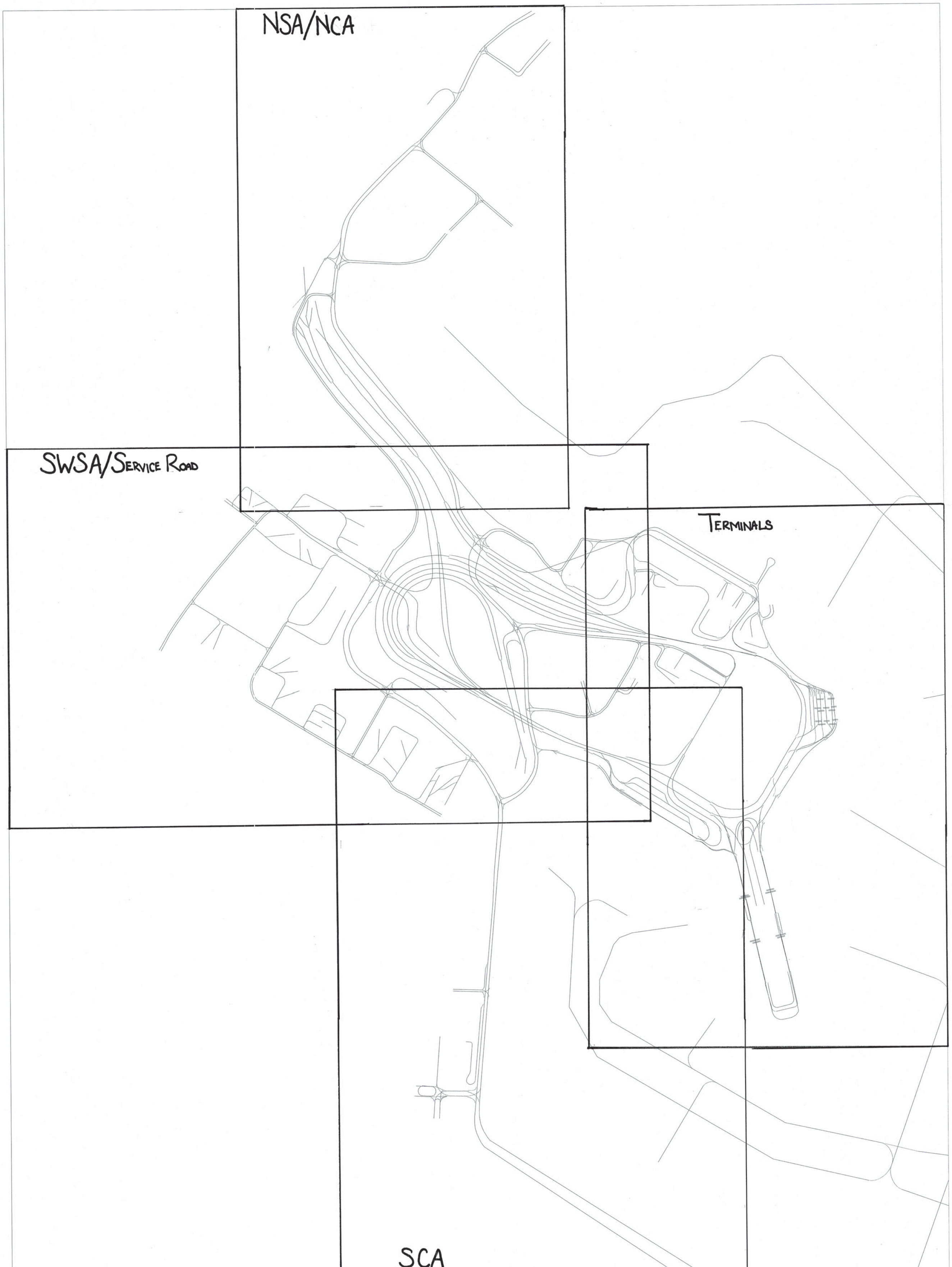
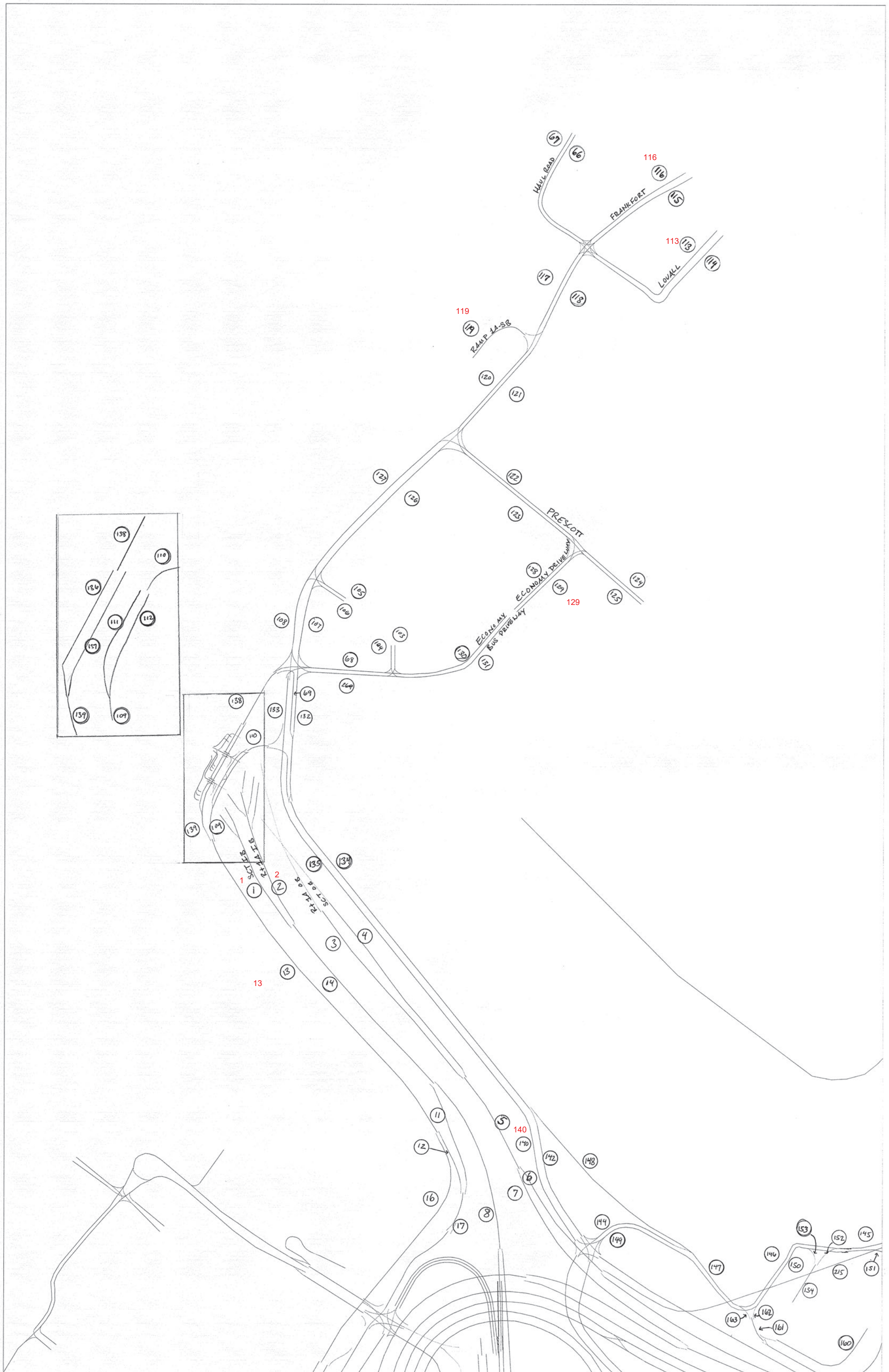


VISSIM 2011 logan network map	Project: 2011 Logan Network
File: 2011 logan network map.inp	Scenario: Network Map
Simulation Time: 0.0	



VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map NCA/NSA
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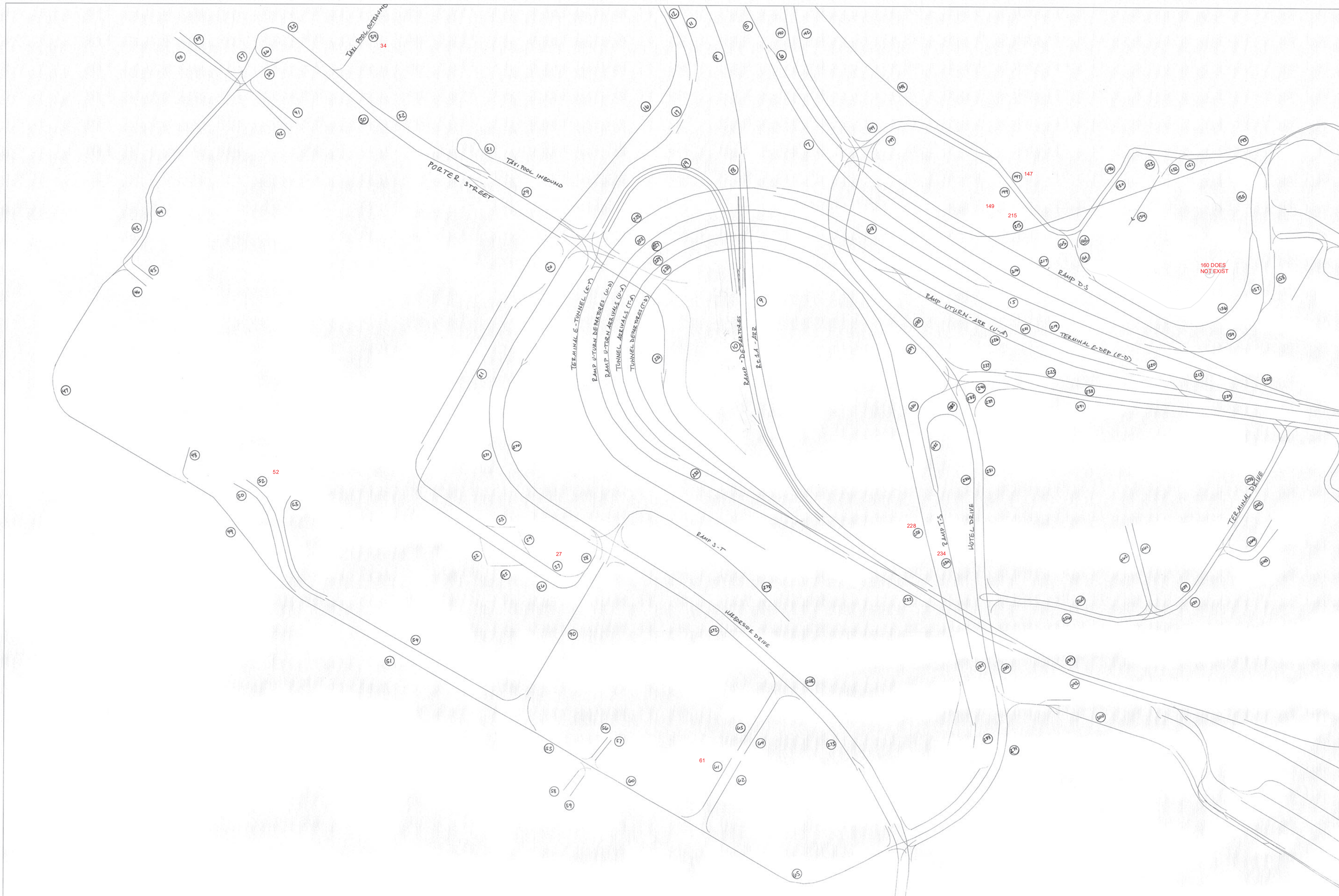
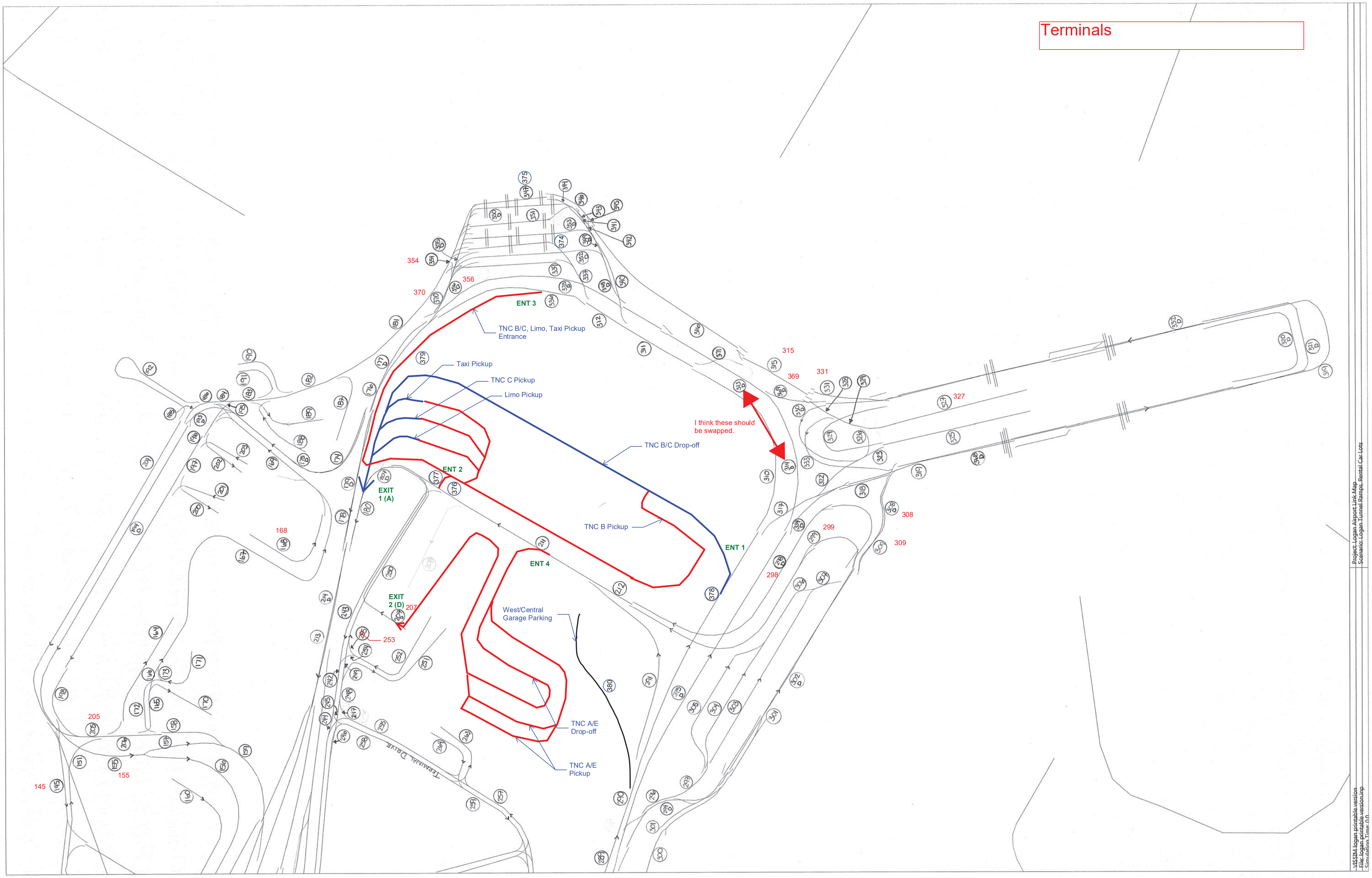
Simulation Time: 0.0	

VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map SCA
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	



VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map SWS4 / Service Roadways
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	


Terminals
ENT 1
ENT 2
ENT 3
ENT 4
EXIT 1 (A)
EXIT 2 (D)
TNC B/C, Limo, Taxi Pickup Entrance
Taxi Pickup
TNC C Pickup
Limo Pickup
TNC B/C Drop-off
TNC B Pickup
I think these should be swapped.
West/Central Garage Parking
TNC A/E Drop-off
TNC A/E Pickup
Terminal Drive
Project: Logan Airport Link Map
Scenario: Logan Tunnel Ramps, Rental Car Lots
VISSIM logan printable version
File: logan printable version.inp
Simulation Time: 0.0

H.4.2 Future Traffic Roadway Network

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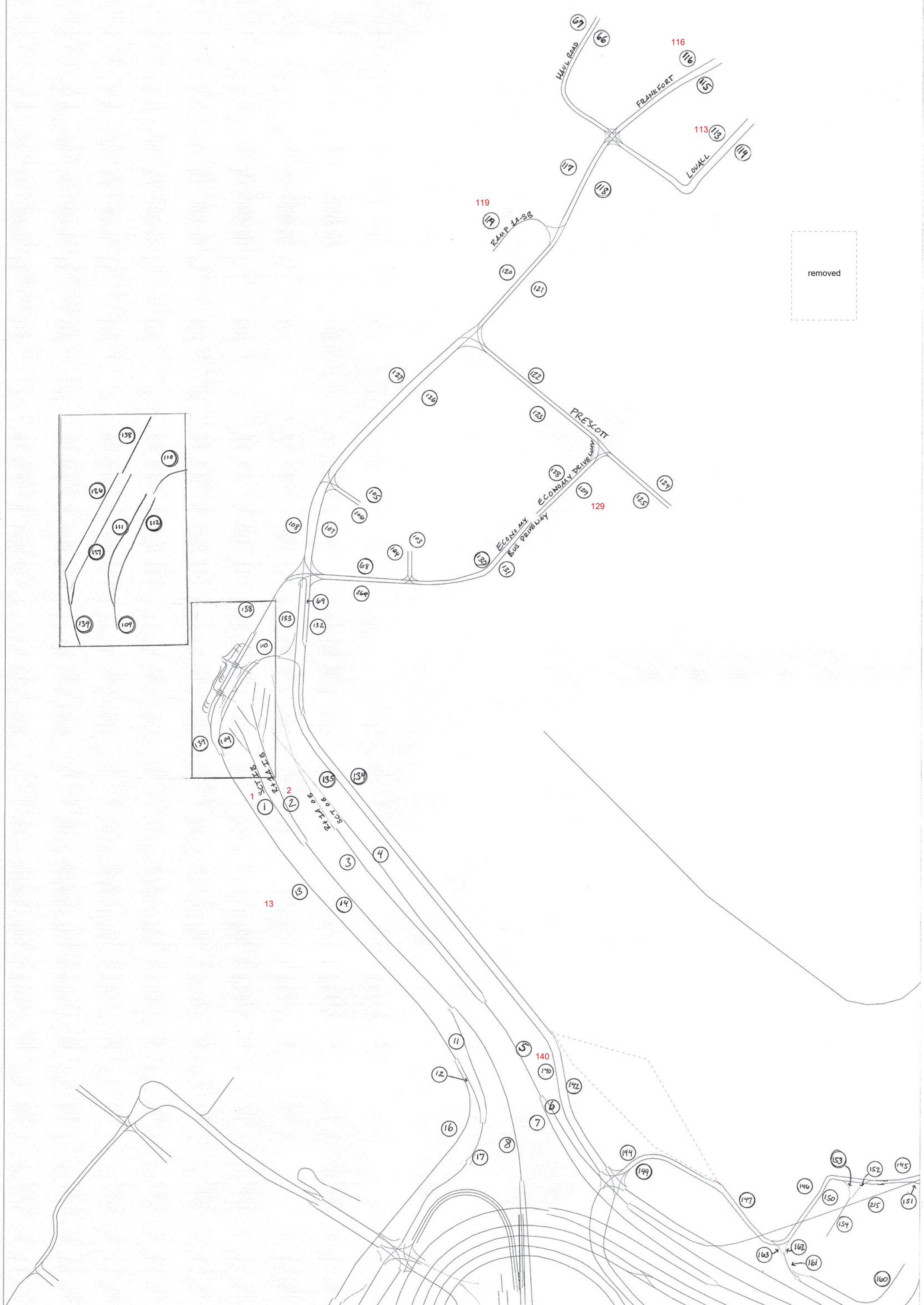
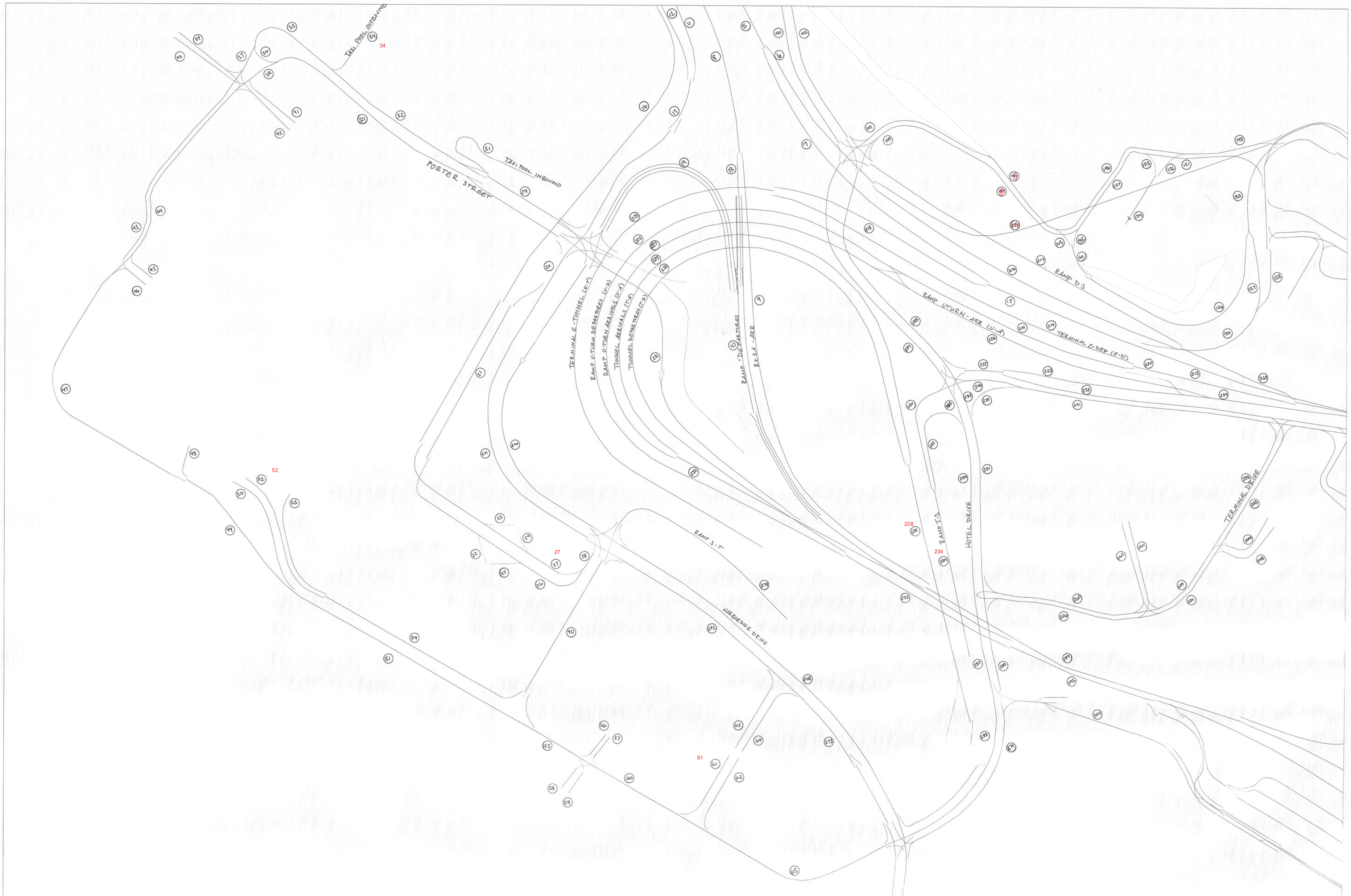
VISSIM 2011 logan network map	Project: 2011 Logan Network
File: 2011 logan network map.inp	Scenario: Network Map
Simulation Time: 0.0	

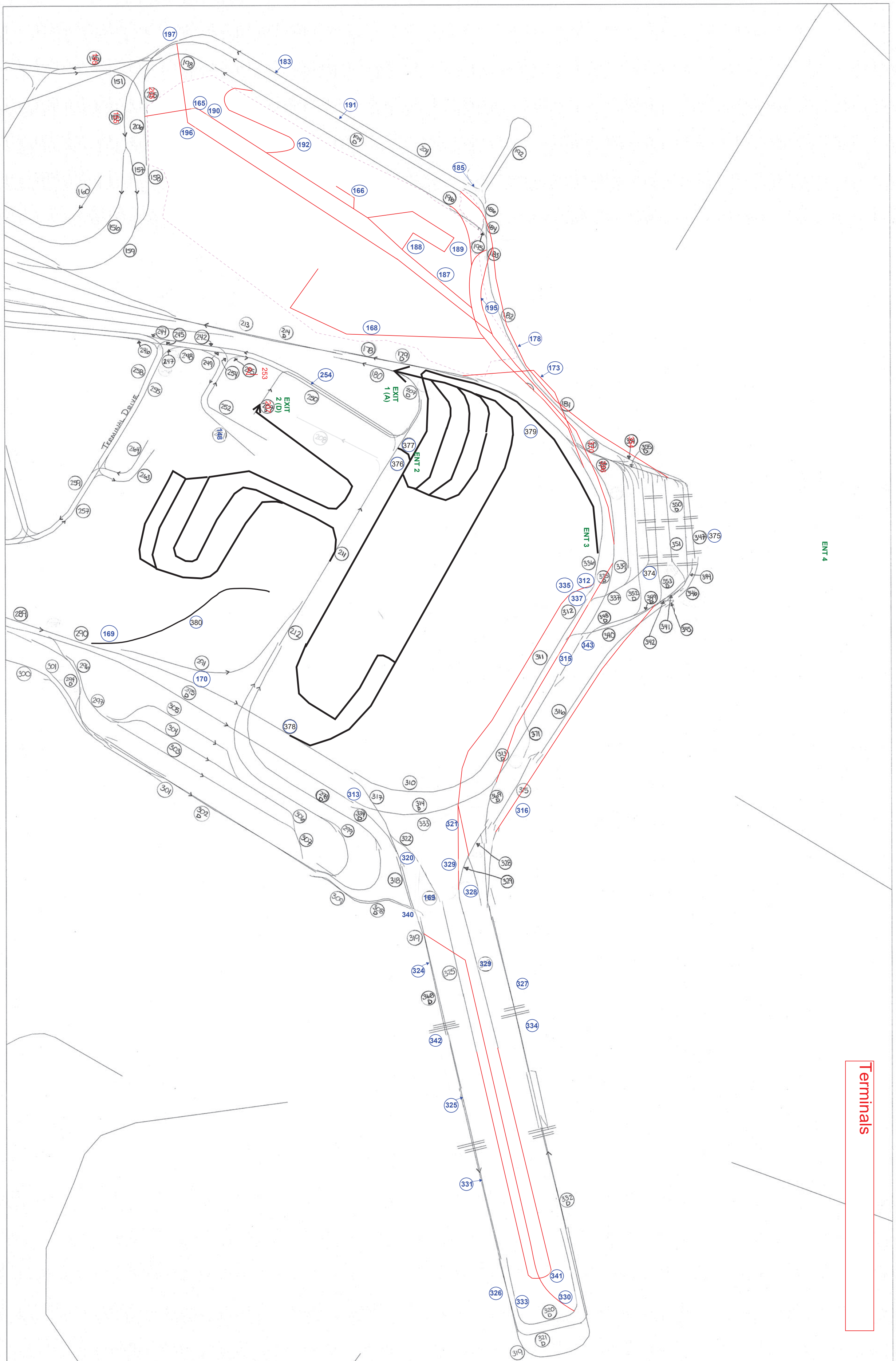


VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map NCA/NSA
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	

VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map SCA
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	



VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map SWS4 / Service Roadways
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	



VISSIM logan printable version
File: logan printable version.inp
Simulation Time: 0.0

Project: Logan Airport Link Map
Scenario: Logan Tunnel Ramps, Rental Car Lots

H.5 Parking Freeze Report

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massport

Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
Telephone: 617-568-5000
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March 22, 2022

Christine Kirby
Assistant Commissioner, Bureau of Air and Waste
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Logan Airport Parking Space Inventory

Dear Ms. Kirby:

In compliance with the reporting requirements of 310 CMR 7.30(3)(a), enclosed please find the Massachusetts Port Authority (Massport) submissions for the Logan Airport (the Airport) Parking Space Inventory:

- Commercial Parking Space Inventory;
- Employee Parking Space Inventory; and
- Location Map.

This submission was filed during the ongoing COVID-19 worldwide pandemic. Since March 2020, flights in and out of Logan have slowly recovered but continue to be reduced as compared to pre-COVID-19 levels. Due to these extraordinary circumstances, Massport responded with temporary parking closures at many of its parking facilities. Those temporary closures included the Economy garage, Terminal B, Terminal E Lot #3 and the Chelsea Garage which primarily serves airport employees. The Chelsea garage employee parkers were temporarily accommodated in on-Airport parking facilities to facilitate social distancing and protect health.

Massport continued to restore HOV services on its Braintree, Framingham and Woburn Logan Express to pre-COVID-19 schedules and recently launched the Peabody Logan Express in a more convenient site along Route I-95 in Peabody. Additionally, Massport continues to offer reduced fares for advanced bookings made through the new on-line Logan Express ticketing system for all of its Logan Express sites. As another element of our Authority-wide emission reductions program, Massport is continuing to add electric vehicle (EV) charging stations within our commercial, employee and ride-for-hire lots both on and off-Airport, and was recently awarded a grant from the MA Clean Energy Center (CEC) to encourage Airport rideshare and taxi partners to switch to electric vehicles.

Since the fall 2021 parking freeze filing, as a result of recovering passenger numbers, Massport has continued to restore service, update facilities, and engage with transportation partners. Massport reopened its Terminal B Garage (June 2021), Economy Garage (December 2021), and relocated employees back to the Chelsea garage in March 2022. The Terminal E surface lots are still closed to passengers due to construction impacts.

Massport continues to make appropriate adjustments to its parking space inventory in full compliance with the Logan Airport parking freeze regulations, and have made minor updates to its employee space totals as detailed in the attached filing. The attachments provide the updated quantity, physical distribution, and allocation of commercial and employee parking spaces on the Airport, as defined by 310 CMR 7.30, as amended, effective as of June 30, 2017.

The permanent Commercial Parking Freeze Space Inventory totals 23,640 parking spaces; the permanent Employee Parking Space Inventory totals 2,448 parking spaces; and the total inventory of parking spaces at the Airport is 26,088. The in-service commercial parking spaces currently total 16,584 and the in-service employee parking spaces currently total 2,256 spaces. Additionally, we continue to provide information on rental car parking spaces, also attached.

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 617-568-3705.

Sincerely,

Massachusetts Port Authority

Joel Barrera, Director
Strategic & Business Planning Department

cc: Lynne Hamjian, EPA
M. Hadley, S. K. Lee, S. Dalzell, C. McDonald/Massport

Attachments

Commercial Parking Spaces Inventory
Logan International Airport
March 2022 Submission

Commercial Parking Spaces

Map ID#	Location of Commercial Parking Areas		Mar-22 Number of Spaces
Terminal Area Parking and Economy Parking Spaces			
C1	Central Garage		6440
C2	West Garage		2954
	West Garage Expansion		1699
		subtotal	**11093**
C3	Terminal B Garage		2212
C5	Terminal E Lot 1 (*TEMPORARILY CLOSED*)		0
C6	Terminal E Lot 2 (*TEMPORARILY CLOSED*)		0
C7	Terminal E Lot 3 (*TEMPORARILY CLOSED*)		0
C8	Economy Garage		2864
		subtotal	**5076**
Overflow Commercial Spaces			
C11	Red Lot (Tomahawk Dr.) (*TEMPORARILY CLOSED*)		0
		subtotal	**0**
Hotel Spaces			
C4a	Logan Airport Hilton Hotel (one lot)		110
C10	Harborside Hyatt Conference Center		270
		subtotal	**380**
General Aviation Spaces			
C9	Signature (General Aviation Terminal)		35
		subtotal	**35**

Total In-Service Commercial Parking Spaces	**16,584**
Total Designated Commercial Parking Spaces	**7,056**
Total Commercial Parking Spaces	**23,640**
Total Employee Parking Spaces *(see table on next page)*	**-**
TOTAL PARKING FREEZE SPACES	**23,640**

Employee Parking Spaces Inventory
Logan International Airport
March 2022 Submission

Employee Parking Spaces

Area	Map ID#	Location of Employee Parking Areas	Mar-22 Number of Spaces
Terminal Area	E81	West Garage - MPA Employee	55
Terminal Area	E81a	West Garage Expansion - MPA Employee	12
Terminal Area	E81b	West Garage Expansion - Hilton Employee	7
Terminal Area	E3a	UPS	36
Terminal Area	E3b	Terminal B Garage (UPS)	55
Terminal Area	E26	Airport Tower/Administration Parking	533
Terminal Area	E20a & E20b	Terminal C Pier A (Old Terminal D) (two lots)	87
Terminal Area	E18	Massport Facilities 1 (Heating Plant)	81
Terminal Area	E34	Hilton Hotel employee lot	28
North Service Area	E68a	LSG Sky Chefs (Bldg. 68), main lot	25
North Service Area	E68b	LSG Sky Chefs (Bldg. 68), overflow lot	126
North Service Area	E1	Flight Kitchen Building 1 (and nearby lot)	80
North Service Area	E40	Lovell Street Lot (contractor trailer)	25
North Service Area	E53	Green Bus Depot (Bus Maintenance Facility)	12
North Service Area	E11a	North Cargo Building 11, TSA lot	64
North Service Area	E11b	North Cargo Building 11, State Police lot	36
North Service Area	E43	North Gate & EMS Trailer (EMS Station A7)	12
North Service Area	E8	North Cargo Building 8	118
North Service Area	E5	US Airways Administration/Hangar (Bldg. 5)	0
North Service Area	E4	Massport Facilities 3 (landside, Bldg. 4)	102
North Service Area	E4	Signature Flight Support	23
North Service Area	E13	UPS (Building 13) - currently vacant - out to RFP	15
North Service Area	E96	UPS (Building 96)	8
North Service Area	E94	United/Delta Buildings (Buildings 93/94)	55
Southwest Service Area	E59	Bus/Limo Pool Lot	4
Southwest Service Area	E60	Rental Car Center (Customer Service Center)	4
Southwest Service Area	E72	Taxi Pool Lot	0
Southwest Service Area	E50	Nouria Gas Station	4
South Service Area	E84	Bird Island Flats / Logan Office Center (LOC) Garage	370
South Service Area	E63	South Cargo Building 63	16
South Service Area	E62	South Cargo Building 62	51
South Service Area	E58	South Cargo Building 58	23
South Service Area	E57	South Cargo Building 57	44
South Service Area	E56	South Cargo Building 56	33
South Service Area	E78	Fire-Rescue HQ & Amelia Earhart Terminal	112

Total In-Service Employee Parking Spaces	**2,256**
Total Designated Employee Parking Spaces	**192**
Total Employee Parking Spaces	**2,448**
Total Commercial Parking Spaces *(see table on previous page)*	**23,640**
TOTAL PARKING SPACES	**26,088**
TOTAL PARKING FREEZE SPACES	**26,088**

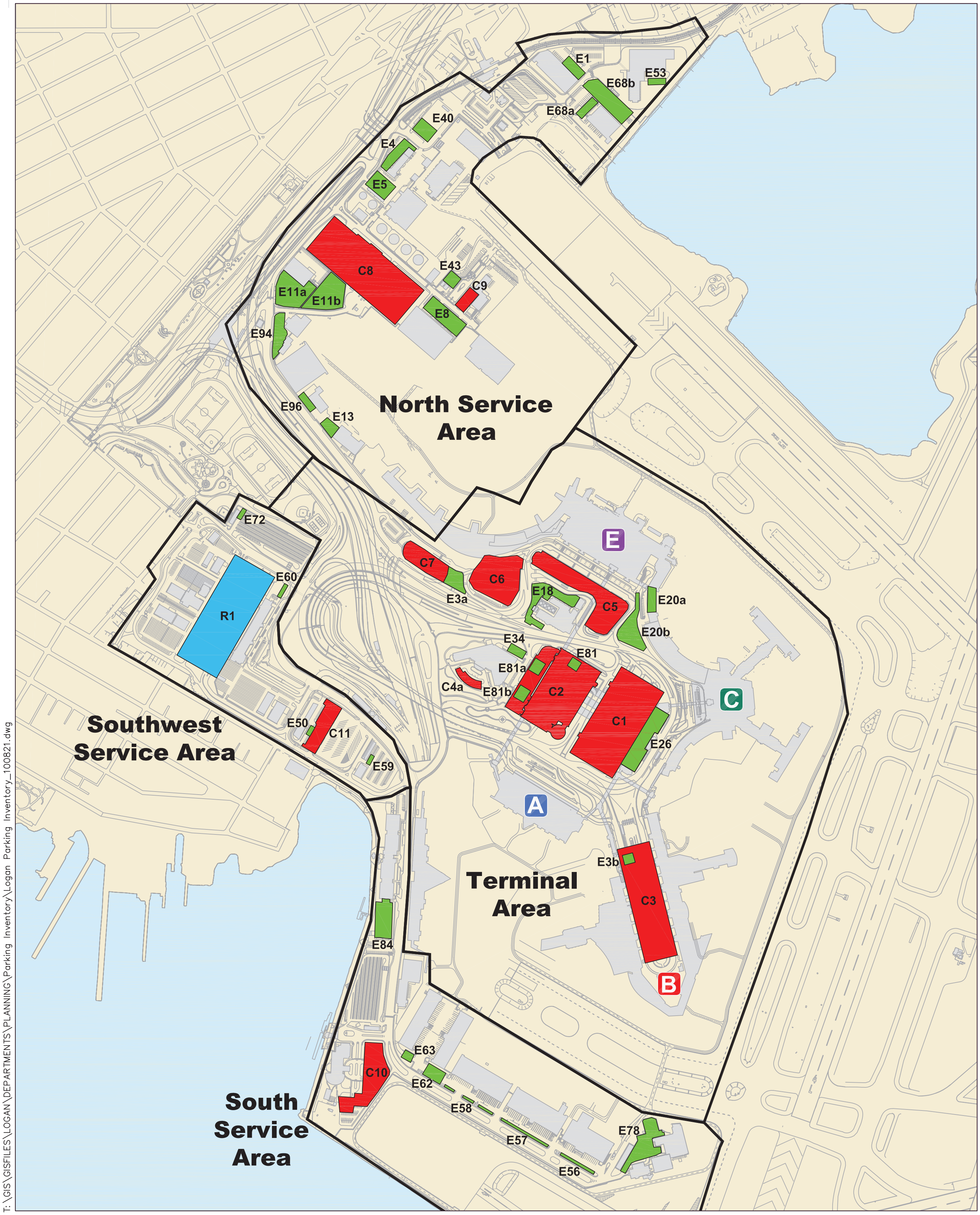
LOGAN PARKING FREEZE SUMMARY

TOTAL COMMERCIAL PARKING SPACES	***23,640***
TOTAL EMPLOYEE PARKING SPACES	***2,448***
TOTAL PARKING FREEZE SPACES	***26,088***

Rental Car Spaces Inventory
Logan International Airport
March 2022 Submission

Rental Car Company Parking Spaces

Map ID#	Location of Employee Parking Areas	Mar-22 Number of Spaces
R1	Rental Car Center (RCC)	5,020
Total Rental Car Spaces		**5,020**



Logan Airport
Parking Space Inventory

Logan International Airport
East Boston, MA

massport
Massachusetts Port Authority
September 2021

Legend:

- Logan Parking Service Area Zones
- Commercial Parking Space Locations
- Employee Parking Space Locations
- Rental Car Parking Space Locations

N

0 250 500 1000
in feet

Notes:

This plan is intended for informational purposes only and no use may be made of the same without the express written permission of the Massachusetts Port Authority ("Massport"). Massport does not certify the accuracy, information or title to the properties contained in this plan nor make any warranties of any kind, express or implied, in fact or by law, with respect to any boundaries, easements, restrictions, claims, overlaps or other encumbrances affecting such properties.

massport
Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
Telephone: 617-568-5000
www.massport.com

August 29, 2022

Christine Kirby
Assistant Commissioner, Bureau of Air and Waste
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Logan Airport Parking Space Inventory

Dear Ms. Kirby:

In compliance with the reporting requirements of 310 CMR 7.30(3)(a), enclosed please find the Massachusetts Port Authority (Massport) submissions for the Logan Airport (the Airport) Parking Space Inventory:

- Commercial Parking Space Inventory;
- Employee Parking Space Inventory; and
- Location Map.

Since March 2020, flights in and out of Logan have slowly recovered but continue to be reduced as compared to pre-COVID-19 levels. As we indicated in our previous submissions, during the height of the pandemic, Massport responded with temporary closures at many of its parking facilities, including the Economy Garage, Terminal B, Terminal E Lot #3 and the Chelsea Garage, which primarily serves airport employees. Massport has now reopened all commercial parking garages, including the Chelsea Garage, however the Terminal E surface lots remain closed to passengers due to ongoing construction impacts.

As of the date of this filing, Massport has restored HOV services on its Braintree, Framingham, Peabody and Woburn Logan Express locations. Massport continues to offer reduced fares for advanced bookings made through the on-line Logan Express ticketing system for these four suburban Logan Express sites. Restoration of the Back Bay Logan Express service is expected this Fall, with $3 service to the Airport and free service from the Airport to Back Bay. As another element of our Authority-wide emission reductions program, Massport, in partnership with MassCAC and MassDOT, continues to advance opportunities for airport rideshare and taxi partners to switch to electric vehicles.

There are no updates to the parking space inventory from our previous filing. The attachments provide the quantity, physical distribution, and allocation of commercial and employee parking spaces on the Airport, as defined by 310 CMR 7.30, as amended, effective as of June 30, 2017.

The Commercial Parking Space Inventory totals 23,640 parking spaces; the Employee Parking Space Inventory totals 2,448 parking spaces; and the total inventory of parking spaces at the Airport is 26,088. The in-service commercial parking spaces currently total 16,584 and the in-service employee parking spaces currently total 2,256 spaces. Additionally, for informational purposes, we continue to provide information on rental car parking spaces, also attached.

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 617-568-3705.

Sincerely,

Massachusetts Port Authority

Joel Barrera, Director
Strategic & Business Planning Department

cc: Lynne Hamjian, EPA
M. Hadley, S. K. Lee, S. Dalzell, C. McDonald/Massport

Attachments

Commercial Parking Spaces Inventory
Logan International Airport
September 2022 Submission

Commercial Parking Spaces

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C2	West Garage		2954
	West Garage Expansion		1699
		subtotal	**11093**
C3	Terminal B Garage		2212
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C6	Terminal E Lot 2 (*TEMPORARILY CLOSED*)		0
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C11	Red Lot (Tomahawk Dr.) (*TEMPORARILY CLOSED*)		0
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C4a	Logan Airport Hilton Hotel (one lot)		110
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Total Commercial Parking Spaces	**23,640**
Total Employee Parking Spaces *(see table on next page)*	**-**
TOTAL PARKING FREEZE SPACES	**23,640**

Employee Parking Spaces Inventory
Logan International Airport
September 2022 Submission

Employee Parking Spaces

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North Service Area	E11b	North Cargo Building 11, State Police lot	36
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North Service Area	E8	North Cargo Building 8	118
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North Service Area	E94	United/Delta Buildings (Buildings 93/94)	55
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Southwest Service Area	E60	Rental Car Center (Customer Service Center)	4
Southwest Service Area	E72	Taxi Pool Lot	0
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South Service Area	E62	South Cargo Building 62	51
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LOGAN PARKING FREEZE SUMMARY

TOTAL COMMERCIAL PARKING SPACES	***23,640***
TOTAL EMPLOYEE PARKING SPACES	***2,448***
TOTAL PARKING FREEZE SPACES	***26,088***

Rental Car Spaces Inventory
Logan International Airport
September 2022 Submission

Rental Car Company Parking Spaces

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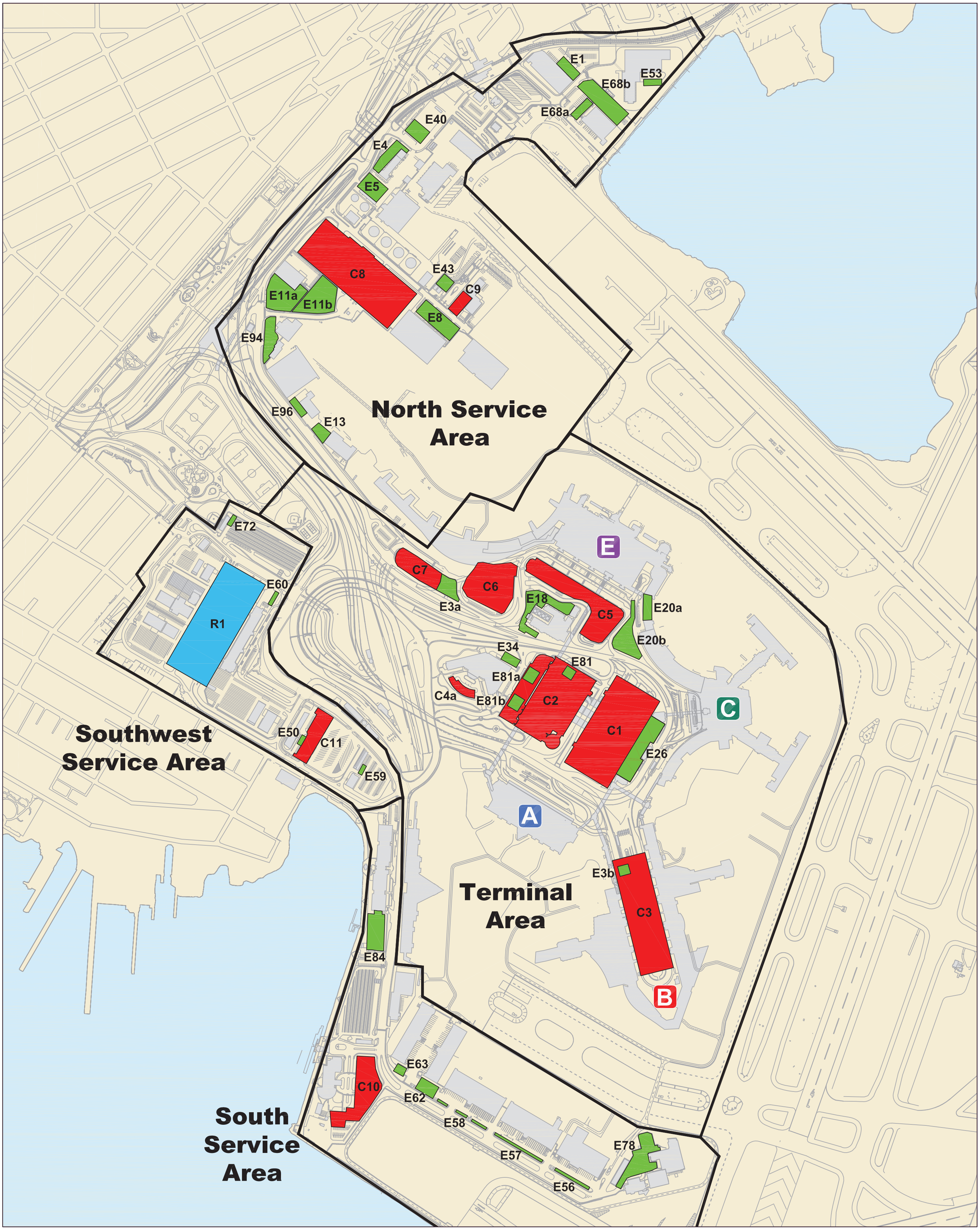
Total Rental Car Spaces		**5,020**



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Logan Airport Parking Space Inventory

Logan International Airport
East Boston, MA

massport

Massachusetts Port Authority
September 2021

Legend:

- Logan Parking Service Area Zones
- Commercial Parking Space Locations
- Employee Parking Space Locations
- Rental Car Parking Space Locations

N

0 250 500 1000
in feet

Notes:

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I. Noise Supporting Documentation

This appendix provides detailed information, tables, and figures in support of Chapter 7, *Noise*. The contents of this appendix are summarized below.

I.1 Fundamentals of Acoustics and Environmental Noise

This section introduces the fundamentals of acoustics and noise terminology as well as the effects of noise on human activity and community annoyance.

I.1.1 Introduction to Acoustics and Noise Terminology

Chapter 7, *Noise* of this *2022 Environmental Status and Planning Report (ESPR)* relies largely on a measure of cumulative noise exposure over an entire calendar year, in terms of a metric called the Day-Night Average Sound Level (DNL). However, DNL does not always provide a sufficient description of noise for many purposes. Other measures are available to address essentially any issue of concern. This section introduces the following acoustic metrics, which are all related to DNL, but provide bases for evaluating a broad range of noise situations. These metrics include:

- Decibel (dB)
- A-Weighted Decibel (dBA)
- Sound Exposure Level (SEL)
- Equivalent Sound Level (Leq)
- Time Above (TA)
- Time Above, Night (TAN)
- DNL

I.1.2 The Decibel (dB)

All sounds come from a sound source – a musical instrument, a voice speaking, or an airplane that passes overhead. It takes energy to produce sound. The sound energy produced by any sound source is transmitted through the air in the form of sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear.

Human ears are sensitive to a wide range of sound pressures. The loudest sounds that we hear without pain have about one million times more energy than the quietest sounds we hear. However, our ears are incapable of detecting small differences in these pressures. Thus, to match how we hear this sound energy, humans compress the total range of sound pressures to a more meaningful range by introducing the concept of sound pressure level (SPL). SPL is a measure of the sound pressure of a given noise source relative to a standard reference value (typically the quietest sound that a young person with good hearing can detect). SPLs are measured in decibels (abbreviated dB). Decibels are logarithmic quantities – logarithms of the squared ratio of two pressures, the numerator being the pressure of the sound source of interest, and the denominator being the reference pressure (the quietest sound we can hear).

The logarithmic conversion of sound pressure to SPL means that the quietest sound we can hear (the reference pressure) has a SPL of about zero dB, while the loudest sounds we hear without pain have SPLs of about 120 dB. Most sounds in our day-to-day environment have SPLs from 30 to 100 dB.

Because decibels are logarithmic quantities, they do not behave like regular numbers with which we are more familiar. For example, if two sound sources each produce 100 dB and they are operated together, they produce only 103 dB – not 200 dB as we might expect. Four equal sources operating simultaneously result in a total SPL of 106 dB. In fact, for every doubling of the number of equal sources, the SPL goes up another three decibels. A tenfold increase in the number of sources makes the SPL go up 10 dB. A hundredfold increase makes the level go up 20 dB, and it takes a thousand equal sources to increase the level 30 dB.

If one source is much louder than another source, the two sources together will produce the same SPL (and sound to our ears) as if the louder source were operating alone. For example, a 100-dB source plus an 80-dB source produces 100 dB when operating together. The louder source "masks" the quieter one, but if the quieter source gets louder, it will have an increasing effect on the total SPL. When the two sources are equal, as described above, they produce a level 3 dB above the sound of either one by itself.

From these basic concepts, note that 100 80 dB sources will produce a combined level of 100 dB; if a single 100-dB source is added, the group will produce a total SPL of 103 dB. Clearly, the loudest source has the greatest effect on the total decibel level.

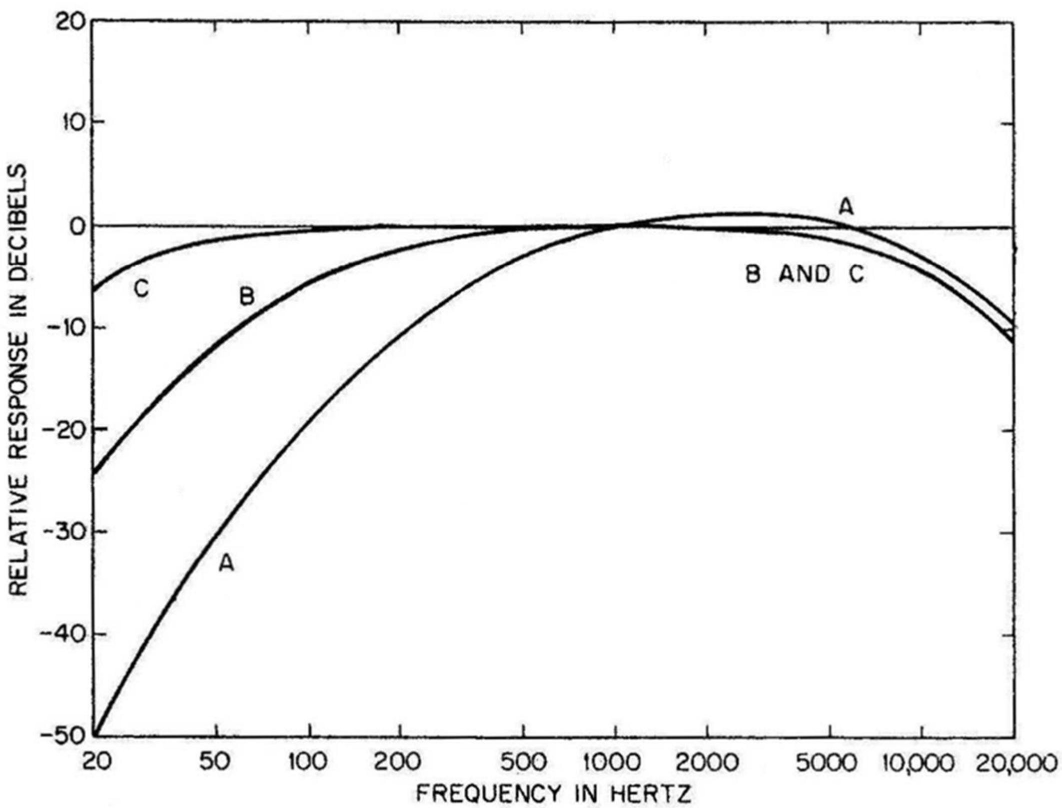
I.1.2.1 A-Weighted Decibel (dBA)

Another important characteristic of sound is its frequency, or "pitch." This is the rate of repetition of the sound pressure oscillations as they reach our ear. Formerly expressed in cycles per second, frequency is now expressed in units known as Hertz (Hz).

Most people hear from about 20 Hz to about 10,000 to 15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, around 1,000 to 2,000 Hz. Acousticians have developed "filters" to match our ears' sensitivity and help us to judge the relative loudness of sounds made up of different frequencies. The so-called "A" filter does the best job of matching the sensitivity of our ears to most environmental noises. SPLs measured through this filter are referred to as A-weighted levels (dBA). A-weighting significantly de-emphasizes noise at low and very high frequencies (below about 500 Hz and above about 10,000 Hz) where we do not hear as well. Because this filter generally matches our ears' sensitivity, sounds having higher A-weighted sound levels are usually judged louder than those with lower A-weighted sound levels, a relationship which does not always hold true for unweighted levels. It is for these reasons that A-weighted sound levels are normally used to evaluate environmental noise.

Other weighting networks include the B and C filters. They correspond to different level ranges of the ear. The rarely used B-weighting attenuates low frequencies (those less than 500 Hz), but to a lesser degree than A-weighting. C weighting is nearly flat throughout the audible frequency range, hardly de-emphasizing low frequency noise. C-weighted levels can be preferable in evaluating sounds for which low-frequency components are responsible for secondary effects such as the shaking of a building, window rattle, or perceptible vibrations. Uses include the evaluation of blasting noise, artillery fire, and in some cases, aircraft noise inside buildings. **Figure I-1** compares these various weighting networks.

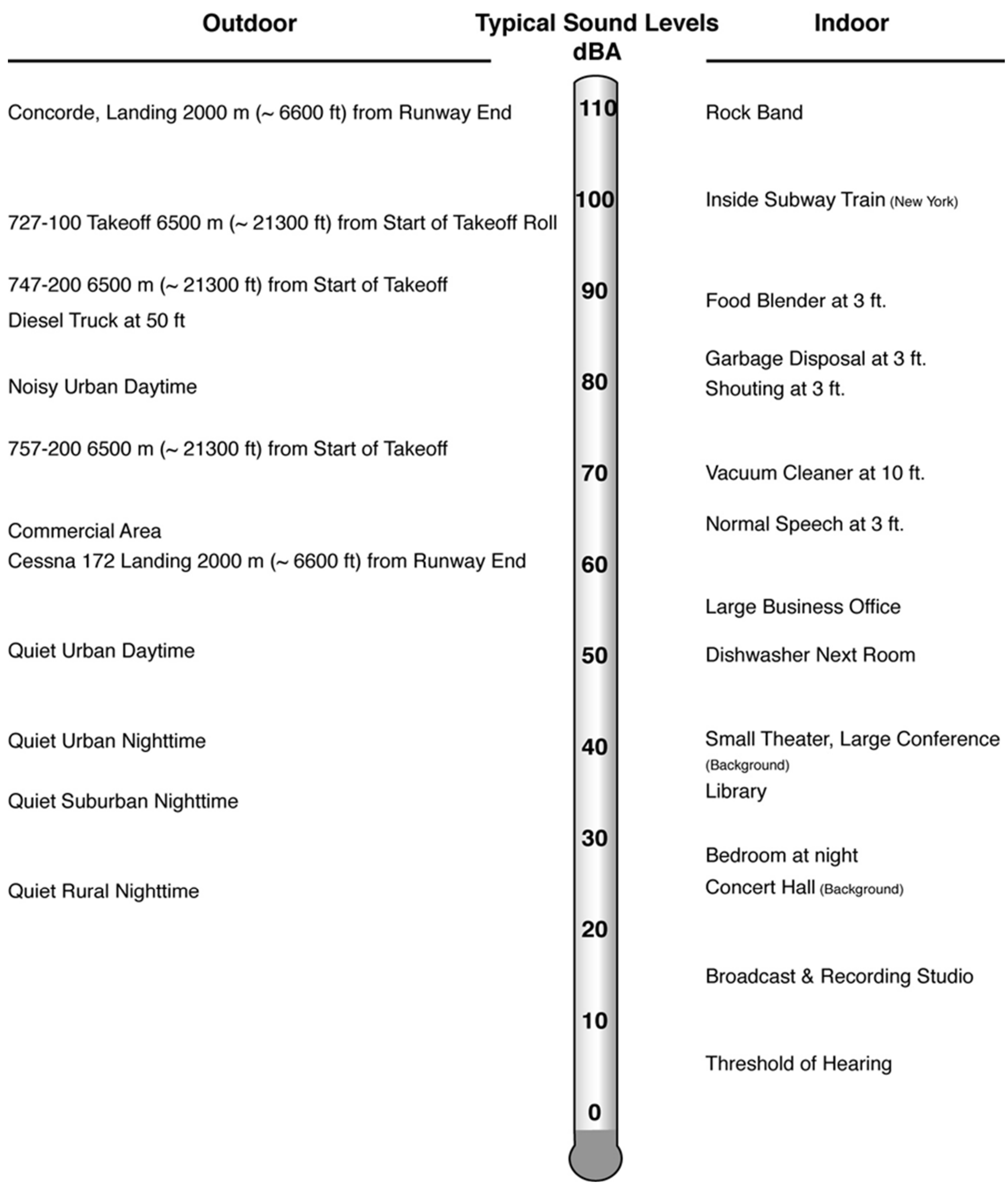
Figure I-1 Frequency-Response Characteristics of Various Weighting Networks



Source: Harris, Cyril M., editor; Handbook of Acoustical Measurements and Noise Control, (Chapter 5, "Acoustical Measurement Instruments"; Johnson, Daniel L.; Marsh, Alan H.; and Harris, Cyril M.); New York; McGraw-Hill, Inc.; 1991; p. 5.13.

Because of the correlation with human hearing, the A-weighted level has been adopted as the basic measure of environmental noise by the U.S. Environmental Protection Agency (EPA) and by nearly every other federal and state agency concerned with community noise. **Figure I-2** presents typical A-weighted sound levels of several common environmental sources.

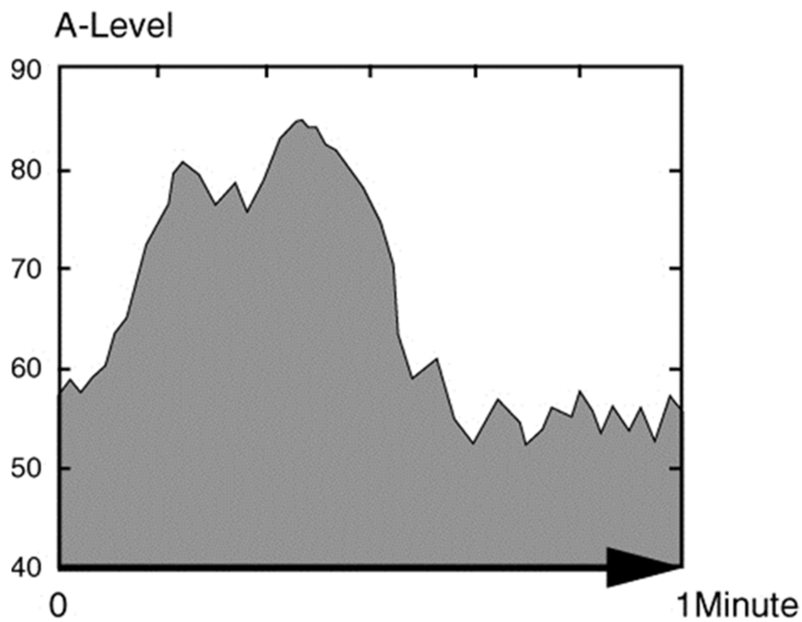
Figure I-2 Common Environmental Sound Levels, in dBA



Source: HMMH (Aircraft noise levels from FAA Advisory Circular 36-3H)
Note: dBA – A-weighted decibel.

An additional dimension to environmental noise is that A-weighted levels vary with time. For example, the sound level increases as an aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance (though even the background varies as birds chirp or the wind blows, or a vehicle passes by). **Figure I-3** illustrates this concept.

Figure I-3 Variations in the A-Weighted Sound Level Over Time



Source: HMMH.

I.1.2.2 Maximum A-Weighted Noise Level (L_{max})

The variation in noise level over time often makes it convenient to describe a particular noise "event" by its maximum sound level, abbreviated as L_{max}. In the figure above, it is approximately 85 dBA.

The maximum level describes only one dimension of an event; it provides no information on the cumulative noise exposure. In fact, two events with identical maxima may produce very different total exposures. One may be of very short duration, while the other may continue for an extended period and be judged much more annoying. The next measure corrects for this deficiency.

I.1.2.3 Sound Exposure Level (SEL)

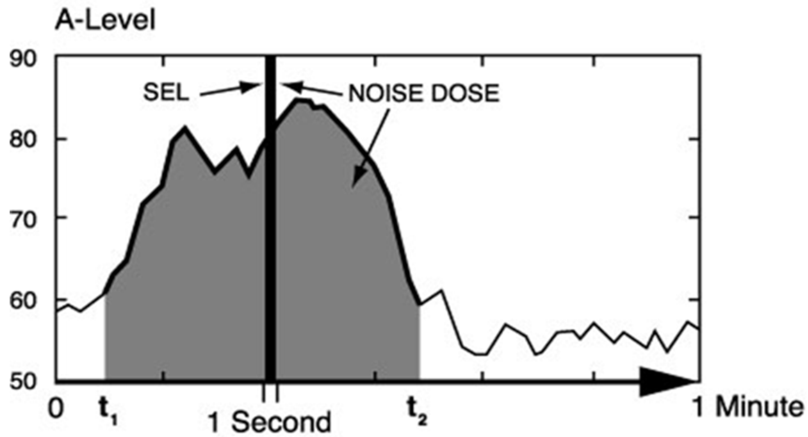
The most frequently used measure of noise exposure for an individual aircraft noise event (and the measure that Part 150[1] specifies for this purpose) is the SEL. SEL is a measure of the total noise energy produced during an event, from the time when the A-weighted sound level first exceeds a threshold level (normally just above the background or ambient noise) to the time that the sound level drops back down

1 "Part 150" refers to Federal Aviation Regulations (FAR) Part 150, discussed in detail in the Regulatory Framework Section of this Appendix.

below the threshold. To allow comparison of noise events with very different durations, SEL "normalizes" the duration in every case to one second; that is, it is expressed as the steady noise level with just a one-second duration that includes the same amount of noise energy as the actual longer duration, time-varying noise. In lay terms, SEL "squeezes" the entire noise event into one second.

Figure I-4 depicts this transformation. The shaded area represents the energy included in an SEL measurement for the noise event, where the threshold is set to 60 dBA. The dark shaded vertical bar, which is 90 dBA high and just one-second-long (wide), contains the same sound energy as the full event.

Figure I-4 Sound Exposure Level (SEL)



Source: HMMH.

Because the SEL is normalized to one second, it will always be larger than the L_{max} for an event longer than one second. In this case, the SEL is 90 dB; the L_{max} is approximately 85 dBA. For most aircraft overflights, the SEL is normally on the order of 7 to 12 dB higher than L_{max}. Because SEL considers duration, longer exposure to relatively slow, quiet aircraft, such as propeller models, can have the same or higher SEL than shorter exposure to faster, louder planes, such as corporate jets.

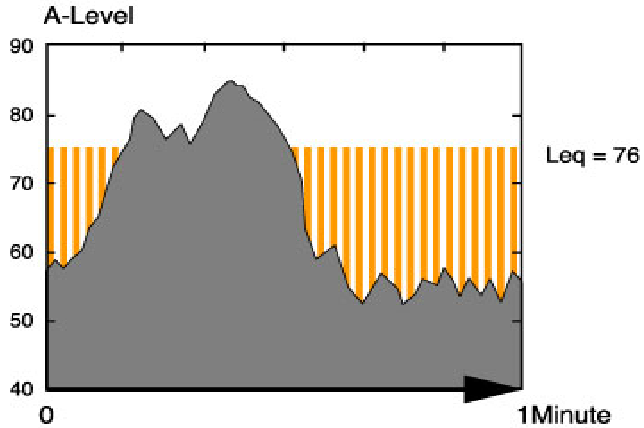
I.1.2.4 Equivalent Sound Level (L_{eq})

The L_{max} and SEL quantify the noise associated with individual events. The remaining metrics in this section describe longer-term cumulative noise exposure that can include many events.

The Equivalent Sound Level (L_{eq}) is a measure of exposure resulting from the accumulation of A-weighted sound levels over a particular period of interest (e.g., an hour, an eight-hour school day, nighttime, or a full 24-hour day). Because the length of the period can differ, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example $L_{eq(8)}$ or $L_{eq(24)}$.

L_{eq} is equivalent to the constant sound level over the period of interest that contains as much sound energy as the actual time-varying level. This is illustrated in **Figure I-5**. Both the solid and striped shaded areas have a one-minute L_{eq} value of 76 dB. It is important to recognize, however, that the two signals (the constant one and the time-varying one) would sound very different in real life. Also, be aware that the "average" sound level suggested by L_{eq} is not an arithmetic value, but a logarithmic, or "energy-averaged" sound level. Thus, loud events dominate L_{eq} measurements.

Figure I-5 Example of a One-Minute Equivalent Sound Level (L_{eq})



Source: HMMH.

In airport noise studies, L_{eq} is often presented for consecutive one-hour periods to illustrate how the exposure rises and falls throughout a 24-hour period, and how individual hours are affected by unusual activity, such as rush hour traffic or a few loud aircraft.

I.1.2.5 Time Above (TA)

TA is a metric that gives the duration, in minutes, for which aircraft-related noise exceeds a specified A--weighted sound level during a given period. The measure is referred to generally as TA. For this *2022 ESPR*, three threshold sound levels are used in the analysis: 65, 75, and 85 dBA. These times are computed using the Federal Aviation Administration's (FAA's) Aviation Environmental Design Tool (AEDT).

I.1.2.6 Time Above Night (TAN)

TAN is identical to TA, except it is computed for only the 9-hour period between 10:00 PM and 7:00 AM. The TAN is also developed using three threshold sound levels 65, 75, and 85 dBA.

I.1.2.7 Day-Night Average Sound Level (DNL)

Virtually all studies of aircraft noise rely on a slightly more complicated measure of noise exposure that describes cumulative noise exposure during an average annual day: the DNL. (EPA identified DNL as the most appropriate means of evaluating airport noise based on the following considerations:[2]

1. The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods.
2. The measure should correlate well with known effects of the noise environment and on individuals and the public.
3. The measure should be simple, practical, and accurate. In principal, it should be useful for planning as well as for enforcement or monitoring purposes.
4. The required measurement equipment, with standard characteristics, should be commercially available.
5. The measure should be closely related to existing methods currently in use.
6. The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.
7. The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods.

Most federal agencies dealing with noise have formally adopted DNL. The Federal Interagency Committee on Noise (FICON) reaffirmed the appropriateness of DNL in 1992 and DNL was reaffirmed again by the Federal Interagency Committee on Aircraft Noise (FICAN) in 2018. The FICON summary report stated; "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric."

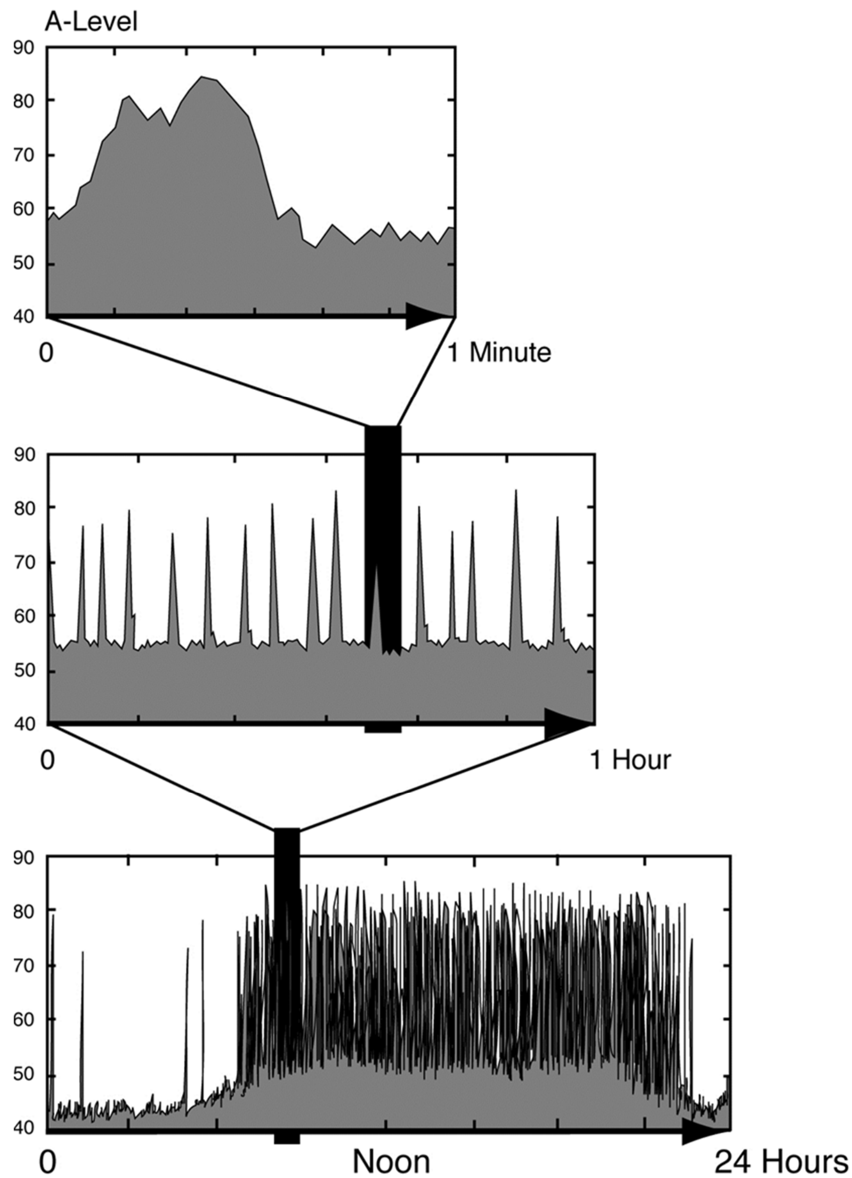
The DNL represents noise as it occurs over a 24-hour period, with one important exception: DNL treats nighttime noise differently from daytime noise. In determining DNL, it is assumed that the A-weighted levels occurring at night (defined as 10:00 PM to 7:00 AM) are 10 dB louder than they really are. This 10-dB penalty is applied to account for greater sensitivity to nighttime noise, and the fact that events at night are often perceived to be more intrusive because nighttime ambient noise is less than daytime ambient noise.

Figure I-4 illustrated the A-weighted sound level due to an aircraft fly-over as it changed with time. The top frame of **Figure I-6** repeats this figure. The shaded area reflects the noise dose that a listener receives during the one-minute period of the sample. The center frame of **Figure I-6** includes this one-minute sample within a full hour. The shaded area represents the noise during that hour with 16 noise events, each producing an SEL. Similarly, the bottom frame includes the one-hour interval within a full 24 hours. Here the shaded area represents the listener's noise dose over a complete day. Note that several overflights occur at a time when the background noise drops some 10 dB, to approximately 45 dBA.

2 Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," U. S. EPA Report No. 550/9-74-004, March 1974.

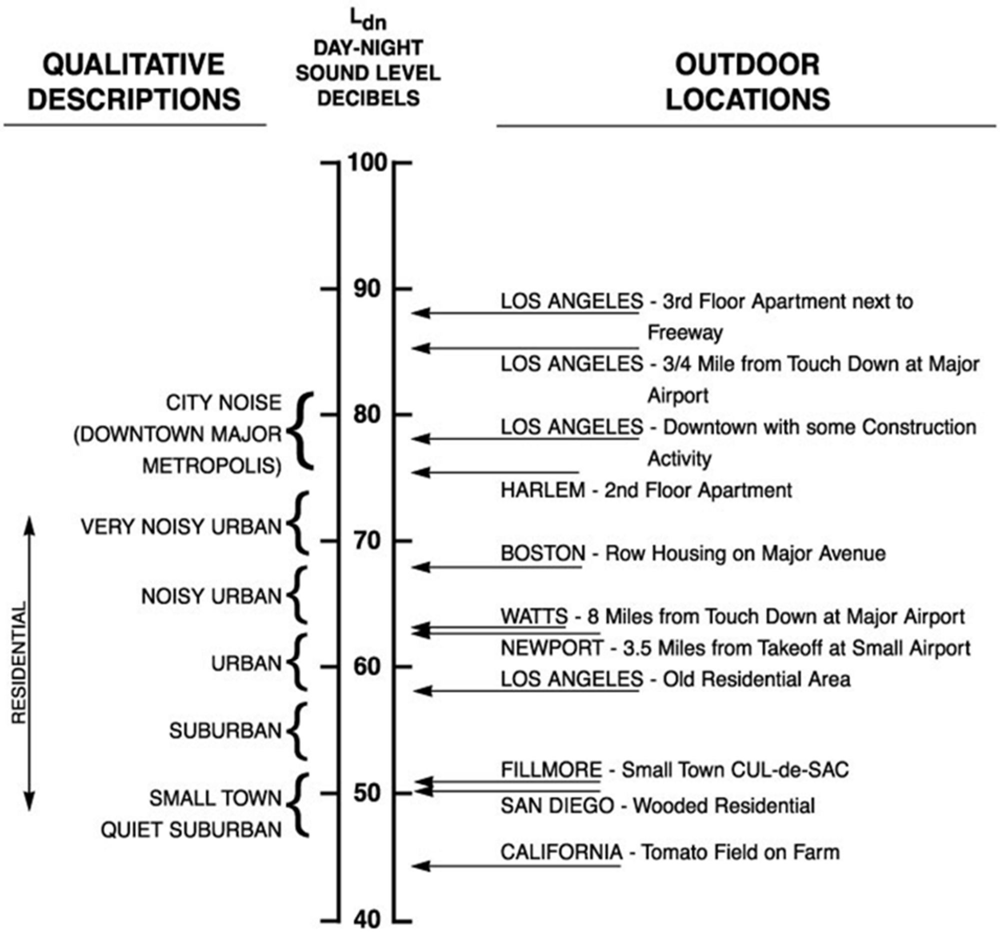
DNL can be measured or estimated. Measurements are practical only for obtaining DNL values for relatively limited numbers of points, and, in the absence of a permanently installed monitoring system, only for relatively short time periods. Most airport noise studies are based on computer-generated DNL estimates, determined by accounting for all the SELs from individual events, which comprise the total noise dose at a given location. Computed DNL values are often depicted in terms of equal-exposure noise contours (much as topographic maps have contours of equal elevation). **Figure I-7** depicts typical DNL values for a variety of noise environments.

Figure I-6 **Daily Noise Dose**



Source: HMMH.

Figure I-7 Examples of Day-Night Average Sound Levels (DNL)



Source: U.S. Environmental Protection Agency (EPA), Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974, p. 14.

In 2015, the FAA began a multi-year effort to update the scientific evidence on the relationship between aircraft noise exposure and its effects on communities around airports.[3] This was the most comprehensive study using a single noise survey ever undertaken in the United States, polling communities surrounding 20 airports nationwide.

For detailed information on the survey, please review the survey introduction and read the survey report[4]. Further information on FAA's aircraft noise research program, can also be found on a Federal Register

3 Federal Aviation Administration. Press Release – FAA To Re-Evaluate Method for Measuring Effects of Aircraft Noise. https://www.faa.gov/news/press_releases/news_story.cfm?newsId=18774

4 Federal Aviation Administration. Analysis of the Neighborhood Environmental Survey. https://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications/Airport-Safety-Detail/ArtMID/3682/ArticleID/2845/Analysis-of-NES

notice published on January 13, 2021[5]. This notice invited comments on the FAA's aircraft noise research program, including the survey, through a 90-day total period which closed on April 14, 2021. The FAA is currently reviewing the over 4,000 comments received to this docket (FAA-2021-0037-001).

The FAA will not make any determinations based on the findings of these research programs for the FAA's noise policies, including any potential revised use of the DNL noise metric, until it has carefully considered public and other stakeholder input along with any additional research needed to improve the understanding of the effects of aircraft noise exposure on communities.

The FAA Reauthorization Act of 2018 under Section 188 and 173, required FAA to complete the evaluation of alternative metrics to the DNL standard within one year. The Section 188 and 173 Report to Congress was delivered on April 14, 2020[6] and concluded that while no single noise metric can cover all situations, DNL provides the most comprehensive way to consider the range of factors influencing exposure to aircraft noise. In addition, use of supplemental metrics is both encouraged and supported to further disclose and aid in the public understanding of community noise impacts.

I.1.3 The Effects of Aircraft Noise on People

To residents around airports, aircraft noise can be an annoyance and a nuisance. It can interfere with conversation and listening to television, it can disrupt classroom activities in schools, and it can disrupt sleep. Relating these effects to specific noise metrics helps in the understanding of how and why people react to their environment.

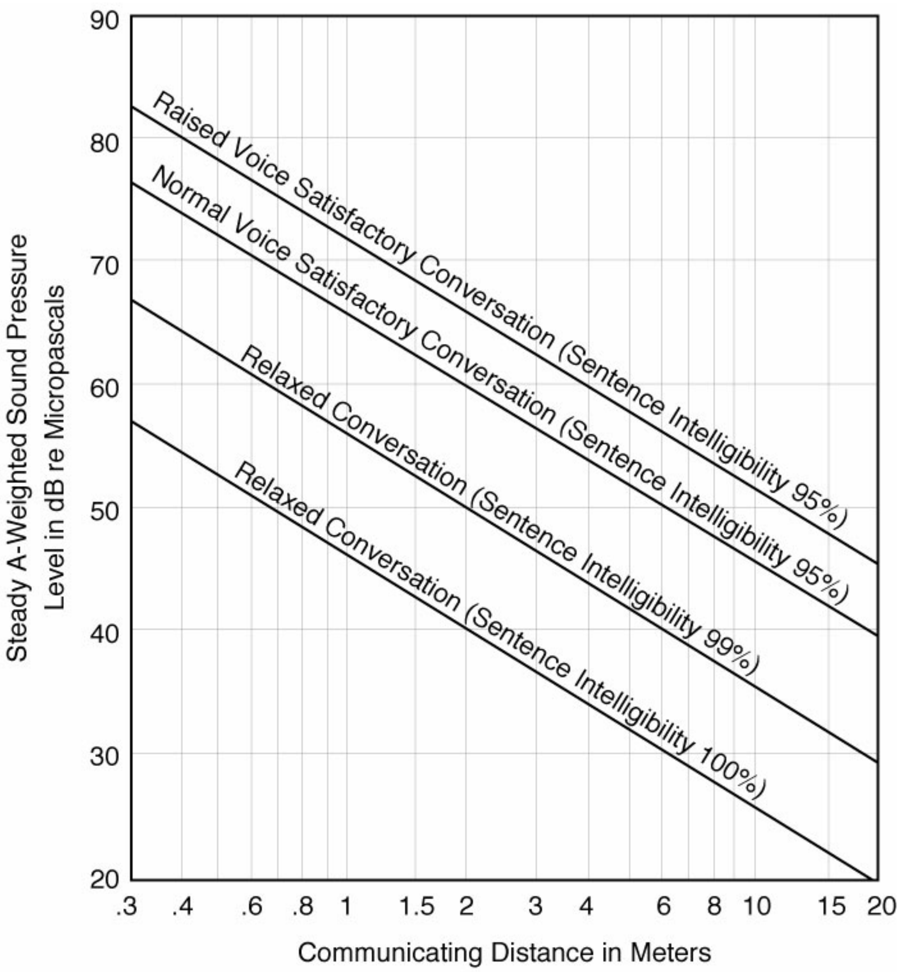
I.1.3.1 Speech Interference

A primary effect of aircraft noise is its tendency to drown out or "mask" speech, making it difficult to carry on a normal conversation. The sound level of speech decreases as the distance between a talker and listener increases. As the background sound level increases, it becomes harder to hear speech. **Figure I-8** presents typical distances between talker and listener for satisfactory outdoor conversations, in the presence of different steady A-weighted background noise levels for raised, normal, and relaxed voice effort. As the background level increases, the talker must raise their voice, or the individuals must get closer together to continue talking.

5 Federal Aviation Administration. Overview of FAA Aircraft Noise Policy and Research Efforts: Request for Input on Research Activities to Inform Aircraft Noise Policy. https://www.federalregister.gov/documents/2021/01/13/2021-00564/overview-of-faa-aircraft-noise-policy-and-research-efforts-request-for-input-on-research-activities

6 Federal Aviation Administration. Report to Congress on an evaluation of alternative noise metrics. https://www.faa.gov/about/plans_reports/congress/media/Day-Night_Average_Sound_Levels_COMPLETED_report_w_letters.pdf

Figure I-8 Outdoor Speech Intelligibility



Source: U.S. Environmental Protection Agency (EPA), Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974, p. D-5.

As indicated in the figure, "satisfactory conversation" does not always require hearing every word; 95 percent intelligibility is acceptable for many conversations. Listeners can infer a few unheard words when they occur in a familiar context. However, in relaxed conversation, we have higher expectations of hearing speech and generally require closer to 100 percent intelligibility. Any combination of talker-listener distances and background noise that falls below the bottom line in **Figure I-8** (thus assuring 100 percent intelligibility) represents an ideal environment for outdoor speech communication and is considered necessary for acceptable indoor conversation as well.

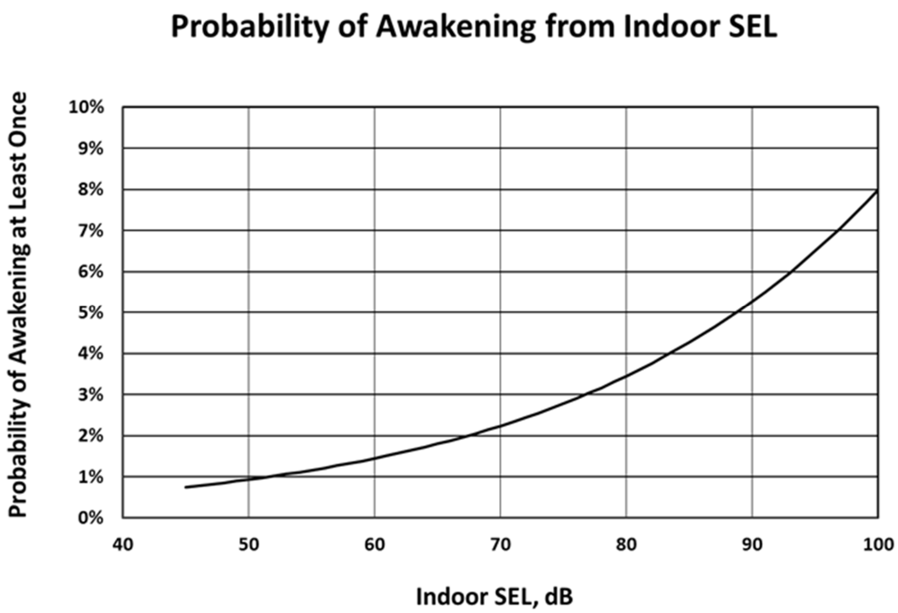
One implication of the relationships in **Figure I-8** is that for typical communication at distances of 3 or 4 feet (1 to 1.5 meters), acceptable outdoor conversations can be carried on in a normal voice as long as the background noise outdoors is less than about 65 dBA. If the noise exceeds this level, as might occur when an aircraft passes overhead, intelligibility would be lost unless vocal effort were increased, or communication distance were decreased.

Indoors, typical distances, voice levels, and intelligibility expectations generally require a background level less than 45 dBA. With windows partly open, housing generally provides about 12 dBA of interior-to-exterior noise level reduction. Thus, if the outdoor sound level is 60 dBA or less, there is a reasonable chance that the resulting indoor sound level will afford acceptable conversation inside. With windows closed, 24 dB of attenuation is typical.

I.1.3.2 Sleep Interference

Research on sleep disruption from noise has led to widely varying observations. In part, this is because (1) sleep can be disturbed without awakening, (2) the deeper the sleep the more noise it takes to cause arousal, and (3) the tendency to awaken increases with age, and other factors. **Figure I-9** shows one such relationship from recent research conducted in the U.S. – the probability that a group of people will be awakened at least once when exposed to a given indoor SEL.

Figure I-9 Probability of Awakening at Least Once from Indoor Noise Event



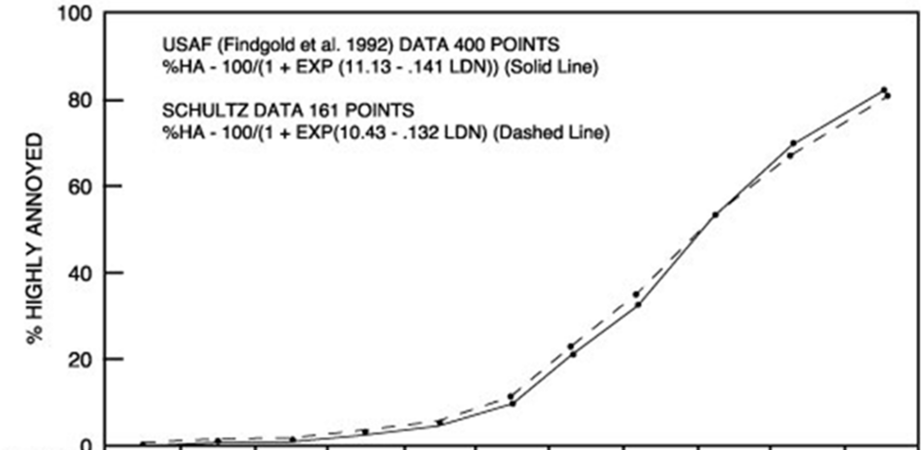
Source: American National Standards Institute (ANSI) S12.9-2008/Part 6, Quantities and Procedures for Description and Measurement of Environmental Sound — Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes; Equation 1.

For example, an indoor SEL of 80 dB results in approximately 3.5 percent of the exposed population being awakened. If windows are open in the bedroom on a warm evening and a house provides a typical outside-to-inside noise level reduction of around 15 dB, which suggests it takes an SEL of about 95 dB outdoors to awaken 3.5 percent of the population. The American National Standards Institute (ANSI) has extended this concept further and developed a standard (ANSI S12.9-2008/Part 6) for computing the percentage of the population that is likely to be awakened by multiple noise events occurring throughout the night. The FICAN subsequently endorsed the standard as the best available means of estimating behavioral awakenings from aircraft noise.

I.1.3.3 Community Annoyance

Social survey data make it clear that individual reactions to noise vary widely for a given noise level. Nevertheless, as a group, people's aggregate response is predictable and relates well to measures of cumulative noise exposure such as DNL. **Figure I-10** shows a widely recognized relationship between environmental noise and annoyance. Based on data from 18 surveys conducted worldwide, the curve indicates that at levels as low as DNL 55, approximately 5.0 percent of the people will still be highly annoyed, with the percentage increasing more rapidly as exposure increases above DNL 65 dB.

Figure I-10 Percentage of People Highly Annoyed

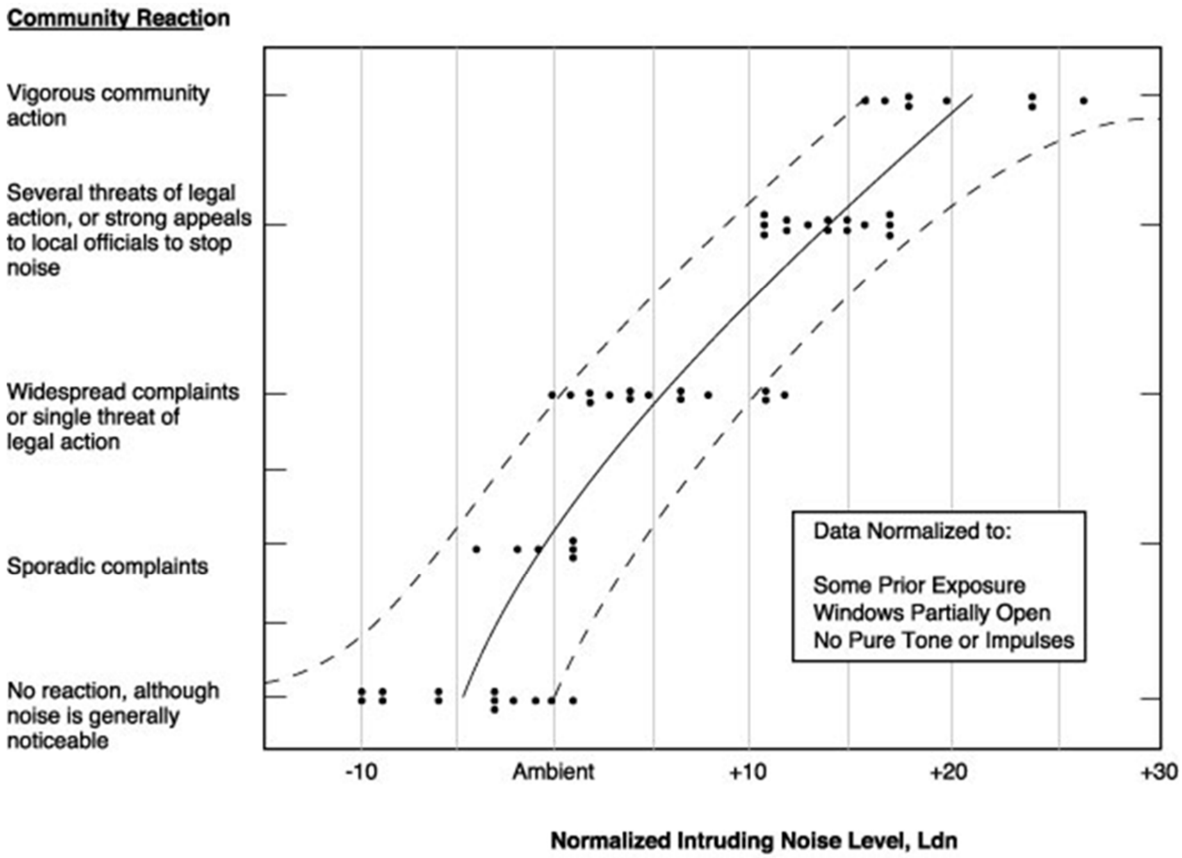


Day - Night Average Sound Level in dB		40	45	50	55	60	65	70	75	80	85	100
Calculated %HA Points	USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Source: Federal Interagency Committee on Aviation Noise (FICAN). "Federal Agency Review of Selected Airport Noise Analysis Issues." August 1992. (From data provided by USAF Armstrong Laboratory). pp. 3-6.

Separate work by the U.S. EPA has shown that overall community reaction to a noise environment can also be related to DNL. This relationship is shown in **Figure I-11**. Levels have been normalized to the same set of exposure conditions to permit valid comparisons between ambient noise environments. Data summarized in **Figure I-11** suggest that little reaction would be expected for intrusive noise levels five decibels below the ambient, while widespread complaints can be expected as intruding noise exceeds background levels by about 5 dB. Vigorous action is likely when the background is exceeded by 20 dB.

Figure I-11 Community Reaction as a Function of Outdoor DNL

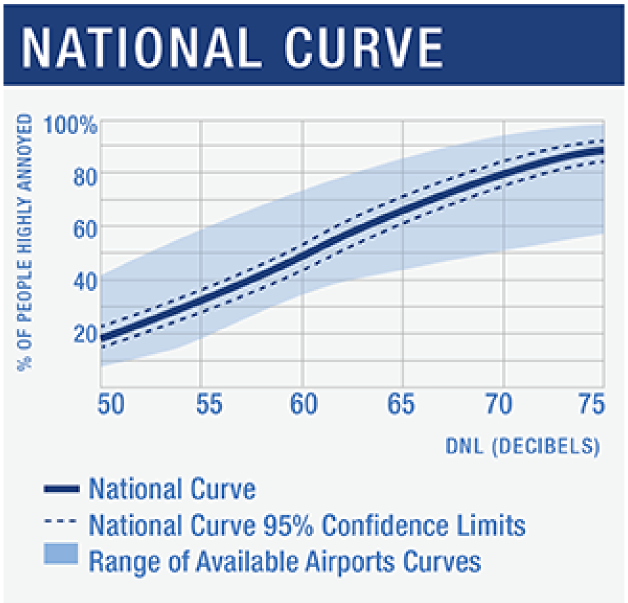


Source: Wyle Laboratories, "Community Noise," prepared for the U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., December 1971, pg. 63.
Note: DNL - Day-Night Average Sound Level.

While the Schultz Curve remains the accepted standard for describing transportation noise exposure-annoyance relationships, its original supporting scientific evidence and social survey data were based on information that was available in the 1970s. The last in-depth review and revalidation of the Schultz Curve was conducted in 1992. More recent analyses have shown that aviation noise results in higher annoyance than other modes of transportation. Recent international social surveys have also generally shown higher annoyance than the Schultz Curve. These analyses and survey data indicate that the Schultz Curve may not reflect the current U.S. public perception of aviation noise.

To ensure that FAA's continued efforts to reduce the effects of aircraft noise exposure on communities is based upon accurate information, FAA conducted a nationwide survey to measure the relationship between aircraft noise exposure and annoyance in communities near airports. This survey captured the community response to a modern fleet of aircraft as they are being flown today and used best practices in terms of noise analysis and data collection. The responses from the survey have been used to create a new National Curve, shown in **Figure I-12**. The survey results show that there has been a substantial change in the public perception of aviation noise, relative to the Schultz Curve, which will ultimately inform future FAA noise initiatives. Compared with the existing Schultz Curve, the new National Curve shows a substantial increase in the percentage of people who are highly annoyed by aircraft noise over the entire range of aircraft noise levels considered, including at lower noise levels.

Figure I-12 National Curve: Percent Highly Annoyed as a Function of DNL



I.1.4 Regulatory Framework

I.1.4.1 Federal Aviation Regulation (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, FAA's FAR Part 36[7] 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 categories are:

- Stage 1 aircraft are the oldest and usually have the loudest operations, having preceded the existence of any noise emission regulation. Rare examples include old, restored civil or military aircraft. There are no Stage 1 aircraft operating at Logan Airport.
- Stage 2 aircraft are less old and less noisy than Stage 1; they were the first aircraft types required to meet a noise limit. A subsequent regulation, FAR Part 91 (described below), prohibits the operation of a Stage 2 aircraft in the continental U.S. unless its takeoff weight is 75,000 pounds or less. The FAA

7 14 CFR Part 36, "Noise Standards: Aircraft Type and Air Worthiness Certification."

Reauthorization bill of 2012 also mandated the phase out of Stage 2 aircraft with a takeoff weight less than 75,000 pounds by the end of 2015. Thus, there are no longer any Stage 2 aircraft operating at Logan Airport.

- Stage 3 aircraft were certified for service before 2006 and have relatively quiet jets, although some are Stage 2 aircraft that have been re-engined, or have been fitted with hushkits, enabling them to meet Stage 3 noise limits.
- Stage 4 aircraft are required to operate with a cumulative noise level at least 10 dB quieter than Stage 3 aircraft at three prescribed measurement points. Jet aircraft certificated after January 1, 2006 must meet the Stage 4 limits. Although not required, the majority of aircraft in the 2022 Logan Airport fleets would also meet the Stage 4 noise limits if they were recertificated.
- Stage 5 aircraft are the newest and quietest aircraft. All aircraft certificated after January 1, 2018 must meet Stage 5 limits, which are a cumulative 7 dB below Stage 4 and 17 dB below Stage 3 aircraft. The Boeing 787, 747-8, and Airbus A350 and A380 are examples of aircraft that meet the new limits. About 29 percent of aircraft in the 2022 Logan Airport fleets would meet Stage 5 noise limits.

I.1.4.2 Logan Airport Noise Abatement Rules and Regulations

For decades, Massport's primary mechanism for reducing noise impacts from Logan Airport's operations was the Noise Rules.[8] 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 cumulative noise index [CNI]) to a maximum of 156.5 Effective Perceived Noise Decibels (EPNdB)
- Maximizing use of Stage 3 aircraft
- Restricting nighttime operations by Stage 2 aircraft
- Placing limitations on times and locations of engine run-ups and use of auxiliary power units (APU)
- Restricting use of certain runways by noisier aircraft and time of day

These restrictions and limitations are subject to FAA implementation and safe operation of the Airport and airspace. While the specific language applying to Stage 2 and Stage 3 aircraft is no longer applicable, due to aircraft fleet modernizations, CNI continues to be calculated and monitored annually.

8 The Logan International Airport Noise Abatement Rules and Regulations, effective July 1, 1986, are codified at 740 Code of Massachusetts Regulations (CMR) 24.01 et seq (also known as the Noise Rules).

I.1.4.3 FAR Part 150

First implemented in February 1981, FAR Part 150[9] 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 these and additional measures at Logan Airport, Massport has not filed an official Part 150 noise compatibility study with 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.

In 2021, Massport submitted a 2020 Noise Exposure Map prepared in accordance with Part 150 to FAA in order to update the Residential Sound Insulation Program. The Noise Exposure Map was accepted by the FAA in December 2021 and Massport was subsequently able to re-start the sound insulation program When the 2021 annual noise analysis was complete, Massport submitted a 2021 Noise Exposure Map to FAA in December, 2022; that contour set was accepted on April 11, 2023, and is being used in the next phase of the program.

I.1.4.4 FAR Parts 91 and 161

The Airport Noise and Capacity Act of 1990 (ANCA)[10] 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
- Establish a program for FAA review and approval of any restriction that limits operations of Stage 3 aircraft, including public notice requirements

9 14 CFR Part 150, "Airport Noise Compatibility Planning."

10 Pub. L. No. 101-508, 104 Stat. 1388, as recodified at 49 United States Code 47521- 47533.

FAA addressed these requirements through amendment of an existing federal regulation, "Part 91,"[11] and establishment of a new regulation, "Part 161."[12] ANCA effectively ended Massport's pursuit of any additional operational restrictions outside of this program.

I.1.4.5 Amendment to Part 91

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, described above.

In 1976, FAA ordered a phase out of all Stage 1 aircraft with a maximum gross takeoff weight (MGTOW) over 75,000 pounds, to be completed on January 1, 1985. After that date, Stage 1 civil aircraft over 75,000 pounds MGTOW were banned from operating in the U.S. (with limited exemptions related to commercial service at "small communities," which has since expired in 1988). ANCA required a similar phase out of Stage 2 aircraft over 75,000 pounds by December 31, 1999. The 75,000-pound weight limit exempted most "business" (or "corporate") jets and a very small number of the very smallest "air carrier" type jets until December 31, 2015, when a full ban took effect.[13] Aircraft operators responded to the Stage 1 and 2 phase-outs by retiring their non-compliant aircraft or modifying some of their aircraft to meet the more stringent standards. The modifications undertaken include installation of quieter engines, noise-reducing physical modifications to the airframe and/or existing engines, and limitation of operating weights and procedures to meet the applicable Part 36 limits. Some former Stage 2 aircraft that were "recertificated" as Stage 3 with these modifications may still operate at Logan Airport, but only on an occasional basis as general aviation aircraft. Aircraft with these modifications are no longer operating as part of the commercial fleet at Logan Airport.

From 2006 to 2017, as airlines added new aircraft, Stage 4 aircraft were added to their fleets. The Stage 4 noise standard applies to any new jet aircraft type designs over 12,500 pounds requiring FAA approval after January 1, 2006. The International Civil Aviation Organization (ICAO) has also adopted the same regulation for international operators, but neither FAA nor ICAO have indicated there will be restrictions on the remaining recertificated Stage 3 aircraft from carrier fleets.

ICAO and FAA adopted a higher standard of noise classification called Stage 5 (Chapter 14 for ICAO) which was effective for new aircraft type certification after December 31, 2017 and December 31, 2020, depending on the weight of the aircraft.[14] Many aircraft currently operating at Logan Airport meet Stage 5 noise standards.

11 14 CFR Part 91, "General Operating and Flight Rules."

12 14 CFR Part 161, "Notice and Approval of Airport Noise and Access Restrictions."

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

14 The Final Rule was published on October 4, 2017.

I.1.4.6 Part 161

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

Part 161 and ANCA define more demanding requirements and explicit guidance for Stage 3 restrictions. To implement a Stage 3 restriction, formal FAA approval is required. FAA's role for Stage 2 restrictions is limited to commenting on compliance with Part 161 notice and analysis procedural requirements. Part 161 provides guidance regarding appropriate information to provide in support of these findings. While Part 161 does not require this information for a Stage 2 restriction, Part 161 states that it would be "useful." Moreover, 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 reasonable terms and without unjust discrimination to all types, kinds, and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the Airport."[15]

Although several (on the order of a dozen) airports have embarked on efforts to adopt both Stage 2 and 3 restrictions in the past two decades, FAA has found that only one, Naples Municipal Airport, a general aviation (GA) airport in Naples, Florida, has fully complied with Part 161 analysis, notice, and documentation requirements for a ban on Stage 2 jet operations. FAA found the airport was in violation of prior to FAA grant assurances. The airport operator successfully sued 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 regarding Stage 2 operations or to restrict Stage 3 operations in any way would almost certainly trigger Part 161 notice, analysis, and approval processes for Stage 3 restrictions. In 2006, Massport requested an opinion from FAA regarding the pursuit of a Part 161 waiver or exemption to allow Massport to implement a

15 FAA Order 5190.6(b), "Airport Compliance Manual" Chapter 13, Section 14, paragraph (a). To be approved, restrictions must meet the following six statutory criteria: 1) The proposed restriction is reasonable, nonarbitrary, and nondiscriminatory. 2) The proposed restriction does not create an undue burden on interstate or foreign commerce. 3) The proposed restriction maintains safe and efficient use of the navigable airspace. 4) The proposed restriction does not conflict with any existing federal statute or regulation. 5) The applicant has provided adequate opportunity for public comment on the proposed restriction. 6) The proposed restriction does not create an undue burden on the national aviation system.

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* in the *2005 ESPR*.

I.2 Logan Airport Noise Modeling

To relate portions of the foregoing discussion to the specific noise environment around Logan Airport for this *2022 ESPR*, Massport has developed DNL noise contours, TA noise metrics, and population counts for 2022 using the latest version of the FAA's AEDT, version 3e, and a proprietary AEDT pre-processor. The pre-processor software takes radar data from individual flights occurring throughout the year, and structures it into a form usable as input to the AEDT. The AEDT serves as the computational "engine" for calculating noise. Prior to 2016, Massport used the FAA's Integrated Noise Model (INM) with a pre-processor called RealContours™ which operated in a similar manner.

Standard AEDT input methodology involves development of operational inputs and calculation of the DNL for a prototypical average annual day.[16] This approach requires manually collecting, refining, and entering the enormous amount of data averaged over a full year of activity at an airport. Typically, the model inputs may include an aircraft fleet mix with several dozen representative aircraft types, on the order of 100 to 300 representative flight tracks (common for a facility the size of Logan Airport), and runway use and flight track use percentages for three or four categories of aircraft types with similar performance characteristics. This normal approach to noise modeling 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.

Instead of relying on consolidated data summaries, Massport takes maximum possible advantage of both AEDT's capabilities and the investment that Massport has made in its Noise and Operations Management System (NOMS). The AEDT pre-processor improves the precision of modeling by utilizing operations monitoring results in these key areas:

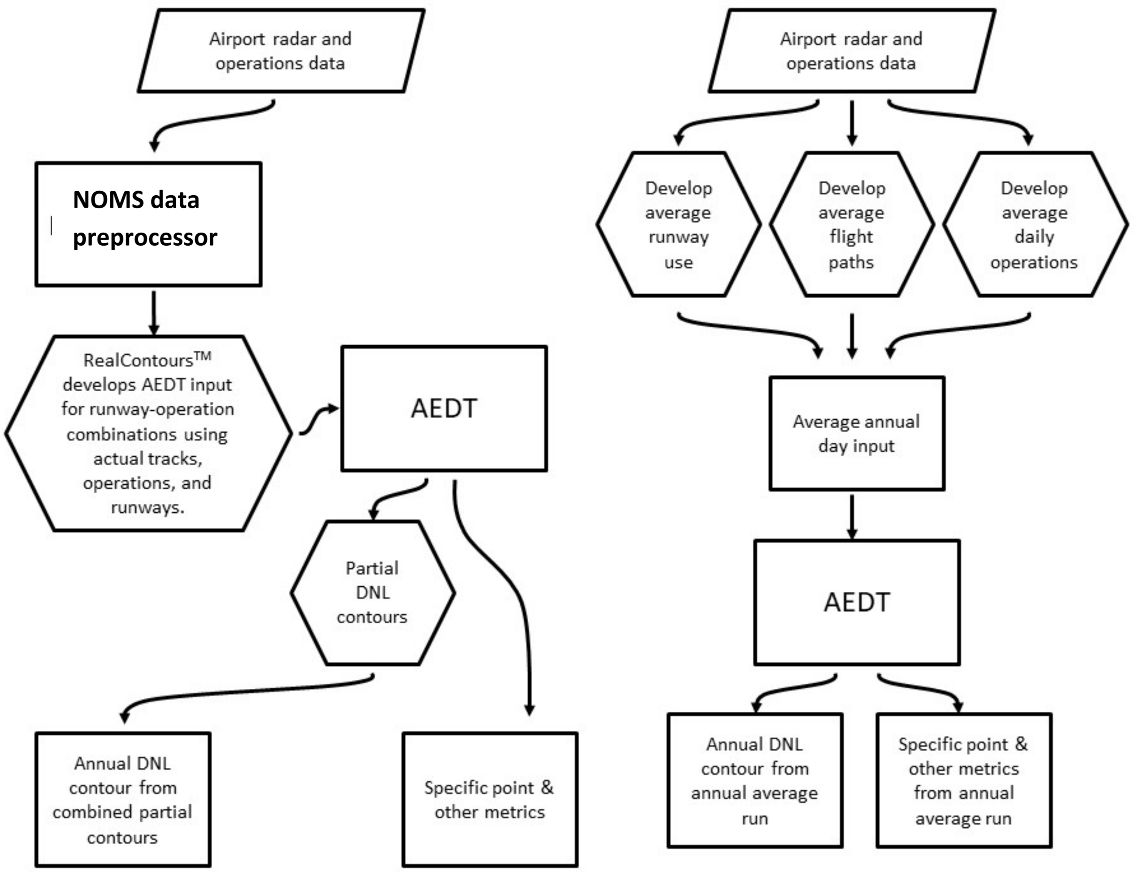
- Directly converts the flight track for every identified aircraft operation to an AEDT track, rather than assigning multiple operations to a limited number of prototypical tracks
- Models each operation on the specific runway that it actually used, rather than applying a generalized distribution to broad ranges of aircraft types
- Models each operation in the time period that it occurred, which realistically represent delays that occur during the year, rather than relying on scheduled flight times

16 Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA, October 27, 2017, Section 3.2, p. 13

- 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, based on the published compositions of the fleets of the specific airlines operating at Logan Airport

Figure I-13 provides a schematic representation of Massport's annual noise modeling process compared to the standard AEDT process. The flow chart on the left depicts data from the NOMS system being used as noise model inputs, while the flow chart on the right illustrates the development of a simplified average annual day that would be otherwise necessary.

Figure I-13 Schematic Noise Modeling Process (using NOMS data pre-processor vs. standard AEDT use)



Source: Federal Aviation Administration (FAA), HMMH.

I.2.1 AEDT Noise Analysis

Logan Airport presents a set of unique challenges to modeling software, and over the course of many years, Massport addressed these challenges by developing a series of adjustments and customizations to better represent the operations, conditions, and terrain that affect noise at Logan Airport. The following adjustments were historically incorporated into INM analyses:

- ***Custom profiles***. The analysis has developed custom climbing and descent profiles based on radar altitude data, rather than using default profiles built into INM. This results in more accurate aircraft thrust calculations, which in turn affects an aircraft's noise emissions.
- ***Daily weather data***. Noise calculations have used average weather conditions for each day to determine aircraft performance and sound propagation.
- ***Hill effect adjustment***. Due to discrepancies between noise monitor data and INM calculations in the Orient Heights area close to the Airport, adjustments have been included to improve the accuracy of calculations in areas with direct line-of-sight exposure to the airfield.
- ***Over-water adjustment***. The INM calculations assume that noise is absorbed as it propagates over ground. However, Logan Airport is mostly surrounded by water, which reflects rather than absorbs the sound. This results in higher noise levels in areas near the Airport. An adjustment has been used that allows the INM to assume higher aircraft noise emissions when they are close to the ground.

In 2015, FAA released its next-generation environmental analysis software, the AEDT version 2B.[17] AEDT incorporates the computational engines of the legacy tools INM and the Emissions and Dispersion Modeling System (EDMS) and provides a unified database back end and graphical user interface. With a common set of aircraft and airport data that are updated regularly, AEDT ensures that noise and emissions analyses can be performed with up-to-date information.

Massport first explored the use of AEDT for the *2015 EDR* and adopted AEDT as its ongoing noise model beginning with the *2016 EDR*. In transitioning from INM to AEDT, Massport has investigated how to implement the historical adjustments in the new software. While the Massachusetts state EDR/Environmental Status and Planning Report (ESPR) process does not require FAA approval, Massport wishes to perform analysis to FAA standards. Massport has held numerous meetings with FAA since the release of AEDT to get approval for adjustments to AEDT. The following is a summary of the proposed measures to address the adjustments previously implemented in INM, and FAA's response.

- ***Altitude control codes***. This feature of AEDT performs a similar function to the custom profiles used previously, using altitude data to more accurately calculate aircraft thrust levels. Since this is a capability built into AEDT, **FAA approval is implicit** and was not requested.
- ***Aircraft weight adjustment***. It has been determined that some aircraft takeoff weights, based on Department of Transportation T-100 data, do not always match the weight assumptions (stage length) made by AEDT. Consequently, an adjustment was developed to more accurately represent takeoff

17 AEDT 2A was released in 2013 and replaced the NIRS model for airspace analysis. AEDT 2B replaces, AEDT 2A, INM and EDMS.

weight, and therefore aircraft thrust during takeoff. **FAA concurs with this approach but required that the analysis evaluate all aircraft departures.** The weight analysis resulted in some aircraft increasing stage length and some aircraft decreasing in stage length. This resulted in essentially no modification to the noise contours; therefore, Massport decided to no longer include this adjustment in the modeling process.

- ***Annual weather***. AEDT by default used 10-year average weather for the Airport. Massport has proposed using an annual average for the year under study to better capture year-to-year variations in weather.[18] **FAA concurs with this approach**. AEDT 3 allows for the use of annual average weather in the model so this approach no longer needs FAA approval.
- ***Hill effects***. Massport has proposed including the adjustments previously used in INM. **FAA does not concur with this approach**. There are ongoing research studies to develop modifications to the AEDT model and FAA recommends waiting until those methods are available.
- ***Over water adjustment***. Massport explored other options including the existing INM adjustment method. Massport proposed including the adjustments previously used in INM. **FAA does not concur with this approach**. There are ongoing research studies to develop modifications to the AEDT model and FAA recommends waiting until those methods are available.

Massport will continue to work with FAA to address these issues and to incorporate enhancements to AEDT as they become available. In March 2017, the Airport Cooperative Research Program (ACRP) published an FAA-sponsored study entitled "Improving AEDT Noise Modeling of Ground Surfaces." The study recommends a methodology and provides guidance for implementation in AEDT, however at the time of this study, FAA has not recommended the method for use with AEDT or incorporated the ACRP study information into the AEDT.

In March 2018, ACRP published "Enhanced AEDT Modeling of Aircraft Arrival and Departure Profiles Volume 1: Guidance."[19] It highlights new data with alternate default profiles for specific aircraft and new methodology available to model users to customize flight profiles in greater detail than was previously available. The study recommends a methodology and provides guidance for implementation in AEDT. Modified profiles have been added to the AEDT database, however, these profiles are not standard data and Massport would have to demonstrate the need to use the profiles and seek approval for each study.

At this time, FAA has concurred with adjustments for annual average weather and the adjustment of aircraft stage length (both adjustments are no longer used), but disapproved adjustments for over-water effects and elevated terrain line-of-sight exposure. Massport has performed the AEDT analyses for 2022 using only FAA standard methods.

18 Daily weather is currently not an option in AEDT modeling inputs, however Massport will continue to request that FAA allow for such an option.

19 Airport Cooperative Research Program Web-Only Document 36: Enhanced AEDT Modeling of Aircraft Arrival and Departure Profiles, Volume 1: Guidance. http://www.trb.org/Main/Blurbs/178074.aspx.

FAA guidance states that an airport noise modeling project should use the most current model version available at the time the project begins. FAA's AEDT version 2c Service Pack 2 (AEDT 2c SP2) was released for general use on March 13, 2017; it was the version used to generate the 2016 DNL contours and accompanying noise analyses. AEDT version 2d was released on September 27, 2017. Massport used AEDT 2d for the 2017 DNL calculations. AEDT version 3b was released on September 24, 2019, followed by AEDT version 3c (originally released on March 6, 2020, and re-released with corrections on June 19, 2020). Massport used the re-released AEDT version 3c for the 2018 and 2019 analyses. AEDT version 3d was released on March 29, 2021. Massport used AEDT version 3d for the 2020 and 2021 analyses. Version 3e was released on May 9, 2022 and was used for the 2022 noise modeling contained in this ESPR.

As with the previous upgrade from version 3c to 3d, the most significant changes in the model from AEDT 3d to AEDT 3e are improvements to emissions and dispersion modeling. The differences between AEDT 3d and AEDT 3e with regard to noise calculations are minimal. Two new aircraft types, the 747400RN and 7879, were added to the AEDT version 3e database; both are specific engine adjustments to the Boeing 747-400 and the 787-9 respectively. The BD-700-1A11 aircraft which was already in the AEDT database received nose/performance updates.. The following sections of this appendix provide several tables describing the AEDT input data for 2022. Where possible, the data for 2019 are included for comparison.

I.2.2 2022 Radar Data

Logan Airport's radar data are the basis for Massport's annual noise calculations. The Passive Surveillance Radar System (PASSUR) radar dataset was used for the *2004 ESPR* through the *2008 EDR*. For the *2009 EDR* through the *2014 EDR*, Massport used the radar data from its Harris NOMS system. These radar data were obtained from a multilateration system of eight sensors deployed around the Airport. The positioning data from these sensors were correlated to provide better, more accurate coverage of aircraft (in areas where the traditional FAA radar has limitations) and provide a more complete set of points to define each track. Traditional radar provides points every four to five seconds where the multilateration system provides data every second.

In 2015, the Massport system switched to FAA's NextGen data feed, which integrates the Automatic Dependent Surveillance Broadcast (ADS-B) feed with multiple redundant real-time FAA surveillance sources into a single fused data feed. The NextGen data is a "multisensory-based" subscription data source that aggregates all available surveillance sources, including:

- FAA En Route Radars;
- FAA Terminal Radars;
- FAA Airport Surface Detection Equipment X Band (ASDE-X) Systems;
- FAA Aircraft Situational Display to Industry (ASDI) Oceanic and Canadian Tracks only; and
- Harris ADS-B Data Feed.

Logan Airport is supported by an FAA ASDE-X system which provides highly accurate one-second data points for aircraft situational awareness on the Airport and within at least 5 miles of the Airport. These data are fused with the other sources and provided to the Massport NOMS system in a geo-referenced data format. The geo-referenced radar data are imported into the AEDT model, which is built on a geo-referenced platform to retain accuracy of the data for modeling.

For 2022, a total of 376,575 flight records from the NOMS contained suitable data for modeling, which is over 99.9 percent of the recorded flight records. These operations were scaled slightly by category and airline to match the 378,613 annual flights in Massport records.

I.2.3 Fleet Mix

Table I-1 (2022), **Table I-2** (2021), and **Table I-3** (2019 for comparison) provide the scaled annual operations, listed by Aircraft Noise and Performance (ANP) aircraft type. Each ANP type listed in **Table I-1** and **Table I-2** is also mapped to a Runway use group based on its weight and performance characteristics described in the Runway Use section below.

Regional jets (RJ) are defined as those aircraft with 90 or fewer seats, consistent with the categorization in Chapter 3, *Activity Levels and Forecasting*.[20] For years prior to 2010, the RJs in this report 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, while the traditional air carrier jet has over 100 seats. As newer aircraft types have become available, the smaller 35- to 50-seat types have been replaced by 70- to 99-seat types, with the types having 90 or more seats flying many of the traditional air carrier routes. The majority of the newer types fall into two categories: the 70- to 75-seat category, which remain categorized as RJs, and the 91- to 99-seat category, which are categorized as air carrier jets. The Embraer 190 falls into this second category and is now classified in the Light Jet B group.

20 U.S. 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 RJ air carrier service to be aircraft with a maximum of 75 seats. Therefore, this report categorizes aircraft with 70-75 seats and below as RJ and aircraft with 90 seats and higher aircraft as air carrier (Note: there are no types with 75 to 90 seats).

Table I-1 2022 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
Commercial Jet Operations						
747400	Heavy Jet A	205	0	203	2	410
7478	Heavy Jet A	5	1	6	0	12
A340-211	Heavy Jet A	167	0	96	71	334
A340-642	Heavy Jet A	254	2	238	18	512
A380-841	Heavy Jet A	172	0	171	1	344
A380-861	Heavy Jet A	2	0	1	1	4
767300	Heavy Jet B	178	36	6	208	429
7673ER	Heavy Jet B	3,307	984	2,290	2,000	8,581
767400	Heavy Jet B	264	3	193	74	534
767CF6	Heavy Jet B	28	11	8	31	78
767JT9	Heavy Jet B	24	5	2	27	58
777200	Heavy Jet B	503	31	413	121	1,069
7773ER	Heavy Jet B	701	141	377	465	1,685
7878R	Heavy Jet B	20	79	90	9	198
7879	Heavy Jet B	866	43	633	276	1,818
A300-622R	Heavy Jet B	67	253	199	121	640
A330-301	Heavy Jet B	2,345	22	1,965	402	4,734
A330-343	Heavy Jet B	1,552	137	860	830	3,379
A350-941	Heavy Jet B	736	28	383	380	1,527
DC1030	Heavy Jet B	1	0	0	1	2
MD11GE	Heavy Jet B	61	4	36	29	130
MD11PW	Heavy Jet B	41	0	18	23	82
717200	Light Jet A	4	2	5	1	12
737400	Light Jet B	23	6	17	12	58
737700	Light Jet B	12,059	2,938	13,379	1,618	29,994
737800	Light Jet B	11,678	5,210	14,585	2,303	33,775
7378MAX	Light Jet B	3,581	1,493	4,205	869	10,148
757300	Light Jet B	54	5	54	5	118
757PW	Light Jet B	1,902	987	2,643	246	5,778
757RR	Light Jet B	460	56	499	17	1,032

Table I-1 2022 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
A319-131	Light Jet B	6,905	918	7,304	519	15,647
A320-211	Light Jet B	1,349	35	1,285	99	2,769
A320-232	Light Jet B	8,591	2,503	9,699	1,395	22,187
A320-271N	Light Jet B	1,004	431	1,137	298	2,870
A321-232	Light Jet B	23,065	7,690	26,386	4,368	61,509
EMB190	Light Jet B	17,871	2,056	17,824	2,103	39,854
BD-700-1A10	RJ	0	0	0	0	1
CL600	RJ	13	2	13	1	29
Commercial Jet Operations						
CL601	RJ	1	0	1	0	3
CNA750	RJ	1	0	0	0	2
CRJ9-ER	RJ	2,129	183	2,071	241	4,625
CRJ9-LR	RJ	158	3	160	1	323
EMB145	RJ	1	1	1	1	4
EMB14L	RJ	1,446	31	1,367	110	2,955
EMB170	RJ	1,100	126	1,128	99	2,453
EMB175	RJ	23,199	2,056	23,362	1,892	50,508
G650ER	RJ	1	0	1	0	3
GIV	RJ	11	2	11	2	26
GV	RJ	4	0	4	1	9
Commercial Jets Subtotal		128,111	28,514	135,332	21,293	313,250
Commercial Non-Jet Operations						
BEC58P	Non-jet	14,578	48	14,620	7	29,253
CNA208	Non-jet	859	6	858	7	1,729
DHC830	Non-jet	1	13	14	0	27
SF340	Non-jet	1,852	72	1,913	11	3,848
Commercial Non-Jet Operations Subtotal		17,290	139	17,403	25	34,857
Commercial Aircraft Total		145,401	28,653	152,736	21,318	348,107
General Aviation Operations						
A340-211	Heavy Jet A	2	0	1	1	4
A340-642	Heavy Jet A	1	0	1	0	2

Table I-1 2022 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
777300	Heavy Jet B	2	1	2	1	6
7878R	Heavy Jet B	2	0	2	0	4
A330-343	Heavy Jet B	1	0	1	0	2
737700	Light Jet B	14	4	11	7	36
737800	Light Jet B	2	0	2	0	4
757PW	Light Jet B	1	0	1	0	2
757RR	Light Jet B	1	0	1	0	2
A319-131	Light Jet B	7	0	7	0	14
A320-211	Light Jet B	5	3	6	2	16
A320-232	Light Jet B	4	7	12	0	24
A320-271N	Light Jet B	1	0	1	0	2
A321-232	Light Jet B	29	4	22	12	67
EMB190	Light Jet B	14	0	13	1	28
BD-700-1A10	RJ	466	52	466	52	1,037
BD-700-1A11	RJ	170	16	177	9	373
CIT3	RJ	18	1	17	2	38
CL600	RJ	1,600	147	1,650	97	3,495
CL601	RJ	511	34	510	36	1,091
CNA500	RJ	5	1	4	2	12
CNA510	RJ	17	0	15	2	34
CNA525C	RJ	375	63	386	52	877
CNA55B	RJ	1,290	85	1,299	76	2,751
CNA560E	RJ	1	0	1	0	2
CNA560U	RJ	118	13	118	13	262
CNA560XL	RJ	799	52	812	38	1,702
CNA680	RJ	1,894	163	1,952	105	4,114
CNA750	RJ	972	65	971	65	2,073
CRJ9-ER	RJ	2	0	2	0	4
ECLIPSE500	RJ	67	13	67	13	161
EMB145	RJ	44	4	45	4	97
EMB175	RJ	1	0	1	0	2

Table I-1 2022 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
FAL20	RJ	5	0	3	2	10
FAL900EX	RJ	221	14	216	19	470
G650ER	RJ	296	33	301	28	659
GII	RJ	1	0	1	0	2
GIIB	RJ	1	0	1	0	2
GIV	RJ	428	51	433	46	958
GV	RJ	447	55	461	41	1,004
IA1125	RJ	76	4	70	10	161
LEAR35	RJ	883	131	897	117	2,029
MU3001	RJ	209	17	213	12	450
1900D	Non-jet	1	0	1	0	2
BEC58P	Non-jet	318	20	319	19	676
CNA172	Non-jet	10	0	10	0	20
CNA182	Non-jet	28	0	28	0	56
CNA206	Non-jet	4	0	4	0	8
CNA208	Non-jet	1,187	76	1,186	77	2,527
CNA441	Non-jet	38	5	37	6	85
COMSEP	Non-jet	220	3	217	6	446
DHC6	Non-jet	499	50	488	60	1,097
DHC830	Non-jet	2	0	2	0	4
GASEPF	Non-jet	13	1	13	1	28
GASEPV	Non-jet	173	5	177	2	357
HS748A	Non-jet	1	0	1	0	2
PA30	Non-jet	4	0	4	0	8
PA42	Non-jet	1	0	1	0	2
A109	Helo	8	0	8	0	16
B206L	Helo	22	0	22	0	44
B407	Helo	9	2	9	2	22
B427	Helo	2	0	2	0	4
B429	Helo	22	57	19	60	157
EC130	Helo	15	10	17	8	50

Table I-1 2022 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
R44	Helo	22	0	22	0	44
S76	Helo	143	10	144	9	305
SA330J	Helo	193	4	192	5	395
SA350D	Helo	23	1	25	0	50
SA355F	Helo	12	0	12	0	24
General Aviation Total		13,975	1,278	14,131	1,122	30,506
Grand Total		159,376	29,931	166,867	22,440	378,613

Source: HMMH, 2023
Notes: ANP - Aircraft Noise and Performance.

Table I-2 2021 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
Commercial Jet Operations						
747400	Heavy Jet A	2	0	2	0	4
A340-211	Heavy Jet A	101	1	99	3	204
A380-861	Heavy Jet A	1	0	1	0	2
767300	Heavy Jet B	137	35	27	145	344
7673ER	Heavy Jet B	2,097	827	1,636	1,288	5,848
767400	Heavy Jet B	34	0	5	29	68
777200	Heavy Jet B	572	128	599	101	1,400
767CF6	Heavy Jet B	79	32	11	100	223
767JT9	Heavy Jet B	6	9	9	6	30
7773ER	Heavy Jet B	256	3	29	230	518
7878R	Heavy Jet B	1,253	0	1,126	127	2,506
A300-622R	Heavy Jet B	265	358	357	266	1,247
A330-301	Heavy Jet B	770	5	674	101	1,551
A330-343	Heavy Jet B	678	175	510	343	1,705
A350-941	Heavy Jet B	528	22	184	365	1,099
DC1010	Heavy Jet B	3	1	1	3	8

Table I-2 2021 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
DC1030	Heavy Jet B	7	2	3	6	18
MD11GE	Heavy Jet B	103	9	58	54	224
MD11PW	Heavy Jet B	38	5	29	14	86
717200	Light Jet A	5	1	6	0	12
737800	Light Jet B	9,671	4,239	12,551	1,360	27,820
7378MAX	Light Jet B	1,011	494	1,362	143	3,010
737300	Light Jet B	1	0	1	0	2
737400	Light Jet B	25	7	19	13	64
737500	Light Jet B	0	1	1	0	2
737700	Light Jet B	4,116	1,635	4,917	833	11,500
757300	Light Jet B	8	2	8	2	20
757PW	Light Jet B	1,510	669	1,952	227	4,358
757RR	Light Jet B	379	66	418	27	890
A319-131	Light Jet B	4,858	1,027	5,415	470	11,770
A320-211	Light Jet B	1,802	752	2,406	148	5,108
A320-232	Light Jet B	10,494	3,039	12,377	1,155	27,065
A320-271N	Light Jet B	640	202	771	71	1,685
A321-232	Light Jet B	13,049	5,003	15,662	2,391	36,105
EMB190	Light Jet B	10,666	1,485	11,303	849	24,304
BD-700-1A10	RJ	4	0	4	0	9
CL600	RJ	13	1	14	0	28
CNA55B	RJ	1	0	1	0	2
CRJ9-ER	RJ	1,356	143	1,288	211	2,997
CRJ9-LR	RJ	729	3	719	13	1,463
EMB14L	RJ	707	14	664	57	1,441
EMB170	RJ	2,227	126	2,215	138	4,708
EMB175	RJ	12,496	1,001	12,563	934	26,994
GIV	RJ	1	0	1	0	2
Commercial Jets Subtotal		82,698	21,524	91,997	12,224	208,443
Commercial Non-Jet Operations						
BEC58P	Non-jet	15,525	28	15,536	18	31,107

Table I-2 2021 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
CNA208	Non-jet	879	9	874	14	1,777
DHC6	Non-jet	7	8	15	0	30
DHC830	Non-jet	308	9	318	0	635
Commercial Non-Jet Operations Subtotal		16,720	55	16,742	32	33,549
Commercial Aircraft Total		99,417	21,579	108,740	12,256	241,992
General Aviation Operations						
A109	Helicopter	6	0	6	0	12
B206L	Helicopter	40	0	40	0	79
B407	Helicopter	18	1	18	1	38
B429	Helicopter	10	30	8	32	79
EC130	Helicopter	30	5	31	5	72
R44	Helicopter	16	0	15	1	32
S76	Helicopter	99	8	88	19	215
SA330J	Helicopter	100	3	101	2	207
SA350D	Helicopter	55	7	55	7	123
SA355F	Helicopter	12	0	12	0	24
SA365N	Helicopter	2	0	2	0	4
74720B	Heavy Jet A	1	0	1	0	2
747400	Heavy Jet A	2	0	1	1	4
7673ER	Heavy Jet B	3	0	3	0	6
737700	Light Jet B	8	0	7	1	16
757PW	Light Jet B	1	0	0	1	2
A319-131	Light Jet B	3	0	2	1	6
EMB190	Light Jet B	0	1	1	0	2
MD81	Light Jet B	2	1	0	3	6
BD-700-1A10	RJ	305	31	298	39	673
BD-700-1A11	RJ	123	12	121	14	270
CIT3	RJ	16	0	16	0	32
CL600	RJ	1,290	113	1,334	68	2,805
CL601	RJ	362	19	360	21	763
CNA500	RJ	45	2	45	2	93

Table I-2 2021 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
CNA510	RJ	21	1	21	1	44
CNA525C	RJ	233	45	234	44	556
CNA55B	RJ	934	68	945	57	2,004
CNA560U	RJ	140	10	135	15	300
CNA560XL	RJ	630	43	640	32	1,345
CNA680	RJ	1,451	105	1,486	70	3,113
CNA750	RJ	637	67	658	46	1,408
ECLIPSE500	RJ	35	5	37	3	79
EMB145	RJ	45	4	44	5	97
FAL20	RJ	6	1	4	3	14
FAL900EX	RJ	183	14	184	12	393
G650ER	RJ	121	13	121	13	268
GIV	RJ	424	39	418	45	926
GV	RJ	261	22	252	31	566
IA1125	RJ	45	15	54	6	119
LEAR35	RJ	781	84	794	71	1,730
MU3001	RJ	229	11	226	14	481
BEC58P	Non-jet	317	23	319	21	679
CNA172	Non-jet	20	0	20	0	40
CNA182	Non-jet	24	0	24	0	48
CNA206	Non-jet	4	0	4	0	8
CNA208	Non-jet	1,047	57	1,038	66	2,207
CNA441	Non-jet	32	4	31	5	73
COMSEP	Non-jet	260	13	259	14	546
DHC6	Non-jet	461	34	460	35	989
GASEPV	Non-jet	199	3	199	3	405
PA28	Non-jet	13	2	14	1	30
PA30	Non-jet	5	0	5	0	10
General Aviation Total		11,106	915	11,189	832	24,042
Grand Total		110,523	22,494	119,929	13,088	266,034

Source: HMMH, 2022.

Notes: ANP - Aircraft Noise and Performance.BEC58P is the AEDT substitution for the Cessna 402. Some totals may not match due to rounding

Table I-3 2019 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
Commercial Jet Operations						
7478	Heavy Jet A	210	0	209	1	419
747400	Heavy Jet A	277	3	274	6	559
A340-211	Heavy Jet A	358	4	146	216	725
A340-642	Heavy Jet A	308	4	295	16	623
A380-841	Heavy Jet A	201	0	201	0	402
A380-861	Heavy Jet A	160	0	3	157	320
767300	Heavy Jet B	14	1	11	4	30
767400	Heavy Jet B	50	1	49	2	102
777200	Heavy Jet B	1,058	295	1,003	350	2,707
777300	Heavy Jet B	1	0	1	0	2
767CF6	Heavy Jet B	87	40	6	121	254
767JT9	Heavy Jet B	120	17	3	134	273
7773ER	Heavy Jet B	848	127	40	935	1,949
7878R	Heavy Jet B	1,867	42	1,396	514	3,819
A300-622R	Heavy Jet B	410	665	615	460	2,151
A330-301	Heavy Jet B	2,082	4	1,709	377	4,172
A330-343	Heavy Jet B	1,576	445	1,224	797	4,043
A350-941	Heavy Jet B	250	1	242	9	502
DC1010	Heavy Jet B	30	10	24	16	81
DC1030	Heavy Jet B	18	13	14	17	63
MD11GE	Heavy Jet B	38	6	44	1	89
MD11PW	Heavy Jet B	13	3	15	1	32
U_7673ER	Heavy Jet B	2,455	841	2,147	1,148	6,590
717200	Light Jet A	1,656	390	1,482	564	4,093
737800	Light Jet A	15,886	6,442	18,296	4,033	44,658
MD9025	Light Jet A	3	0	3	0	6
MD9028	Light Jet A	1	1	1	1	4
737300	Light Jet B	1	0	1	0	2
737400	Light Jet B	24	12	24	12	71
737700	Light Jet B	5,763	1,973	6,263	1,474	15,473
757300	Light Jet B	289	20	278	31	618

Table I-3 2019 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
737MAX8	Light Jet B	192	191	228	154	765
737N17	Light Jet B	1	0	0	1	2
757PW	Light Jet B	2,842	1,098	3,113	826	7,879
757RR	Light Jet B	1,767	598	2,128	237	4,730
A319-131	Light Jet B	6,840	1,220	6,820	1,241	16,121
A320-211	Light Jet B	3,642	1,047	4,252	437	9,380
A320-232	Light Jet B	17,864	6,681	20,414	4,131	49,090
A320-271N	Light Jet B	507	206	508	204	1,425
A321-232	Light Jet B	17,276	6,158	19,398	4,036	46,868
EMB190	Light Jet B	29,533	6,367	29,873	6,027	71,800
MD83	Light Jet B	5	0	4	1	10
CL600	RJ	783	19	745	58	1,605
CNA750	RJ	1	0	1	0	2
CRJ9-ER	RJ	5,246	560	5,159	646	11,610
CRJ9-LR	RJ	733	30	625	138	1,526
EMB145	RJ	18	0	17	1	36
EMB14L	RJ	1,655	119	1,763	11	3,549
EMB170	RJ	5,264	375	5,204	436	11,279
EMB175	RJ	8,863	1,033	8,972	924	19,792
FAL20	RJ	1	1	2	0	3
G650ER	RJ	1	0	1	0	2
GV	RJ	2	0	2	0	3
LEAR35	RJ	7	5	8	3	24
Commercial Jets Subtotal		139,096	37,071	145,257	30,910	352,334
Commercial Non-Jet Operations						
BEC58P	Non-jet	17,514	165	17,608	71	35,358
CNA208	Non-jet	1,126	12	1,118	20	2,276
DHC6	Non-jet	5	12	16	0	33
DHC830	Non-jet	3,764	152	3,727	189	7,833
GASEPV	Non-jet	2	0	2	0	4
SF340	Non-jet	208	0	208	0	416
Commercial Non-Jet Operations Subtotal		22,619	341	22,681	279	45,920

Table I-3 2019 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
Commercial Aircraft Total		161,715	37,412	167,938	31,189	398,254
General Aviation Operations						
A109	Helicopter	7	0	7	0	14
B206L	Helicopter	11	0	11	0	21
B407	Helicopter	22	2	20	4	48
B427	Helicopter	1	0	1	0	2
B429	Helicopter	8	14	11	11	43
B430	Helicopter	3	1	4	0	8
EC130	Helicopter	34	2	30	6	72
H500D	Helicopter	2	0	2	0	4
R44	Helicopter	20	1	19	2	43
S76	Helicopter	148	28	135	41	351
SA330J	Helicopter	193	24	191	26	434
SA350D	Helicopter	3	0	2	1	6
SA355F	Helicopter	31	1	32	0	64
SA365N	Helicopter	5	1	5	1	12
747400	Heavy Jet A	1	0	1	0	2
747SP	Heavy Jet A	1	0	1	0	2
A340-211	Heavy Jet A	1	0	0	1	2
A340-642	Heavy Jet A	2	0	2	0	4
777300	Heavy Jet B	2	1	3	0	6
7773ER	Heavy Jet B	0	1	0	1	2
7878R	Heavy Jet B	1	0	1	0	2
A330-301	Heavy Jet B	1	0	1	0	2
A330-343	Heavy Jet B	1	0	1	0	2
C17	Heavy Jet B	1	0	1	0	2
U_7673ER	Heavy Jet B	1	0	1	0	2
737800	Light Jet A	0	1	1	0	2
727EM1	Light Jet A	1	0	0	1	2
737400	Light Jet B	23	4	18	9	54
737700	Light Jet B	5	0	5	0	10
757PW	Light Jet B	0	1	0	1	2
757RR	Light Jet B	1	0	1	0	2

Table I-3 2019 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
A319-131	Light Jet B	4	0	3	1	8
A321-232	Light Jet B	0	1	1	0	2
EMB190	Light Jet B	1	0	1	0	2
MD81	Light Jet B	1	0	1	0	2
BD-700-1A10	RJ	325	36	319	41	720
BD-700-1A11	RJ	140	17	143	14	314
CIT3	RJ	25	0	25	0	50
CL600	RJ	1,506	139	1,535	110	3,290
CL601	RJ	278	25	279	23	604
CNA500	RJ	46	3	43	6	97
CNA510	RJ	195	9	191	13	407
CNA525C	RJ	388	60	383	65	897
CNA55B	RJ	904	79	920	63	1,966
CNA560E	RJ	2	1	3	0	6
CNA560U	RJ	679	50	687	42	1,458
CNA560XL	RJ	334	14	334	14	695
CNA680	RJ	1,104	72	1,126	51	2,353
CNA750	RJ	873	70	889	54	1,886
CRJ9-ER	RJ	0	1	1	0	2
ECLIPSE500	RJ	11	1	11	1	23
EMB145	RJ	29	3	29	3	64
FAL20	RJ	4	0	3	1	8
FAL900EX	RJ	283	21	278	26	608
G650ER	RJ	174	28	190	12	405
GIIB	RJ	6	1	7	0	14
GIV	RJ	564	77	568	73	1,282
GV	RJ	398	42	400	40	879
IA1125	RJ	180	21	185	15	401
LEAR25	RJ	1	0	1	0	2
LEAR35	RJ	837	135	861	110	1,942
MU3001	RJ	314	22	311	25	672
1900D	Non-jet	1	0	1	0	2
BEC58P	Non-jet	426	26	426	26	904

Table I-3 2019 Annual Modeled Operations

Aircraft Noise and Performance (ANP)	Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
C130	Non-jet	4	0	4	0	8
CNA172	Non-jet	24	2	26	0	52
CNA182	Non-jet	75	0	75	0	149
CNA206	Non-jet	5	0	5	0	10
CNA208	Non-jet	1,137	99	1,138	99	2,473
CNA441	Non-jet	17	3	16	4	41
COMSEP	Non-jet	317	34	335	17	703
DHC6	Non-jet	780	81	749	112	1,722
DHC8	Non-jet	2	0	2	0	4
EMB120	Non-jet	0	1	0	1	2
GASEPF	Non-jet	15	0	15	0	29
GASEPV	Non-jet	204	12	209	8	434
HS748A	Non-jet	2	0	2	0	4
PA28	Non-jet	23	2	25	0	50
PA30	Non-jet	1	0	1	0	2
PA31	Non-jet	26	0	25	1	52
PA42	Non-jet	2	1	2	1	6
General Aviation Total		13,191	1,270	13,286	1,175	28,922
Grand Total		174,907	38,681	181,224	32,364	427,176

Source: HMMH, 2020.
Notes: ANP - Aircraft Noise and Performance.
BEC58P is the AEDT substitution for the Cessna 402.
The CRJ9-ER in the RJ category is the CRJ700 aircraft.
Some totals may not match due to rounding

In the calculation of DNL, annual operations data are scaled to represent an average annual day by dividing by the 365 days in a year (or, in the case of a leap year like 2020, by the 366 days). To compare operations between years, it is simpler to look at category totals. **Table I-4, Table I-5, Table I-6,** and **Table I-7** summarize the numbers of average daily operations by categories of aircraft operating at Logan Airport from 1990 through 2022. Operations are summarized by operator category (commercial/GA), aircraft category, and day or night operation (night defined as 10:00 PM to 7:00 AM, consistent with the definition of DNL). GA operations were not included in the noise modeling prior to 1998 and commercial jet operations were not separated until 1999.

Table I-4 Modeled Daily Operations[1] by Commercial and GA Aircraft – 1990 to 1997

		1990	1991	1992	1993	1994	1995	1996	1997
Commercial Aircraft									
Stage 2 Jets[2]	Day	312.40	N/A	228.89	203.34	189.40	156.90	132.40	108.46
	Night	19.99	N/A	13.13	7.44	10.10	5.50	4.79	7.75
	Total	332.39	N/A	242.02	210.78	199.50	162.40	137.19	116.21
Stage 3 Jets	Day	288.89	N/A	384.49	418.99	425.70	429.40	439.81	505.08
	Night	57.25	N/A	58.29	65.47	62.80	69.00	80.16	85.06
	Total	346.14	N/A	442.78	484.46	488.50	498.40	519.97	590.14
Air Carrier Jets	Day	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
	Night	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
	Total	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Regional Jets[5]	Day	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
	Night	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
	Total	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Non-jets	Day	444.41	N/A	411.84	598.16	541.97	526.85	505.31	514.7
	Night	11.72	N/A	69.32	46.84	13.59	11.14	13.73	27.27
	Total	456.13	N/A	481.16	645.00	555.56	537.99	519.04	541.97
Total Commercial Operations									
Operations	Day	1045.70	N/A	1,025.22	1,220.49	1,157.07	1,113.15	1,077.52	1,128.24
	Night	88.96	N/A	140.74	119.75	86.49	85.64	98.68	120.08
	Total	1,134.66	N/A	1,165.96	1,340.24	1,243.56	1,198.79	1,176.20	1,248.32
GA Aircraft									
Stage 2 Jets[2]	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Total	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
Stage 3 Jets	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Total	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
Non-jets	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Total	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]

Table I-4 Modeled Daily Operations[1] by Commercial and GA Aircraft – 1990 to 1997

		1990	1991	1992	1993	1994	1995	1996	1997
Total GA Operations									
Operations	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Total	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
Overall Totals									
Day		1,045.70	N/A	1,025.22	1,220.49	1,157.07	1,113.15	1,077.52	1,128.24
Night		88.96	N/A	140.74	119.75	86.49	85.64	98.68	120.08
Total		1,134.66	N/A	1,165.96	1,340.24	1,243.56	1,198.79	1,176.20	1,248.32

Table I-5 Modeled Daily Operations[1] by Commercial and GA Aircraft – 1998 to 2005

		1998	1999	2000	2001	2002	2003	2004	2005
Commercial Aircraft									
Stage 2 Jets[2]	Day	84.93	83.30	5.13	1.18	0.05	0.08	0.03	0.05
	Night	5.92	6.66	0.26	0.05	0.00	0.00	0.01	0.01
	Total	90.85	89.96	5.39	1.23	0.05	0.08	0.05	0.06
Stage 3 Jets	Day	541.43	597.28	727.09	756.24	740.75	717.85	772.39	765.76
	Night	95.54	98.59	103.66	109.77	97.04	92.69	113.24	113.66
	Total	636.97	695.87	830.75	866.01	837.79	810.54	885.63	879.42
Air Carrier Jets	Day	N/A[3]	569.18	648.95	569.99	500.70	461.06	518.96	505.48
	Night	N/A[3]	96.21	99.79	101.30	83.52	72.69	89.24	91.99
	Total	N/A[3]	665.39	748.74	671.29	584.22	533.75	608.20	597.47
Regional Jets[5]	Day	N/A[3]	28.10	78.14	186.25	240.05	256.80	253.43	260.34
	Night	N/A[3]	2.38	3.87	8.47	13.52	19.99	24.00	21.68
	Total	N/A[3]	30.48	82.01	194.72	253.57	276.79	277.43	282.01
Non-jets	Day	552.56	448.82	409.62	317.62	165.45	135.18	133.24	148.77
	Night	21.86	16.63	21.58	10.97	3.45	2.41	3.03	3.02
	Total	574.42	465.45	431.20	328.58	168.89	137.59	136.28	151.79
Total Commercial Operations									
Operations	Day	1,178.92	1,129.90	1,141.84	1,075.04	906.25	853.10	905.66	914.59
	Night	123.32	121.88	125.51	120.79	100.49	95.10	116.29	116.68
	Total	1,302.24	1,251.78	1,267.35	1,195.82	1,006.73	948.20	1,021.95	1,031.27

Table I-5 Modeled Daily Operations[1] by Commercial and GA Aircraft – 1998 to 2005

		1998	1999	2000	2001	2002	2003	2004	2005
GA Aircraft									
Stage 2 Jets[2]	Day	5.25	9.89	7.29	5.15	3.65	2.84	0.94	2.29
	Night	0.40	0.74	0.64	0.50	0.41	0.26	0.14	0.25
	Total	5.65	10.63	7.93	5.65	4.08	3.10	1.08	2.54
Stage 3 Jets	Day	30.54	48.46	40.08	34.23	37.83	46.21	53.72	58.84
	Night	4.21	6.55	3.21	3.28	6.42	6.98	8.37	9.33
	Total	34.75	55.01	43.29	37.51	44.25	53.19	62.09	68.16
Non-jets	Day	37.29	19.36	34.57	37.31	17.36	17.81	16.95	14.00
	Night	16.28	18.89	1.83	1.92	4.45	4.40	5.20	4.75
	Total	53.57	38.25	36.40	39.23	21.81	22.21	22.14	18.75
Total GA Operations									
Operations	Day	73.08	77.71	81.94	76.68	58.84	66.88	71.60	75.12
	Night	20.89	26.17	5.68	5.71	11.29	11.64	13.71	14.33
	Total	93.97	103.88	87.62	82.39	70.13	78.52	85.31	89.46
Overall Totals									
Day		1,252.00	1,207.61	1,223.78	1,151.72	965.09	919.98	977.27	989.71
Night		144.21	148.05	131.19	126.50	111.78	106.74	130.00	131.02
Total		1,396.21	1,355.66	1,354.97	1,278.21	1,076.86	1,026.72	1,107.26	1,120.73

Table I-6 Modeled Daily Operations[1] by Commercial and GA Aircraft – 2006 to 2013

		2006	2007	2008	2009	2010	2011	2012	2013	2014
Commercial Aircraft										
Stage 2 Jets[2]	Day	0.03	0.03	0.01	0.00	0.01	0.01	0.01	0.01	0.00
	Night	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
	Total	0.03	0.04	0.02	0.00	0.02	0.01	0.01	0.01	0.00
Stage 3 Jets	Day	767.55	748.13	699.39	667.45	674.25	684.19	649.22	667.65	670
	Night	114.81	118.29	114.30	103.05	107.92	109.38	106.55	115.91	123.6
	Total	882.36	866.42	813.69	770.50	782.17	793.57	755.77	783.56	793.61
Air Carrier Jets	Day	490.63	472.39	443.15	422.92	521.64	571.03	530.76	546.27	556.59
	Night	92.71	96.28	89.89	82.21	93.98	99.17	98.68	107.17	115.84
	Total	583.34	568.66	533.04	505.14	615.62	670.2	629.44	653.44	672.43

Table I-6 Modeled Daily Operations[1] by Commercial and GA Aircraft – 2006 to 2013

		2006	2007	2008	2009	2010	2011	2012	2013	2014
Regional Jets[5]	Day	276.95	275.77	256.24	244.53	152.61	113.16	118.46	121.38	113.41
	Night	22.11	22.03	24.40	20.84	13.94	10.21	7.87	8.74	7.77
	Total	299.06	297.80	280.64	265.37	166.55	123.37	126.33	130.12	121.18
Non-jets	Day	140.81	145.27	132.52	136.43	138.53	135.18	133.92	132.33	128.45
	Night	3.26	3.47	4.00	5.56	5.21	4.73	3.06	3.21	2.28
	Total	144.07	148.73	136.52	141.99	143.74	139.91	136.98	135.54	130.73
Total Commercial Operations										
Operations	Day	908.41	893.43	831.92	804.77	812.78	819.39	783.14	799.99	798.45
	Night	118.09	121.77	118.31	108.65	113.13	114.11	109.62	119.12	125.88
	Total	1,026.51	1,015.19	950.23	913.42	925.91	933.5	892.76	919.12	924.33
GA Aircraft										
Stage 2 Jets[2]	Day	1.90	1.24	0.36	0.09	0.27	0.08	0.25	0.31	0.00
	Night	0.17	0.19	0.03	0.01	0.04	0.00	0.04	0.02	0.00
	Total	2.07	1.43	0.38	0.10	0.30	0.08	0.29	0.33	0.00
Stage 3 Jets	Day	61.08	54.82	43.98	22.31	27.80	52.51	52.93	51.21	52.64
	Night	6.57	6.39	4.52	2.28	3.21	5.35	7.20	5.10	4.65
	Total	67.65	61.21	48.49	23.59	31.01	57.87	60.13	56.31	57.29
Non-jets	Day	15.05	11.98	15.13	8.19	8.19	18.18	15.16	13.06	13.95
	Night	1.39	3.61	1.08	0.74	0.72	1.29	1.29	1.15	1.13
	Total	16.44	15.58	16.20	8.93	8.92	19.48	16.45	14.22	15.08
Total GA Operations										
Operations	Day	78.03	68.04	59.46	30.46	36.26	70.78	68.35	64.58	66.59
	Night	8.13	10.19	5.62	3.08	3.97	6.65	8.52	6.28	5.78
	Total	86.15	78.22	65.05	33.54	40.22	77.43	76.86	70.85	72.37
Overall Totals										
Day		986.43	961.46	891.39	834.33	849.03	890.16	851.49	864.57	865.05
Night		126.22	131.96	123.93	111.70	117.10	120.76	118.13	125.40	131.66
Total		1,112.66	1,093.42	1,015.31	946.03	966.13	1,010.92	969.61	989.97	996.70

Table I-7 Modeled Daily Operations[1] by Commercial and GA Aircraft – 2014 to 2022

		2015	2016	2017	2018	2019	2020	2021	2022	Change 2019 to 2022
Commercial Aircraft										
Stage 2 Jets[2]	Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Night	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stage 3 Jets	Day	685.92	713.65	734.46	770.67	779.05	376.47	478.62	721.76	-57.29
	Night	130.96	142.16	158.49	177.15	186.25	72.20	92.46	136.46	-49.79
	Total	816.88	855.81	892.95	947.82	965.30	448.67	571.08	858.22	-107.08
Air Carrier Jets	Day	585.55	620.45	636.04	657.25	655.57	319.04	382.72	567.82	-87.75
	Night	126.36	134.93	148.75	164.09	174.30	68.41	85.22	123.44	-50.86
	Total	711.92	755.38	784.79	821.34	829.87	387.45	467.94	691.26	-138.61
Regional Jets[5]	Day	100.36	93.20	98.42	113.42	123.48	57.43	95.90	153.94	30.46
	Night	4.6	7.23	9.74	13.06	11.95	3.79	7.24	13.02	1.07
	Total	104.96	100.43	108.16	126.48	135.43	61.22	103.13	166.96	31.53
Non-jets	Day	125.27	125.88	119.03	126.76	124.11	79.33	91.68	95.05	-29.06
	Night	2.41	3.01	2.24	2.36	1.70	0.34	0.24	0.45	-1.25
	Total	127.68	128.89	121.27	129.12	125.81	79.67	91.92	95.50	-30.31
Total Commercial Operations										
Operations	Day	811.19	839.53	853.49	897.44	903.16	455.80	570.29	816.81	-86.35
	Night	133.37	145.17	160.73	179.51	187.95	72.54	92.70	136.91	-51.04
	Total	944.56	984.70	1,014.22	1,076.94	1,091.11	528.34	662.99	953.72	-137.39
GA Aircraft										
Stage 2 Jets[2]	Day	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Night	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stage 3 Jets	Day	51.82	51.82	52.19	55.77	53.17	25.32	45.96	60.76	7.59
	Night	4.28	4.59	4.56	5.08	4.79	2.38	3.69	5.21	0.41
	Total	56.10	56.41	56.75	60.85	57.96	27.70	49.65	65.97	8.01
Non-jets	Day	19.31	25.92	26.43	22.01	19.37	9.52	15.12	16.24	-3.13
	Night	1.46	1.87	2.25	1.91	1.90	0.74	1.10	1.37	-0.54
	Total	20.77	27.79	28.68	23.92	21.28	10.27	16.22	17.61	-3.67

Table I-7 Modeled Daily Operations[1] by Commercial and GA Aircraft – 2014 to 2022

		2015	2016	2017	2018	2019	2020	2021	2022	Change 2019 to 2022
Total GA Operations										
Operations	Day	71.40	77.75	78.61	77.78	72.54	34.85	61.08	77.00	4.46
	Night	5.77	6.46	6.81	6.99	6.70	3.12	4.79	6.57	-0.12
	Total	77.17	84.21	85.43	84.77	79.24	37.97	65.87	83.58	4.34
Overall Totals										
Day		882.59	917.28	932.10	975.22	975.70	490.65	631.37	893.82	-81.89
Night		139.14	151.63	167.54	186.49	194.64	75.66	97.49	143.48	-51.16
Total		1,021.73	1,068.91	1,099.65	1,161.71	1,170.35	566.31	728.86	1037.30	-133.05

I.2.3.1 Commercial Jet Aircraft by Part 36 Stage Category

As described in the Regulatory Framework section of this appendix, jet aircraft are classified into categories referred to as stages based on noise levels. The heavier the aircraft, the more noise it is permitted to make, within limits. Aircraft are allowed to be recertificated to the higher standard when modifications are made to the aircraft engine or design. Because of the substantial differences in noise between Stage 2, recertificated Stage 3, Stage 3, Stage 4, and Stage 5 aircraft, Massport tracks operations by these separate categories to follow their trends. **Table I-3** shows the percentage of commercial jet operations by stage category from 1998 through 2021.

One of the most significant changes occurring after the economic downturn in 2001 was the almost immediate retirement of the re-certificated Stage 3 aircraft from airlines' fleets due to their high operating costs. This type of accelerated retirement was not as prevalent during the 2008 to 2009 economic downturn since the major airlines no longer operated these aircraft.

Table I-8 Percentage of Commercial Jet Operations by Part 36 Stage Category – 1998 to 2022

Year	Stage 5 Requirements[1]	Stage 4 Requirements[2]	Stage 3[3]	Recertificated Stage 3[4]	Stage 2 Greater than 75,000 lbs.	Total
1998	N/A	N/A	65.9%	21.7%	12.4%	100%
1999	N/A	N/A	70.0%	21.0%	9.0%	100%
2000	N/A	N/A	75.0%	24.0%	1.0%	100%
2001	N/A	N/A	86.3%	13.6%	0.1%	100%
2002	N/A	N/A	92.8%	7.2%	0.0%	100%

Table I-8 Percentage of Commercial Jet Operations by Part 36 Stage Category – 1998 to 2022

Year	Stage 5 Requirements[1]	Stage 4 Requirements[2]	Stage 3[3]	Recertificated Stage 3[4]	Stage 2 Greater than 75,000 lbs.	Total
2003	N/A	N/A	95.8%	4.1%	0.0%	100%
2004	N/A	N/A	97.8%	2.2%	0.0%	100%
2005	N/A	N/A	98.0%	2.0%	0.0%	100%
2006	N/A	N/A	98.6%	1.4%	0.0%	100%
2007	N/A	N/A	98.9%	1.1%	0.0%	100%
2008	N/A	N/A	99.1%	0.9%	0.0%	100%
2009	N/A	87.8%	11.3%	0.9%	0.0%	100%
2010	N/A	93.2%	5.7%	1.1%	0.0%	100%
2011	N/A	95.5%	4.0%	0.5%	0.0%	100%
2012	N/A	95.8%	4.1%	0.1%	0.0%	100%
2013	N/A	97.4%	2.6%	0.0%	0.0%	100%
2014	N/A	97.4%	2.6%	0.0%	0.0%	100%
2015	N/A	96.7%	3.3%	0.0%	0.0%	100%
2016	17.8%	79.2%	3.0%	0.0%	0.0%	100%
2017	17.7%	79.8%	2.4%	0.0%	0.0%	100%
2018	15.5%	83.0%	1.5%	0.0%	0.0%	100%
2019	15.2%	82.9%	2.0%	0.0%	0.0%	100%
2020	28.5%	68.7%	2.8%	0.0%	0.0%	100%
2021	29.1%	69.2%	1.7%	0.0%	0.0%	100%
2022	33.6%	65.3%	1.1%	0.0%	0.0%	100%

Source: Massport and Federal Aviation Administration (FAA) radar data, HMMH 2022

Notes: N/A – not applicable. Values less than 0.05% appear as 0.0% due to rounding.

1 This column includes operations by aircraft that would qualify as Stage 5 if recertificated. Aircraft with maximum takeoff weight greater than 121,254 pounds that are certificated after January 1, 2018, must meet Stage 5 standards. The percent of Logan Airport operations in aircraft meeting Stage 5 requirements was not determined prior to 2016.

2 This column includes aircraft that are either certificated Stage 4 or would qualify as Stage 4 if recertificated. Certification as Stage 4 was not available until 2006 and the percent of Logan Airport operations in aircraft that meet Stage 4 requirements was not determined prior to 2009.

3 Certificated Stage 3 aircraft are originally manufactured meeting Stage 3 requirements under Federal Regulation Part 36. This column includes only operations by Certificated Stage 3 aircraft that do not meet higher certification standards.

4 Recertificated Stage 3 aircraft are aircraft that were originally manufactured and certified as Stage 1 or 2 under Federal Regulation Part 36, which either have been treated with hushkits or have been re-engineered to meet Stage 3 requirements.

I.2.3.2 Nighttime Operations

Massport tracks flights that operate in the defined nighttime period between the hours of 10:00 PM to 7:00 AM, when each flight is penalized 10 dB in calculations of DNL. **Table I-9** shows this nighttime activity by different groups of aircraft. As in years past, the majority of nighttime operations (between 10:00 PM and 7:00 AM) occurred either before midnight or after 5:00 AM.

Table I-9 Modeled Nighttime Operations at Logan Airport – 1990 to 2022

Year	Commercial Jets	Commercial Non-Jets	General Aviation	Total
1990	77.24	11.72	N/A	88.96
1991	N/A	N/A	N/A	N/A
1992	71.42	69.32	N/A	140.74
1993	72.91	46.84	N/A	119.75
1994	72.90	13.59	N/A	86.49
1995	74.50	11.14	N/A	85.64
1996	84.95	13.73	N/A	98.68
1997	92.81	27.27	N/A	120.08
1998	101.46	21.86	20.89	144.21
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
2011	109.38	4.73	6.65	120.76
2012	106.55	3.06	8.52	118.13
2013	115.91	3.21	6.28	125.40
2014	123.60	2.28	5.78	131.66
2015	130.96	2.41	5.77	139.14
2016[1]	142.16	3.01	6.48	151.63
2017	158.49	2.24	6.81	167.55
2018	177.15	2.36	6.99	186.49

Table I-9 Modeled Nighttime Operations at Logan Airport – 1990 to 2022

Year	Commercial Jets	Commercial Non-Jets	General Aviation	Total
2019	186.25	1.70	6.70	194.64
2020	72.00	0.34	3.11	75.45
2021	92.46	0.24	4.79	97.49
2022	136.46	0.45	6.57	143.48
Change (2019 to 2022)	-49.79	-1.25	-0.12	-51.16
Percent Change	-38%	-52%	-2%	-26%
Change (2021 to 2022) 2021)	44.00	0.21	1.79	46.00
Percent Change	48%	89%	37%	47%

Source: Massport, HMMH, 2022
Notes: GA – general aviation; N/A - not available. Negative numbers shown in parentheses ( ).
1 Minor errors reported for 2016 data in *2016 EDR* have been corrected in this table.

I.2.4 Runway Use

Using radar data, the AEDT pre-processor determines which runway was used, the specific aircraft type, and time classification (daytime or nighttime) for each flight. Massport compares annual runway use to previous years using a variety of summary tables with different perspectives.

The first summary of daytime and nighttime runway usages presented here is broken into six representative aircraft groups with similar runway requirements. The list below provides example aircraft types from each group:

- Heavy Jet A – B747s, A340s, A380s
- Heavy Jet B – B767s, B777s, B787s, A300s, A310s, A330s, A350s, MD-11s
- Light Jet A – B717s, MD-90s
- Light Jet B – B737s, B757s, A319s, A220s, A320s, MD-80s, E190
- Regional Jet (RJ) – E135, E145, E170, E175, CRJ2, CRJ7, CRJ9, J328 and Corporate Jets
- Turboprops and Piston Aircraft (non-jets)

Since Massport began categorizing aircraft this way, the proportions of aircraft in the Heavy Jet A and Light Jet A categories have diminished, due to changing fleets. The Heavy Jet A category represents only 6 percent of the heavy jets and the Light Jet A category represents less than 1 percent of the lighter large jets.

Table I-10, Table I-11, and **Table I-12** show the runway use summary for the modeled 2022 and 2021 noise conditions, respectively. **Table I-12** shows the corresponding summary from the modeled 2019 noise conditions for comparison. The turbojet aircraft in the table were grouped into the different categories for reporting purposes. Because the DNL contours developed using the radar data with the AEDT pre-processor reflect the actual use of the runways by each flight, they accurately represent Logan Airport's noise environment. The modeled runway usage for a given particular aircraft type may be different from the overall group runway use presented in **Table I-10, Table I-11,** and **Table I-12**.

Table I-10 2022 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
ARRIVALS												
Runway	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
04L	0.2%	-	0.2%	0.1%	-	-	2.2%	<0.1%	5.5%	0.2%	18.5%	0.4%
04R	40.0%	-	34.6%	19.0%	25.0%	-	30.8%	18.0%	28.0%	20.0%	14.0%	10.3%
09	-	-	-	-	-	-	-	-	-	-	-	-
15R	0.1%	-	0.4%	1.5%	-	-	0.6%	1.0%	0.6%	1.0%	4.9%	36.5%
22L	35.2%	-	32.9%	30.2%	50.0%	-	31.0%	40.5%	31.1%	41.8%	31.0%	26.9%
22R	-	-	<0.1%	-	-	-	<0.1%	<0.1%	<0.1%	-	3.4%	1.7%
27	5.3%	-	17.4%	6.5%	25.0%	50.0%	27.2%	16.7%	21.2%	20.5%	9.5%	8.7%
32	-	-	-	-	-	-	1.2%	-	6.2%	-	11.7%	0.2%
33L	19.1%	100.0%	14.6%	42.8%	-	50.0%	7.0%	23.8%	7.4%	16.5%	4.7%	14.8%
33R	-	-	-	-	-	-	-	-	-	-	2.3%	0.4%
Total	99.9	100.0	100.1	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9
DEPARTURES												
Runway	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
04L	0.2%	-	0.2%	0.1%	-	-	2.2%	<0.1%	5.5%	0.2%	18.5%	0.4%
04R	40.0%	-	34.6%	19.0%	25.0%	-	30.8%	18.0%	28.0%	20.0%	14.0%	10.3%
09	-	-	-	-	-	-	-	-	-	-	-	-
15R	0.1%	-	0.4%	1.5%	-	-	0.6%	1.0%	0.6%	1.0%	4.9%	36.5%
22L	35.2%	-	32.9%	30.2%	50.0%	-	31.0%	40.5%	31.1%	41.8%	31.0%	26.9%
22R	-	-	<0.1%	-	-	-	<0.1%	<0.1%	<0.1%	-	3.4%	1.7%
27	5.3%	-	17.4%	6.5%	25.0%	50.0%	27.2%	16.7%	21.2%	20.5%	9.5%	8.7%
32	-	-	-	-	-	-	1.2%	-	6.2%	-	11.7%	0.2%
33L	19.1%	100.0%	14.6%	42.8%	-	50.0%	7.0%	23.8%	7.4%	16.5%	4.7%	14.8%

Table I-10 2022 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
33R	-	-	-	-	-	-	-	-	-	-	2.3%	0.4%
Total	99.9%	100.0%	100.1%	100.1%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%

Source: Massport, HMMH, 2023
Notes: Nighttime for noise modeling is defined as 10:00 PM to 7:00 AM.
Values may not add exactly to 100 percent due to rounding.

Table I-11 2021 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
ARRIVALS												
Runway	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
04L	-	-	<0.1%	-	-	-	0.6%	<0.1%	1.8%	<0.1%	6.1%	0.8%
04R	31.1%	100.0%	27.7%	16.9%	57.1%	100.0%	27.0%	19.1%	26.4%	19.9%	20.7%	13.2%
9	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	0.5%	-
15R	0.9%	-	3.8%	1.9%	-	-	4.1%	1.4%	3.7%	1.6%	5.6%	2.0%
22L	28.3%	-	33.1%	26.0%	21.4%	-	31.4%	33.3%	32.2%	36.9%	30.0%	45.1%
22R	-	-	-	-	-	-	<0.1%	-	<0.1%	<0.1%	3.6%	2.4%
27	17.0%	-	13.3%	3.4%	21.4%	-	19.6%	14.3%	15.9%	16.7%	9.3%	7.5%
32	-	-	-	-	-	-	0.4%	-	2.4%	-	3.6%	-
33L	22.6%	-	22.1%	51.7%	-	-	16.9%	31.9%	17.6%	24.8%	17.6%	29.0%
33R	-	-	-	-	-	-	-	-	-	-	3.1%	-
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
DEPARTURES												
Runway	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
04L	-	-	-	-	-	-	-	-	-	-	12.6%	3.5%
04R	26.9%	25.0%	10.1%	4.9%	-	-	5.0%	4.2%	0.8%	0.6%	6.4%	5.5%
9	3.8%	-	17.4%	11.3%	33.3%	-	23.8%	14.5%	30.5%	19.2%	17.7%	8.0%
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	-	-
15R	8.7%	50.1%	7.3%	27.6%	-	-	3.9%	22.9%	1.6%	19.9%	3.1%	44.4%
22L	17.3%	-	6.8%	2.2%	-	-	2.8%	2.2%	0.1%	0.3%	0.1%	0.8%

Table I-11 2021 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
22R	7.7%	24.9%	26.0%	15.8%	50.0%	-	29.5%	18.0%	34.6%	25.1%	35.3%	14.3%
27	-	-	10.2%	3.9%	16.7%	-	13.9%	13.9%	15.4%	11.8%	7.0%	6.4%
32	-	-	-	-	-	-	-	-	-	-	-	-
33L	35.6%	-	22.1%	34.3%	-	-	21.1%	24.4%	17.1%	23.0%	17.8%	17.0%
33R	-	-	-	-	-	-	-	-	-	-	-	-
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Massport, HMMH, 2022
Notes: Nighttime for noise modeling is defined as 10:00 PM to 7:00 AM.
Values may not add exactly to 100 percent due to rounding.

Table I-12 2019 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
ARRIVALS												
Runway	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
04L	0.1%	-	0.3%	0.2%	2.5%	0.2%	4.1%	0.4%	8.3%	0.8%	25.5%	3.2%
04R	43.4%	18.3%	41.1%	23.4%	33.7%	21.2%	28.0%	18.3%	28.4%	23.2%	12.6%	19.2%
9	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	0.1%	-
15R	0.4%	-	0.5%	0.2%	0.5%	0.2%	0.6%	0.2%	0.4%	0.2%	2.2%	11.3%
22L	29.5%	54.5%	27.0%	35.6%	22.8%	39.3%	28.8%	38.7%	24.8%	40.3%	25.9%	30.1%
22R	-	-	-	-	<0.1%	<0.1%	<0.1%	-	<0.1%	0.1%	3.0%	4.0%
27	4.4%	9.3%	15.2%	3.6%	31.4%	17.7%	24.2%	16.5%	19.9%	22.1%	4.0%	11.4%
32	-	-	-	-	-	-	1.8%	-	5.7%	-	12.9%	-
33L	22.2%	18.0%	16.0%	37.0%	9.1%	21.5%	12.4%	25.9%	12.5%	13.4%	7.6%	16.1%
33R	-	-	-	-	-	-	-	-	-	-	6.0%	4.7%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
DEPARTURES												
Runway	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
04L	-	-	-	-	-	-	-	-	-	-	20.5%	12.3%
04R	16.3%	10.1%	11.9%	4.0%	8.8%	5.8%	3.3%	2.2%	0.2%	0.4%	2.9%	2.3%

Table I-12 2019 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
9	5.7%	0.8%	18.9%	15.1%	26.5%	16.3%	33.0%	20.5%	38.5%	26.3%	18.7%	8.0%
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	0.0%	-
15R	30.9%	44.3%	10.4%	18.8%	3.5%	14.3%	2.1%	10.6%	0.5%	6.3%	2.2%	23.7%
22L	6.5%	3.9%	4.7%	2.0%	3.5%	3.5%	1.5%	1.3%	0.1%	0.6%	0.1%	0.2%
22R	14.3%	11.4%	24.6%	32.6%	25.8%	20.5%	28.8%	29.4%	30.4%	33.0%	29.6%	29.6%
27	0.1%	-	6.8%	1.9%	10.6%	23.1%	11.6%	20.3%	11.3%	20.6%	5.2%	3.6%
32	-	-	-	-	-	-	-	-	-	-	-	-
33L	26.2%	29.6%	22.6%	25.6%	21.3%	16.5%	19.8%	15.6%	19.1%	12.7%	20.7%	20.5%
33R	-	-	-	-	-	-	-	-	-	-	-	-
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Massport, HMMH, 2020.

Notes: Nighttime for noise modeling is defined as 10:00 PM to 7:00 AM.
Values may not add exactly to 100 percent due to rounding.

While previous tables present runway use by aircraft groups, **Table I-13, Table I-14,** and **Table I-15** present the total runway use (jets and non-jets) by runway and time of day. The first section of each table displays the number of operations on each runway by time period for an average day. The second section displays the same information for the entire year and the last section displays the percent that each runway is used for a given operation type and time of day.

Table I-13 shows that on an average day in 2022, Runway 22R had the most departures (about 174, per day and night combined) and Runway 22L had the most arrivals (about 169 per day and night combined). This usage pattern was also seen in 2021 and in 2019, although in 2019, Runway 9 handled as many departures in 2019 as Runway 22R did.

Table I-13 Summary of Jet and Non-Jet Aircraft Runway Use: 2022

	Runway												
	4L	4R	9	14	15L	15R	22L	22R	27	32	33L	33R	Total
2022 Daily Operations Counts													
Dep Day	9.8	18.7	122.0	0	0	9.7	8.4	160.4	26.0	0.0	102.3	0.0	457.2
Dep Night	0.0	2.2	11.9	0	0	13.7	0.9	13.9	4.4	0.0	14.5	0.0	61.5
Arr Day	21.9	123.5	0.0	0	0	3.7	136.6	1.9	99.4	16.2	32.1	1.3	436.6
Arr Night	0.1	14.9	0.0	0	0	1.0	32.7	0.0	13.5	0.0	19.7	0.0	82.0
Total Daily Operations	31.7	159.4	133.9	0	0	28.1	178.6	176.2	143.2	16.2	168.6	1.3	1037.3
2022 Annual Operations Counts													
Dep Day	3,564	6,827	44,525	0	0	3,545	3,060	58,541	9,478	0	37,327	0	166,867
Dep Night	10	813	4,342	0	0	4,996	321	5,060	1,604	0	5,292	0	22,440
Arr Day	7,977	45,083	0	0	0	1,337	49,871	710	36,283	5,912	11,729	473	159,376
Arr Night	21	5,444	0	0	0	382	11,952	9	4,920	1	7,200	2	29,931
Total Annual Operations	11,573	58,166	48,867	0	0	10,261	65,204	64,321	52,285	5,913	61,548	475	378,613
2022 Percentage Operations													
Dep Day	2%	4%	27%	0%	0%	2%	2%	35%	6%	0%	22%	0%	100%
Dep Night	<1%	4%	19%	0%	0%	22%	1%	23%	7%	0%	24%	0%	100%
Arr Day	5%	28%	0%	0%	0%	1%	31%	<1%	23%	4%	7%	<1%	100%
Arr Night	<1%	18%	0%	0%	0%	1%	40%	<1%	16%	<1%	24%	<1%	100%

Source: Massport radar data and HMMH 2022

Notes: Arr – Arrivals, Dep - Departures

These data reflect actual counts or 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: there are no arrivals to Runway 14 and no departures from Runway 32.

Values may not add to 100 percent due to rounding.

Table I-14 Summary of Jet and Non-Jet Aircraft Runway Use: 2021

	Runway												
	4L	4R	9	14	15L	15R	22L	22R	27	32	33L	33R	Total
2021 Daily Operations Counts													
Dep Day	6.7	14.9	78.8	0.0	0.0	11.3	6.4	103.1	42.4	0.0	65.0	0.0	328.6
Dep Night	0.0	1.4	5.1	0.0	0.0	8.6	0.7	6.6	3.9	0.0	9.5	0.0	35.9
Arr Day	5.5	78.2	0.0	0.0	0.2	12.8	95.2	2.0	50.0	4.3	52.9	1.6	302.8
Arr Night	0.0	11.7	0.0	0.0	0.0	1.0	20.3	0.0	8.4	0.0	20.1	0.0	61.6
Total Daily Operations	12.2	106.2	83.9	0.0	0.2	33.8	122.6	111.7	104.8	4.3	147.5	1.6	728.9
2021 Annual Operations Counts													
Dep Day	2,455	5,447	28,763	0	0	4,129	2,327	37,630	15,466	0	23,713	0	119,929
Dep Night	8	509	1,871	0	0	3,137	243	2,417	1,440	0	3,463	0	13,088
Arr Day	2,002	28,534	0	0	89	4,683	34,746	715	18,252	1,584	19,318	601	110,523
Arr Night	5	4,261	0	0	0	380	7,420	7	3,080	0	7,341	0	22,494
Total Annual Operations	4,470	38,751	30,634	0	89	12,329	44,735	40,769	38,238	1,584	53,835	601	266,034
2021 Percentage Operations													
Dep Day	2%	5%	24%	0%	0%	3%	2%	31%	13%	0%	20%	0%	100%
Dep Night	<1%	4%	14%	0%	0%	24%	2%	18%	11%	0%	26%	0%	100%
Arr Day	2%	26%	0%	0%	<1%	4%	31%	1%	17%	1%	17%	1%	100%
Arr Night	<1%	19%	0%	0%	0%	2%	33%	<1%	14%	0%	33%	0%	100%

Source: Massport radar data and HMMH 2022

Notes: Arr – Arrivals, Dep – Departures

These data reflect actual counts or 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: there are no arrivals to Runway 14 and no departures from Runway 32.

Values may not add to 100 percent due to rounding.

Table I-15 Summary of Jet and Non-Jet Aircraft Runway Use: 2019

	Runway												
	4L	4R	9	14	15L	15R	22L	22R	27	32	33L	33R	Total
2019 Daily Operations Counts													
Dep Day	14.8	18.9	150.7	0.0	0.0	12.6	7.1	141.9	50.6	0.0	100.0	0.0	496.5
Dep Night	0.2	2.6	17.0	0.0	0.0	11.2	1.5	25.5	15.4	0.0	15.3	0.0	88.6

Table I-15 Summary of Jet and Non-Jet Aircraft Runway Use: 2019

	Runway												
	4L	4R	9	14	15L	15R	22L	22R	27	32	33L	33R	Total
Arr Day	36.8	131.2	0.0	0.0	0.1	3.8	129.4	2.2	98.1	18.7	56.2	4.3	**480.6**
Arr Night	0.5	20.4	0.0	0.0	0.0	0.4	40.4	0.1	16.9	0.0	25.8	0.1	**104.5**
Total Daily Operations	52.2	173.1	167.7	0.0	0.1	27.9	178.3	169.7	181.0	18.7	197.3	4.4	**1,170.3**
2019 Annual Operations Counts													
Dep Day	5,384	6,882	55,019	0	1	4,593	2,586	51,805	18,452	0	36,511	0	**181,234**
Dep Night	79	953	6,197	0	0	4,087	530	9,303	5,624	0	5,581	0	**32,354**
Arr Day	13,417	47,882	0	0	23	1,375	47,237	791	35,794	6,822	20,506	1,581	**175,429**
Arr Night	172	7,450	0	0	0	138	14,733	31	6,180	0	9,422	32	**38,159**
Total Annual Operations	19,052	63,167	61,216	0	24	10,193	65,087	61,930	66,050	6,822	72,020	1,614	**427,176**
2019 Percentage Operations													
Dep Day	3%	4%	30%	0%	<1%	3%	1%	29%	10%	0%	20%	0%	**100%**
Dep Night	<1%	3%	19%	0%	0%	13%	2%	29%	17%	0%	17%	0%	**100%**
Arr Day	8%	27%	0%	0%	<1%	1%	27%	<1%	20%	4%	12%	1%	**100%**
Arr Night	<1%	20%	0%	0%	0%	<1%	39%	<1%	16%	0%	25%	<1%	**100%**

Source: Massport radar data and HMMH 2020.
Notes: Arr – Arrivals, Dep - Departures
These data reflect actual counts or 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: there are no arrivals to Runway 14 and no departures from Runway 32.
Values may not add to 100 percent due to rounding.

Runway use can also be presented in terms of percent of total operations. **Table I-6** presents the 2022, 2021 and 2019 runway use for all operations which use Logan Airport, supplementing the information in **Table I-10, Table I-11,** and **Table I-12** that separate runway use by aircraft group and time of day, and the data in **Table I-13, Table I-14,** and **Table I-15** which total the runway use by operation type and time of day.

For 2022, Runways 22L and 22R were the most active, with 22R handling the most Departures and 22L handling the most arrivals. Overall, the usage rates were similar to those seen in 2019 than in 2020 or 2021. For 2019 through 2021, Runway 33L was the most active, with primarily jet departures. Runways 4R, 9, 22L, 22R and 27 handled the majority of the rest of the traffic. Some year-to-year shifts can be seen in the data in **Table I-6**.

Table I-16 Total 2022, 2021, and 2019 Modeled Runway Use by All Operations

Runway	Jet Arrivals		Non-Jet Arrivals		Jet Departures		Non-Jet Departures		All Operations
	Day	Night	Day	Night	Day	Night	Day	Night	
2022 Operations									
4L	1.1%	<0.1%	1.0%	<0.1%	0.0%	0.0%	0.9%	<0.1%	3.1%
4R	11.1%	1.4%	0.8%	<0.1%	1.4%	0.2%	0.4%	<0.1%	15.4%
9	0.0%	0.0%	0.0%	0.0%	10.9%	1.1%	0.9%	<0.1%	12.9%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15L	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15R	0.2%	0.1%	0.1%	<0.1%	0.8%	1.3%	0.1%	<0.1%	2.7%
22L	11.5%	3.1%	1.7%	<0.1%	0.8%	0.1%	<0.1%	<0.1%	17.2%
22R	<0.1%	<0.1%	0.2%	<0.1%	13.5%	1.3%	2.0%	<0.1%	17.0%
27	9.1%	1.3%	0.5%	<0.1%	2.3%	0.4%	0.2%	<0.1%	13.8%
32	0.9%	0.0%	0.6%	<0.1%	0.0%	0.0%	0.0%	0.0%	1.6%
33L	2.8%	1.9%	0.3%	<0.1%	9.0%	1.4%	0.9%	<0.1%	16.3%
33R	0.0%	0.0%	0.1%	<0.1%	0.0%	0.0%	0.0%	0.0%	0.1%
Total	36.7%	7.8%	5.4%	0.1%	38.7%	5.9%	5.4%	0.1%	100.0%
2021 Operations									
4L	0.3%	<0.1%	0.4%	<0.1%	0.0%	0.0%	0.9%	<0.1%	1.7%
4R	9.2%	1.6%	1.5%	<0.1%	1.6%	0.2%	0.5%	<0.1%	14.6%
9	0.0%	0.0%	0.0%	0.0%	9.5%	0.7%	1.3%	<0.1%	11.5%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15L	0.0%	0.0%	<0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	<0.1%
15R	1.4%	0.1%	0.4%	<0.1%	1.3%	1.1%	0.2%	<0.1%	4.6%
22L	10.9%	2.8%	2.2%	<0.1%	0.9%	0.1%	<0.1%	<0.1%	16.8%
22R	<0.1%	<0.1%	0.3%	<0.1%	11.6%	0.9%	2.6%	<0.1%	15.3%
27	6.2%	1.2%	0.7%	<0.1%	5.3%	0.5%	0.5%	<0.1%	14.4%
32	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
33L	6.0%	2.7%	1.3%	<0.1%	7.6%	1.3%	1.3%	<0.1%	20.2%
33R	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Total	34.2%	8.4%	7.3%	0.1%	37.8%	4.8%	7.3%	0.1%	100.0%
2019 Operations									
4L	1.6%	<0.1%	1.6%	<0.1%	0.0%	0.0%	1.3%	<0.1%	4.5%
4R	10.4%	1.7%	0.8%	<0.1%	1.4%	0.2%	0.2%	<0.1%	14.8%

Table I-16 Total 2022, 2021, and 2019 Modeled Runway Use by All Operations

Runway	Jet Arrivals		Non-Jet Arrivals		Jet Departures		Non-Jet Departures		All Operations
	Day	Night	Day	Night	Day	Night	Day	Night	
9	0.0%	0.0%	0.0%	0.0%	11.7%	1.4%	1.1%	<0.1%	14.3%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15L	0.0%	0.0%	<0.1%	0.0%	0.0%	0.0%	<0.1%	0.0%	<0.1%
15R	0.2%	<0.1%	0.1%	<0.1%	0.9%	0.9%	0.1%	<0.1%	2.4%
22L	9.5%	3.4%	1.6%	<0.1%	0.6%	0.1%	<0.1%	<0.1%	15.2%
22R	<0.1%	<0.1%	0.2%	<0.1%	10.3%	2.1%	1.8%	<0.1%	14.5%
27	8.1%	1.4%	0.2%	<0.1%	4.0%	1.3%	0.3%	<0.1%	15.5%
32	0.8%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%
33L	4.3%	2.2%	0.5%	<0.1%	7.3%	1.3%	1.3%	<0.1%	16.9%
33R	0.0%	0.0%	0.4%	<0.1%	0.0%	0.0%	0.0%	0.0%	0.4%
Total	34.9%	8.8%	6.1%	0.2%	36.3%	7.4%	6.1%	0.2%	100.0%

Source: Massport radar data and HMMH, 2022

Notes: Night for noise modeling is defined as 10:00 PM to 7:00 AM.
Nighttime runway restrictions are from 11:00 PM to 6:00 AM.
Values may not add to exactly 100 percent due to rounding.

Table I-17 presents a historical summary of runway use by jets. Since 2009, the radar data have been analyzed with Massport's Harris NOMS. Data from 2001 through 2008 were compiled with Massport's PreFlight™ software, an analysis package used to access 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 Airport Noise Rules prevent arrivals to Runway 22R and departures from Runway 4L by jet aircraft except for certain circumstances.

Table I-17 Summary of Jet Aircraft Runway Use – 1990 to 2022

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
1990										
Departures	0%[2]	3%	21%	N/A	10%	2%	36%	20%	N/A	7%
Arrivals	1%	25%	0%	N/A	2%	14%	0%	28%	N/A	29%
1992[2]										
Departures	0%	6%	31%	N/A	7%	2%	38%	10%	N/A	6%
Arrivals	1%	37%	0%	N/A	3%	12%	0%	30%	N/A	17%

Table I-17 Summary of Jet Aircraft Runway Use – 1990 to 2022

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
1993										
Departures	0%	9%	33%	N/A	7%	3%	40%	4%	N/A	4%
Arrivals	2%	44%	0%	N/A	1%	11%	0%	28%	N/A	15%
1994										
Departures	0%	9%	33%	N/A	4%	3%	32%	12%	N/A	5%
Arrivals	3%	42%	0%	N/A	1%	8%	0%	27%	N/A	19%
1995										
Departures	0%	8%	36%	N/A	5%	5%	29%	11%	N/A	5%
Arrivals	3%	41%	0%	N/A	2%	8%	0%	27%	N/A	17%
1996										
Departures	0%	8%	32%	N/A	5%	6%	33%	12%	N/A	5%
Arrivals	2%	38%	0%	N/A	2%	11%	0%	29%	N/A	18%
1997										
Departures	0%	8%	30%	N/A	5%	6%	31%	15%	N/A	5%
Arrivals	2%	36%	0%	N/A	2%	9%	0%	30%	N/A	20%
1998										
Departures	0%	8%	35%	N/A	6%	5%	28%	14%	N/A	5%
Arrivals	2%	41%	0%	N/A	2%	7%	0%	28%	N/A	19%
1999										
Departures	0%	8%	31%	N/A	5%	4%	30%	15%	N/A	6%
Arrivals	3%	37%	0%	N/A	2%	10%	0%	28%	N/A	21%
2000										
Departures	0%	8%	35%	N/A	4%	3%	30%	15%	N/A	6%
Arrivals	4%	40%	0%	N/A	1%	7%	0%	28%	N/A	20%
2001										
Departures	0%	7%	34%	N/A	4%	3%	35%	12%	N/A	5%
Arrivals	5%	36%	0%	N/A	1%	8%	0%	32%	N/A	18%
2002										
Departures	0%	4%	31%	N/A	6%	3%	35%	16%	N/A	6%
Arrivals	6%	31%	0%	N/A	1%	12%	0%	30%	N/A	21%

Table I-17 Summary of Jet Aircraft Runway Use – 1990 to 2022

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
2003										
Departures	0%	4%	33%	N/A	7%	2%	34%	14%	N/A	6%
Arrivals	7%	33%	0%	N/A	1%	14%	0%	28%	N/A	18%
2004										
Departures	0%	5%	34%	N/A	10%	4%	24%	18%	N/A	6%
Arrivals	6%	34%	0%	N/A	1%	12%	0%	24%	N/A	23%
2005										
Departures	0%	5%	36%	N/A	7%	1%	31%	13%	N/A	7%
Arrivals	8%	33%	0%	N/A	1%	11%	0%	29%	N/A	17%
2006										
Departures	0%	4%	33%	0%	3%	1%	40%	13%	0%	6%
Arrivals	7%	29%	0%	0%	1%	14%	0%	33%	0.2%	16%
2007										
Departures	0%	5%	31%	0%	4%	1%	33%	7%	0%	19%
Arrivals	5%	31%	0%	0%	1%	15%	0%	36%	2%	11%
2008										
Departures	0%	6%	33%	<1%	3%	<1%	36%	6%	0%	16%
Arrivals	6%	30%	0%	0%	2%	17%	0%	33%	2%	11%
2009[3]										
Departures	0%	7%	32%	0%	3%	2%	34%	6%	0%	16%
Arrivals	7%	31%	0%	0%	3%	17%	0%	30%	1%	11%
2010										
Departures	0%	4%	28%	<1%	8%	2%	31%	10%	0%	17%
Arrivals	5%	28%	0%	0%	1%	15%	0%	32%	1%	16%
2011[4]										
Departures	0%	6%	36%	<1%	5%	2%	36%	7%	0%	7%
Arrivals	7%	37%	0%	0%	<1%	16%	0%	28%	1%	11%
2012[4]										
Departures	0%	6%	33%	<1%	5%	3%	38%	6%	0%	9%
Arrivals	6%	34%	0%	0%	1%	16%	0%	33%	<1%	9%

Table I-17 Summary of Jet Aircraft Runway Use – 1990 to 2022

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
2013										
Departures	<1%	5%	30%	<1%	5%	2%	35%	12%	0%	12%
Arrivals	6%	29%	0%	0%	1%	16%	<1%	32%	1%	15%
2014										
Departures	0%	5%	31%	<1%	5%	2%	28%	13%	0%	17%
Arrivals	5%	30%	0%	0%	2%	25%	<1%	21%	1%	16%
2015										
Departures	0%	4%	29%	<1%	5%	2%	32%	12%	0%	15%
Arrivals	5%	29%	0%	0%	2%	25%	<1%	23%	1%	16%
2016[5]										
Departures	0%	4%	30%	0%	6%	2%	27%	13%	0%	18%
Arrivals	4%	31%	0%	0%	1%	24%	<1%	23%	1%	16%
2017[6]										
Departures	0%	2%	25%	0%	5%	1%	28%	15%	0%	23%
Arrivals	5%	21%	0%	0%	5%	23%	<1%	27%	2%	18%
2018										
Departures	<1%	4%	30%	0%	5%	2%	34%	10%	0%	16%
Arrivals	4%	30%	0%	0%	<1%	32%	<1%	21%	1%	12%
2019										
Departures	0%	4%	30%	0%	4%	2%	28%	12%	0%	20%
Arrivals	4%	28%	0%	0%	<1%	29%	<1%	22%	2%	15%
2020[7]										
Departures	0%	5%	19%	0%	7%	2%	33%	13%	0%	21%
Arrivals	1%	23%	0%	0%	4%	36%	<1%	16%	1%	19%
2021										
Departures	0%	4%	24%	0%	6%	2%	29%	14%	0%	21%
Arrivals	1%	25%	0%	0%	3%	32%	<1%	17%	1%	20%

Table I-17 Summary of Jet Aircraft Runway Use – 1990 to 2022

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
2022										
Departures	0%	4%	27%	0%	5%	2%	33%	6%	0%	23%
Arrivals	2%	28%	0%	0%	1%	33%	<1%	23%	2%	11%

Source: Massport radar data and HMMH 2023

Notes: These 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. 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 exactly 100 percent due to rounding.
N/A - not available.

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 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.

3 Runway 9-27 had extended weekend closings for resurfacing during 2009.

4 Runway 15R-33L was closed for 3 months in 2011 and in 2012.

5 Runway 4L-22R was closed for 31 days in 2016.

6 Runway 4R-22L was closed for 35 days in 2017, with limited availability for Runway 4R arrivals for about 80 additional days.

7 Runway 9-27 was closed for almost 3 months in the summer of 2020, during an unprecedented period of low levels of aircraft activity due to the pandemic.

Since runway use plays such a key role in determining noise the aircraft noise distribution in the Airport's environment, Massport also tracks the level of traffic off each runway end by combining counts of operations that overfly the same general area. The total operations and percentages shown for 2019, 2021, and 2022 in **Table I-18** represent the amount of activity experienced off each runway end for a given year.

Table I-18 Runway Usage by Runway End

Runway End	Operation(s)[1]	2019		2021		2022	
		Total Flights	% of Total[2]	Total Flights	% of Total[2]	Total Flights	% of Total[2]
04L	R4L A + R22R D	74,697	17.5%	42,054	15.8%	71,600	26.9%
04R	R4R A + R22L D	58,449	13.7%	35,365	13.3%	53,908	20.3%
9	R9 A + R27 D	24,076	5.6%	16,906	6.4%	11,082	4.2%
14	N/A	0	0.0%	0	0.0%	0	0.0%
15L	R15L A + R33R D	23	0.0%	89	0.0%	0	0.0%
15R	R15R A + R33L D	43,606	10.2%	32,240	12.1%	44,338	16.7%
22L	R22L A + R4R D	69,805	16.3%	48,121	18.1%	69,463	26.1%
22R	R22R A + R4L D	6,285	1.5%	3,185	1.2%	4,293	1.6%

Table I-18 Runway Usage by Runway End

Runway End	Operation(s)[1]	2019		2021		2022	
		Total Flights	% of Total[2]	Total Flights	% of Total[2]	Total Flights	% of Total[2]
27	R27 A + R9 D	103,191	24.2%	51,966	19.5%	90,070	33.9%
32	R32 A + R14 D	6,822	1.6%	1,584	0.6%	5,913	2.2%
33L	R33L A + R15R D	38,607	9.0%	33,924	12.8%	27,471	10.3%
33R	R33R A + R15L D	1,615	0.4%	601	0.2%	475	0.2%
All		427,176	100.0%	266,034	100.0%	378,613	142.3%

Source: Massport radar data and HMMH 2023

Notes: N/A – not applicable.

Runway 14-32 is unidirectional: there are no arrivals to Runway 14 and no departures from Runway 32. The 15 operations shown in this row for 2016 are non-jet departures which were most likely erroneously associated with Runway 32 by the computer algorithm.

1 A=Arrivals; D=Departures.

2 Percentages are rounded to the nearest tenth.

I.2.5 Flight Tracks

The AEDT pre-processor converts each radar track to an AEDT model track and then models the scaled aircraft operation on that track. This method keeps the modeled 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 pre-processor system. **Table I-19** lists the number of flight tracks used in the modeling process for 2021 and 2022. A sample of flight tracks from 2021 and 2022 are displayed in **Figure 7-5** through **Figure 7-11** in Chapter 7, *Noise*.

Table I-19 Total Count of Flight Tracks Modeled with AEDT (2021 and 2022)

	Runway											
	4L	4R	9	14	15L	15R	22L	22R	27	32	33L	33R
2022												
Departures	3,579	7,614	48,62	0	0	8,469	3,366	63,30	11,028	0	42,40	0
Arrivals	7,975	50,21	0	0	0	1,696	61,45	715	40,93	5,892	18,817	474
2021												
Departures	2,369	5,886	30,35	0	0	7,225	2,560	39,61	16,76	0	26,92	0
Arrivals	1,989	32,63	0	0	88	4,959	41,94	713	21,23	1,574	26,51	596
2019												
Departures	5,392	7,660	60,00	0	1	8,481	3,042	59,89	23,54	0	41,22	0
Arrivals	13,149	52,05	0	0	23	1,421	58,33	819	39,151	6,634	28,22	1,610

Source: Massport's Harris Noise and Operational Monitoring System (NOMS) data and HMMH, 2023

I.3 Annual Noise Model Results

I.3.1 Noise Exposed Population

Table I-20 presents the noise-exposed population by community through 2022. This table includes population within the DNL 60 to 65 dB contour interval, although DNL 65 dB is the federally defined noise criterion used as a guideline to identify when residential land use is considered incompatible with aircraft noise. The population assessments for 2022 use 2020 U.S. Census data.

As noted in the *2017 Environmental Status and Planning Report* (*2017 ESPR*), the method for calculating population impact was refined for the 2017 analysis. Historically, the population calculations were developed by the noise model (AEDT or INM) or by GIS software by adding the populations of U.S. Census blocks within each contour level. A block was considered to be within the contour if the center location (or centroid) was within the DNL contour. The weakness of that method arises from the fact that the population of a U.S. Census block is distributed throughout the block, not clustered at its centroid. Blocks on the edge of the contour were either entirely included or entirely excluded from the count, but in reality, some fraction of the block's population resides within the contour.

The updated method (adopted for the *2017 ESPR* and continued since) determines the fraction of the area of the U.S. Census block that is within the contour and multiplies the block population by this fraction to determine the population exposed to DNL 65 dB or greater for that block. This more accurately represents the included population within U.S. Census blocks that are on the DNL contour boundary. This proportional method, while still an approximation, also better addresses the more obscure problem of oddly shaped blocks whose centroid is outside the block boundary.

When comparing population impact assessment across multiple years, it should be noted that the population estimation is affected by the noise model used to create the contours. As discussed in the *2016 EDR*, AEDT-modeled contours are smaller than the INM-modeled contours, which included FAA-approved over-water effects, hill effects, and custom altitude profiles. Consequently, population calculations based on AEDT contours result in smaller exposed populations.

Table I-20 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	N/A
1992	1980	0	0	800	4,316	5,116	N/A
1993	1980	0	0	264	2,820	3,084	N/A
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	2000	0	0	234	9,014	9,248	35,785
2001	2000	0	0	315	6,515	6,700	27,778
2002	2000	0	0	132	2,625	2,757	23,225
2003	2000	0	0	164	1,730	1,894	21,763
2004 [4]	2000	0	65	192	4,142	4,399	24,473
2005 [4]	2000	0	65	104	2,020	2,189	17,661
2006 [4]	2000	0	65	99	1,054	1,218	14,866
2007 [4,5]	2000	0	0	169	4,094	4,263	21,446
2008 [4,5]	2000	0	5	0	3,487	3,492	18,890
2009 [4,5]	2000	0	5	67	937	1,009	12,284
2010 [4,5]	2010	0	0	0	689	689	17,646
2011 [4,5]	2010	0	0	0	331	331	11,600
2012 [4,5]	2010	0	0	0	421	421	11,037
2013 [4,5]	2010	0	0	0	612	612	14,835
2014 [4,5]	2010	0	0	34	4,151	4,185	23,343
2015 [4,5]	2010	0	0	110	7,225	7,365	32,309
2016 [4,5]	2010	0	0	0	4,031	4,031	20,806

Table I-20 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
2017 [4,5]	2010	0	0	14	4,720	4,734	24,595
2018 [4,5]	2010	0	0	11	2,228	2,239	23,445
2019 [4,5]	2010	0	0	7	4,029	4,036	25,163
2020 [4,5]	2020	0	0	0	60	60	7,946
2021 [4,5]	2020	0	0	0	885	885	9,473
2022 [4,5]	2020	0	0	0	3,862	3,862	17,804
CHELSEA							
1990	1980	0	0	0	4,813	4,813	N/A
1992	1980	0	0	0	3,952	3,952	N/A
1993	1980	0	0	0	0	0	N/A
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	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 [4,5]	2000	0	0	0	0	0	9,774
2008 [4,5]	2000	0	0	0	0	0	7,793
2009 [4,5]	2000	0	0	0	0	0	5,462
2010 [4,5]	2010	0	0	0	0	0	4,897
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	3,485
2014 [4,5]	2010	0	0	0	0	0	9,236
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	12,110
2017 [4,5]	2010	0	0	0	65	65	13,900
2018 [4,5]	2010	0	0	0	0	0	10,526

Table I-20 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
2019 [4,5]	2010	0	0	0	0	0	12,650
2020 [4,5]	2020	0	0	0	0	0	721
2021 [4,5]	2020	0	0	0	0	0	4,708
2022 [4,5]	2020	0	0	0	0	0	13,683
EVERETT							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
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	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 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	924
2018 [4,5]	2010	0	0	0	0	0	0
2019 [4,5]	2010	0	0	0	0	0	0
2020 [4,5]	2020	0	0	0	0	0	0

Table I-20 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
2021 [4,5]	2020	0	0	0	0	0	0
2022 [4,5]	2020	0	0	0	0	0	0
MEDFORD							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
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	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 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	0
2018 [4,5]	2010	0	0	0	0	0	0
2019 [4,5]	2010	0	0	0	0	0	0
2020 [4,5]	2020	0	0	0	0	0	0
2021 [4,5]	2020	0	0	0	0	0	0
2022 [4,5]	2020	0	0	0	0	0	0

Table I-20 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
QUINCY							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
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	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 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	0
2018 [4,5]	2010	0	0	0	0	0	0
2019 [4,5]	2010	0	0	0	0	0	0
2020 [4,5]	2020	0	0	0	0	0	0
2021 [4,5]	2020	0	0	0	0	0	0
2022 [4,5]	2020	0	0	0	0	0	0

Table I-20 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
REVERE							
1990	1980	0	0	0	4,274	4,274	N/A
1992	1980	0	0	0	3,848	3,848	N/A
1993	1980	0	0	0	4,617	4,617	N/A
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	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 [4,5]	2000	0	0	0	2,450	2,450	2,853
2008 [4,5]	2000	0	0	0	2,434	2,434	1,802
2009 [4,5]	2000	0	0	0	2,512	2,512	1,452
2010 [4,5]	2010	0	0	0	2,413	2,413	2,473
2011 [4,5]	2010	0	0	0	2,547	2,547	3,123
2012 [4,5]	2010	0	0	0	2,762	2,762	3,191
2013 [4,5]	2010	0	0	0	2,505	2,505	2,791
2014 [4,5]	2010	0	0	0	2,832	2,832	3,829
2015 [4,5]	2010	0	0	0	3,789	3,789	3,385
2016 [4,5]	2010	0	0	0	2,376	2,376	3,508
2017 [4,5]	2010	0	0	0	2,362	2,362	2,899
2018 [4,5]	2010	0	0	0	2,362	2,362	2,899
2019 [4,5]	2010	0	0	0	3,484	3,484	3,733
2020 [4,5]	2020	0	0	0	641	641	3,983
2021 [4,5]	2020	0	0	0	1,260	1,260	3,669
2022 [4,5]	2020	0	0	0	3,416	3,416	3,904

Table I-20 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
WINTHROP							
1990	1980	0	676	1,211	2,420	4,307	N/A
1992	1980	0	626	1,146	2,488	4,262	N/A
1993	1980	0	648	1,211	1,773	3,632	N/A
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	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 [4,5]	2000	0	0	247	1,139	1,386	6,749
2008 [4,5]	2000	0	0	244	1,409	1,653	6,547
2009 [4,5]	2000	0	0	171	643	814	4,221
2010 [4,5]	2010	0	0	130	598	728	3,720
2011 [4,5]	2010	0	0	130	939	1069	4,303
2012 [4,5]	2010	0	0	200	1,186	1,386	5,305
2013 [4,5]	2010	0	0	130	1,060	1,190	5,466
2014 [4,5]	2010	0	0	130	1,775	1,905	6,456
2015 [4,5]	2010	0	0	320	2,623	2,943	6,375
2016 [4,5]	2010	0	0	130	913	1,403	5,062
2017 [4,5]	2010	0	0	125	647	772	4,656
2018 [4,5]	2010	0	0	51	1,170	1,221	5,586
2019 [4,5]	2010	0	0	96	1,152	1,248	5,621
2020 [4,5]	2020	0	0	0	103	103	1,901
2021 [4,5]	2020	0	0	0	352	352	2,106
2022 [4,5]	2020	0	0	27	880	907	4,848

Table I-20 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
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[3]	1990	0	411	1,900	20,838	23,149	64,379
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 [4,5]	2000	0	0	416	7,683	8,099	40,822
2008 [4,5]	2000	0	5	244	7,330	7,579	35,122
2009 [4,5]	2000	0	5	238	4,092	4,335	23,419
2010 [4,5]	2010	0	0	130	3,700	3,830	28,736
2011 [4,5]	2010	0	0	130	3,817	3,947	19,026
2012 [4,5]	2010	0	0	200	4,369	4,569	19,533
2013 [4,5]	2010	0	0	130	4,177	4,307	26,577
2014 [4,5]	2010	0	0	164	8,758	8,922	42,864
2015 [4,5]	2010	0	0	430	13,667	14,097	52,748
2016 [4,5]	2010	0	0	130	7,320	7,450	41,486
2017 [4,5]	2010	0	0	139	7,794	7,933	46,974
2018 [4,5]	2010	0	0	62	6,972	7,034	43,270
2019 [4,5]	2010	0	0	103	8,665	8,768	47,167

Table I-20 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
2020 [4,5]	2020	0	0	0	804	804	14,551
2021 [4,5]	2020	0	0	0	2,497	2,497	19,956
2022 [4,5]	2020	0	0	27	8,158	8,185	40,239

Source: Data prepared for Massport by HMMH 2022
Notes: dB – decibel; DNL - Day-Night Average Sound Level; N/A – not available.
1 65 dB DNL is the federally defined noise criterion.
2 Boston includes portions of Dorchester, East Boston, Roxbury, South Boston, and the South End.
3 Boston population by community changed in 1999 due to employment of more accurate hill effects methodology and reporting change.
4 All results from 2004 to 2015 are from the RealContours™ modeling system with INM.
All results from 2016 to 2022 are from AEDT using the proprietary pre-processor.
5 2022 noise analyses used AEDT version 3e, 2020 and 2021 used AEDT version 3d, 2018 and 2019 used AEDT version 3c, 2017 used AEDT version 2d, 2016 used AEDT version 2c SP2, 2015 through 2012 used INM version 7.0d, 2011 used INM version 7.0c, 2008 through 2010 used INM version 7.0b, 2007 used INM version 7.01, and 1990 and 2000 used earlier versions of INM.

I.3.2 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 experienced at the Airport over a full year of operation, weighted similarly to DNL so that activity occurring at night is weighted by adding an extra 10 dB to each event. This weighting is mathematically equivalent to multiplying the number of nighttime events by each aircraft by a factor of ten. 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 (see **Table I-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, with changes from year to year on the order of a few tenths of a decibel. The 2022 total CNI remains well below the cap of 156.5 EPNL.

Table I-22 shows the relative contribution of each airline to total CNI. The table provides the number of flight operations, the contribution to CNI by airline, and the partial CNI per operation for 2019, 2021 and 2022. The data reflect the contributions of individual aircraft noise levels and the frequency with which they occur. The table is sorted by the partial CNI per operation for 2022 and shows a mix of mostly international carriers and cargo operators at the top of this list. This is due to the higher proportion of nighttime operations among these carriers, as well as the operation of larger and/or older (nosier) aircraft.

JetBlue Airways, with the largest number of operations, has the highest total CNI per airline at 148.1 EPNdB in 2019, 144.3 in 2020, and 146.8 in 2022, but its partial CNI per operation is below the other major airlines, partly due to its use of newer, quieter aircraft. The cargo airline with the most operations at Logan Airport is Federal Express (FedEx). Regional carriers generally contribute the least to the partial CNI per operation whereas the international carriers, which typically operate larger aircraft and generally have more operations at night, are usually at the top of the list. The relative positions for the domestic carriers are due mainly to their fleet characteristics and number of night operations.

Table I-21 Cumulative Noise Index (EPNL) – 1990 to 2022 (limit 156.5)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
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
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
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
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
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
Total Stage 2 Jets	N/A	N/A	N/A	N/A	151.0	150.2	149.4	149.2	147.7	147.1	124.7	121.5
Total Stage 3 Jets	N/A	N/A	N/A	N/A	153.4	153.8	153.8	153.4	153.8	154.2	154.7	154.1
Daytime Stage 2	N/A	N/A	N/A	N/A	149.0	148.5	147.6	146.5	145.2	144.1	122.6	119.3
Nighttime Stage 2	N/A	N/A	N/A	N/A	146.7	145.1	144.8	145.8	144.1	144.0	120.5	117.3
Daytime Stage 3	N/A	N/A	N/A	N/A	149.1	148.8	148.7	148.8	148.9	149.2	149.5	149.0
Nighttime Stage 3	N/A	N/A	N/A	N/A	151.4	152.1	152.2	151.5	152.1	152.5	153.1	152.4
Passenger Jet Stage 2	N/A	N/A	N/A	N/A	150.5	149.9	149.2	148.9	147.5	146.8	124.2	116.3
Passenger Jet Stage 3	N/A	N/A	N/A	N/A	152.2	152.3	152.3	152.2	152.6	153.0	153.6	152.9
Cargo Jet Stage 2	N/A	N/A	N/A	N/A	141.5	137.4	136.8	137.4	139.0	134.5	114.8	119.9
Cargo Jet Stage 3	N/A	N/A	N/A	N/A	147.3	148.5	148.3	147.0	147.3	147.9	148.2	147.8
Daytime Passenger	N/A	152.0	152.2	152.0	152.0	151.5	151.1	150.6	150.1	150.1	149.3	148.7
Nighttime Passenger	N/A	151.6	150.9	150.6	150.8	151.0	151.0	151.1	151.2	151.6	151.6	150.8
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
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
Daytime Passenger Stage 2	N/A	N/A	N/A	N/A	148.9	148.4	147.6	146.5	145.0	143.9	122.3	115.0

Table I-21 Cumulative Noise Index (EPNL) – 1990 to 2022 (limit 156.5)

Daytime Passenger Stage 3	N/A	N/A	N/A	N/A	149.0	148.5	148.4	148.5	148.6	149.0	149.2	148.7
Nighttime Passenger Stage 2	N/A	N/A	N/A	N/A	149.0	148.5	148.4	148.5	142.8	143.7	119.8	110.2
Nighttime Passenger Stage 3	N/A	N/A	N/A	N/A	149.4	149.9	150.1	149.8	150.5	150.8	151.6	150.8
Daytime Cargo Stage 2	N/A	N/A	N/A	N/A	128.3	126.7	124.6	126.4	131.6	131.5	111.1	117.3
Daytime Cargo Stage 3	N/A	N/A	N/A	N/A	135.3	137.7	136.4	135.7	136.9	137.1	137.5	137.0
Nighttime Cargo Stage 2	N/A	N/A	N/A	N/A	141.3	137.0	136.5	137.0	138.2	131.5	112.3	116.4
Nighttime Cargo Stage 3	N/A	N/A	N/A	N/A	147.0	148.1	148.0	146.6	146.9	147.5	147.8	147.4

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Full CNI (Entire Commercial Jet Fleet)	153.2	152.7	153.4	153.2	152.6	152.7	152.9	152.3	151.9	152.1	152.2
Total Passenger Jets	151.8	151.3	152.2	152.1	151.4	151.5	151.9	151.1	150.9	150.6	151.3
Total Cargo Jets	147.4	147.1	147.0	146.6	146.5	146.4	146.1	145.9	145.1	146.7	144.9
Total Daytime	148.5	148.0	148.5	148.2	147.5	147.2	147.6	147.1	146.8	146.9	147.0
Total Nighttime	151.3	150.9	151.7	151.6	151.0	151.2	151.4	150.7	150.3	150.6	150.6
Total Stage 2 Jets	114.3	114.1	118.1	--	--	--	--	--	113.6	110.8	104.9
Total Stage 3 Jets	153.2	152.7	153.4	153.2	152.0	152.7	152.9	152.3	151.9	152.1	152.2
Daytime Stage 2	111.2	113.7	109.4	--	--	--	--	--	103.6	N/A	104.9
Nighttime Stage 2	111.4	103.2	117.5	--	--	--	--	--	113.1	110.8	--
Daytime Stage 3	148.5	148.0	148.5	148.2	147.5	147.2	147.6	147.1	146.8	146.9	147.0
Nighttime Stage 3	151.3	150.9	151.7	151.6	151.0	151.2	151.4	150.7	150.3	150.6	150.6
Passenger Jet Stage 2	--	--	--	--	--	--	--	--	--	--	104.9
Passenger Jet Stage 3	151.8	151.3	152.2	152.1	151.4	151.5	151.9	151.1	150.9	150.6	151.3
Cargo Jet Stage 2	114.3	114.1	118.1	--	--	--	--	--	113.6	110.8	--
Cargo Jet Stage 3	147.4	147.1	147.0	146.6	146.5	146.4	146.1	145.9	145.1	146.7	144.9

Table I-21 Cumulative Noise Index (EPNL) – 1990 to 2022 (limit 156.5)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Daytime Passenger	148.2	147.7	148.2	147.9	147.2	146.9	147.3	146.8	146.6	146.5	146.8
Nighttime Passenger	149.4	148.8	150.0	150.1	149.3	149.7	150.0	149.1	149.0	148.5	149.4
Daytime Cargo	137.0	136.2	135.7	135.8	135.5	135.8	135.8	135.2	134.5	136.6	134.0
Nighttime Cargo	147.0	146.8	146.7	146.2	146.1	146.0	145.6	145.5	144.7	146.3	144.5
Daytime Passenger Stage 2	--	--	--	--	--	--	--	--	--	--	104.9
Daytime Passenger Stage 3	148.2	147.7	148.2	147.9	147.2	146.9	147.3	146.8	146.6	146.5	146.8
Nighttime Passenger Stage 2	--	--	--	--	--	--	--	--	--	--	--
Nighttime Passenger Stage 3	149.4	148.8	150.0	150.1	149.3	149.7	150,.0	149.1	149.0	148.5	149.4
Daytime Cargo Stage 2	111.2	113.7	109.4	--	--	--	--	--	103.6	--	--
Daytime Cargo Stage 3	137.0	136.1	135.7	135.8	135.5	135.8	135.8	135.2	134.4	136.6	134.0
Nighttime Cargo Stage 2	111.4	103.2	117.5	--	--	--	--	--	113.1	110.8	--
Nighttime Cargo Stage 3	147.0	146.8	146.7	146.2	146.1	146.0	145.6	145.5	144.7	146.3	144.5
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Diff '19-'22**
Full CNI (Entire Commercial Jet Fleet)	152.3	152.9	152.7	152.6	153.1	153.4	153.5	150.3	151.5	152.8	-0.7
Total Passenger Jets	151.4	151.7	152.0	152.0	152.6	153.0	153.1	149.4	150.9	152.5	-0.6
Total Cargo Jets	145.1	144.5	144.2	143.8	143.4	142.9	143.0	143.1	142.7	142.2	-0.8
Total Daytime	147.0	147.1	147.2	147.0	147.5	147.6	147.7	144.9	145.8	147.6	-0.1
Total Nighttime	150.8	151.0	151.2	151.2	151.7	152.1	152.2	148.9	150.1	151.3	-0.9
Total Stage 2 Jets	111.3	--	--	--	--	--	--	--	--	N/A	N/A
Total Stage 3 Jets	152.3	152.5	152.7	152.6	153.1	153.4	153.5	150.3	151.5	152.8	-0.7
Daytime Stage 2	101.4	--	--	--	--	--	--	--	--	#N/A	N/A

Table I-21 Cumulative Noise Index (EPNL) – 1990 to 2022 (limit 156.5)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Diff '19-'22
Nighttime Stage 2	110.8	--	--	--	--	--	--	--	--	#N/A	N/A
Daytime Stage 3	147.0	147.1	147.2	147.0	147.5	147.6	147.7	144.9	145.8	147.6	-0.1
Nighttime Stage 3	150.8	151.0	151.2	151.2	151.7	152.1	152.2	148.9	150.1	151.3	-0.9
Passenger Jet Stage 2	101.4	--	--	--	--	--	--	--	--	N/A	N/A
Passenger Jet Stage 3	151.4	151.7	152.0	152.0	152.6	153.0	153.1	149.4	150.9	152.5	-0.6
Cargo Jet Stage 2	110.8	--	--	--	--	--	--	--	--	N/A	N/A
Cargo Jet Stage 3	145.1	144.5	144.2	143.8	143.4	142.9	143.0	143.1	142.7	142.2	-0.8
Daytime Passenger	146.8	146.9	147.0	146.8	147.3	147.5	147.6	144.5	145.4	147.4	-0.2
Nighttime Passenger	149.6	150.0	150.3	150.4	151.1	151.6	151.7	147.7	149.4	150.8	-0.9
Daytime Cargo	133.6	134.9	134.4	133.8	133.9	133.6	133.4	133.8	134.9	134.3	0.9
Nighttime Cargo	144.8	144.0	143.7	143.4	142.8	142.3	142.5	142.6	142.0	141.4	-1.1
Daytime Passenger Stage 2	101.4	--	--	--	--	--	--	--	--	N/A	N/A
Daytime Passenger Stage 3	146.8	146.9	147.0	146.8	147.3	147.5	147.6	144.5	145.4	147.4	-0.2
Nighttime Passenger Stage 2	--	--	--	--	--	--	--	--	--	0.0	N/A
Nighttime Passenger Stage 3	149.6	150.0	150.3	150.4	151.1	151.6	151.7	147.7	149.4	150.8	-0.9
Daytime Cargo Stage 2	--	--	--	--	--	--	--	--	--	0.0	N/A
Daytime Cargo Stage 3	133.6	134.9	134.4	133.8	133.9	133.6	133.4	133.8	134.9	134.3	0.9
Nighttime Cargo Stage 2	110.8	--	--	--	--	--	--	--	--	0.0	N/A
Nighttime Cargo Stage 3	144.8	144.0	143.7	143.4	142.8	142.3	142.5	142.6	142.0	141.4	-1.1

Source: HMMH, 2022

Notes: CNI – cumulative noise index; EPNL - Effective Perceived Noise Level; N/A indicates information not available; dashes indicate no aircraft in that category General aviation (GA) aircraft and non-jet aircraft are not included in the calculations. Negative numbers are shown in parentheses ( ).

Table I-22 Annual Operations and Partial CNI by Airline and per Operation, 2019, 2021, and 2022

Airlines with more than 100 flights in 2022	Airline Group	Operations			Total Airline CNI (EPNdB)			Partial CNI (EPNdB) per Operation		
		2019	2020	2022	2019	2020	2022	2019	2020	2022
El Al Israel Airlines Ltd.	International	296	N/A	164	131.4	N/A	128.6	106.7	N/A	106.5
ABX Air, Inc.	Cargo	N/A	10	147	N/A	0.0	126.5	N/A	0.0	104.8
United Parcel Service, Inc.	Cargo	2,096	2,183	2,114	138.9	138.2	137.7	105.7	104.8	104.5
Federal Express Corporation	Cargo	3,775	4,892	4,722	140.3	140.2	139.9	104.5	103.3	103.1
British Airways, PLC	International	2,650	991	1,703	135.0	128.0	134.6	100.8	98.1	102.3
Kalitta Air (Cargo)	Cargo	N/A	316	349	N/A	128.8	127.3	N/A	103.8	101.9
Hawaiian Airlines	Domestic	426	380	422	132.2	129.5	128.1	105.9	103.7	101.8
Emirates	International	N/A	456	702	N/A	128.4	130.3	N/A	101.8	101.8
IBERIA, Líneas Aéreas de España, S.A.	International	859	158	696	127.1	121.0	128.2	97.7	99.1	99.8
Lufthansa German Airlines	International	1,703	867	1,446	131.3	124.3	131.3	99.0	94.9	99.7
KLM Royal Dutch Airlines	International	263	304	364	123.1	123.8	125.0	98.9	98.9	99.4
Delta Air Lines, Inc.	Domestic	42,218	28,826	46,893	144.6	144.2	145.9	98.3	99.6	99.1
Southwest Airlines Co.	Domestic	19,907	8,916	10,535	141.7	138.1	139.1	98.7	98.6	98.9
Virgin Atlantic Airways, Ltd.	International	N/A	391	670	N/A	122.9	126.9	N/A	97.0	98.7
Turk Hava Yollari A.O.	International	N/A	500	742	N/A	126.3	127.4	N/A	99.3	98.7
Compañía Panameña de Aviación S.A.	International	962	283	228	124.3	118.8	122.2	94.5	94.3	98.6

Table I-22 Annual Operations and Partial CNI by Airline and per Operation, 2019, 2021, and 2022

Airlines with more than 100 flights in 2022	Airline Group	Operations			Total Airline CNI (EPNdB)			Partial CNI (EPNdB) per Operation		
		2019	2020	2022	2019	2020	2022	2019	2020	2022
Alaska Airlines, Inc.	Domestic	5,920	2,882	4,404	137.3	134.6	134.8	99.6	100.0	98.4
Swiss International Air Lines Ltd.	International	978	328	804	130.1	123.3	127.4	100.2	98.1	98.3
Condor Flugdienst GmbH	International	N/A	N/A	104	N/A	N/A	118.5	N/A	N/A	98.3
United Air Lines, Inc.	Domestic	N/A	14,393	22,123	N/A	139.6	141.7	N/A	98.0	98.2
American Airlines, Inc.	Domestic	50,333	28,474	41,255	144.7	143.0	144.3	97.7	98.5	98.1
Spirit Airlines, Inc.	Domestic	9,838	5,689	6,717	136.5	136.0	136.4	96.6	98.5	98.1
SATA Internacional	International	809	409	648	125.3	123.3	126.1	96.2	97.2	97.9
Frontier Airlines, Inc.	Domestic	1,211	1,036	1,489	128.1	126.2	129.6	97.3	96.1	97.8
Qatar Airways	International	730	528	728	130.4	124.5	125.8	101.8	97.3	97.2
jetBlue Airways Corporation	Domestic	114,091	61,898	91,803	148.1	145.5	146.8	97.6	97.6	97.2
Aer Lingus Limited	International	1,860	655	1,910	129.5	124.2	130.0	96.8	96.0	97.2
Italia Trasporto Aereo S.p.A.	International	N/A	N/A	484	N/A	N/A	123.9	N/A	N/A	97.0
Transportes Aereos Portugueses S.A.	International	N/A	526	965	N/A	125.4	126.7	N/A	98.1	96.8
Icelandair	International	1,044	1,122	1,450	130.0	127.0	127.8	99.8	96.5	96.2
Korean Air Lines Co., Ltd.	International	367	314	366	121.1	122.1	121.8	95.5	97.1	96.2

Table I-22 Annual Operations and Partial CNI by Airline and per Operation, 2019, 2021, and 2022

Airlines with more than 100 flights in 2022	Airline Group	Operations			Total Airline CNI (EPNdB)			Partial CNI (EPNdB) per Operation		
		2019	2020	2022	2019	2020	2022	2019	2020	2022
Jazz Air Inc.	International	2,922	2,274	4,166	126.2	125.3	131.7	91.6	91.7	95.5
Societe Air France	International	856	616	961	126.5	124.5	125.0	97.2	96.6	95.2
Scandinavian Airlines of North America, Inc.	International	369	N/A	389	123.2	N/A	120.8	97.5	N/A	94.9
Fly Play Corp	International	N/A	N/A	453	N/A	N/A	121.4	N/A	N/A	94.8
Republic Airlines	Domestic	21,832	29,990	46,247	137.7	139.3	141.4	94.4	94.6	94.8
Sun Country Inc	Domestic	288	358	416	118.8	119.5	120.3	94.2	93.9	94.1
Air Canada (Signature)	International	1,908	20	625	126.2	0.0	121.9	93.4	0.0	93.9
WestJet Airlines Ltd.	International	N/A	N/A	144	N/A	N/A	115.4	N/A	N/A	93.8
SkyWest Airlines	Domestic	4,880	250	782	132.9	118.2	122.6	96.0	94.2	93.7
Allegiant Air	Domestic	7	1,063	1,154	0.0	123.6	123.9	0.0	93.3	93.3
Endeavor Air	Domestic	10,520	2,973	4,621	133.9	128.3	129.8	93.7	93.6	93.2
Envoy Airlines	Domestic	396	528	2,039	116.0	119.7	125.7	90.0	92.5	92.7
Japan Airlines Co., Ltd.	International	728	644	730	123.1	125.0	120.8	94.5	97.0	92.2
Piedmont Airlines	Domestic	3,087	1,439	2,955	126.8	122.1	125.2	91.9	90.5	90.5

Source: Massport and HMMH, 2023.
Notes: CNI – Cumulative Noise Index
N/A Not available; airline had no operations at Logan Airport in that year
Operations for some carriers differ to those in Chapter 3, *Activity Levels and Forecasting*, and Chapter 8, *Air Quality and Greenhouse Gas Emissions*, because this table only includes jet aircraft and not turboprops, and because it includes both scheduled and unscheduled air carriers.

I.3.3 Dwell and Persistence Reporting

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 end combinations for computing the effects of dwell and persistence on the communities, as shown in **Table I-23**. As required by Massport's commitments for the Logan Airside Improvements Planning Project,[21] this *2022 ESPR* reports on noise dwell and persistence levels. Higher levels of dwell or persistence for over-water areas represent a benefit since this produces a corresponding decrease in total hours overpopulated areas. **Figure I-14** and **Figure I-15** illustrate the annual hours of dwell and persistence by runway end for 2018 through 2022, with 2010 and 2015 hours included for reference. The data accounts for the time the runway configuration was in use and does not necessarily represent operations on those runways.

The graphics indicate that areas to the north of the Airport (Orient Heights and Revere; arrivals to Runways 22L or 22R or departures from Runways 4L or 4R) as well as the peninsula immediately to the east of the Airport (Winthrop; arrivals to Runway 27 or departures from Runway 9) experience prolonged periods of overflights more often than other areas. Evaluating the analysis results against the goal of reducing excessive dwell and persistence as much as possible, the results for 2022 in both graphs show a more equitable distribution than in other recent years.

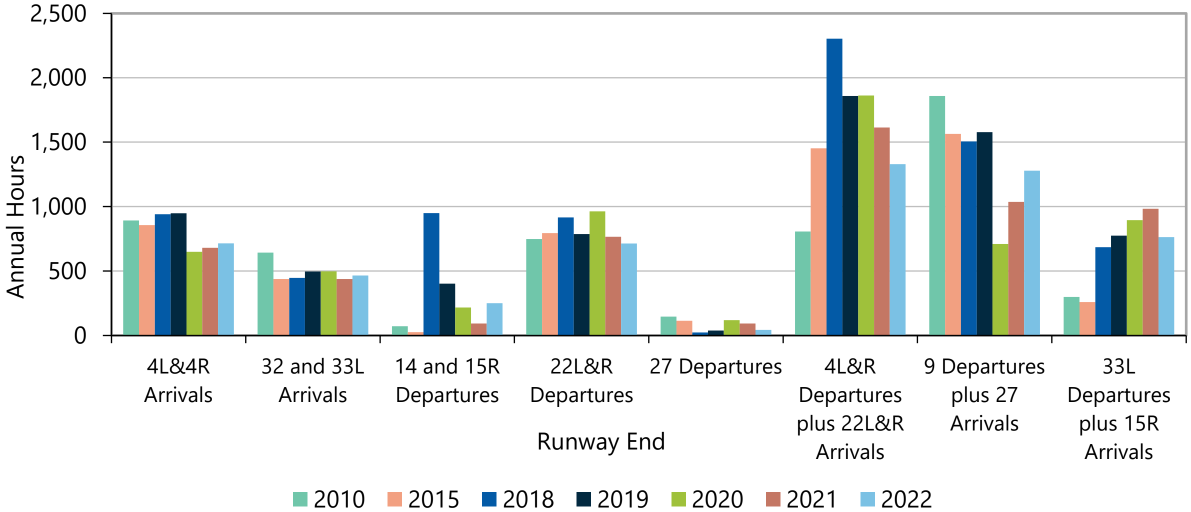
Table I-23 Representative Neighborhoods near Logan Airport Subject to Overflights

Runway	Representative 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 other South Shore locations
14 and 15R Departures	Boston Harbor, Hull, Cohasset, Hingham, Scituate, and other South Shore locations
22L and 22R Departures	South Boston (Farragut Street), Boston Harbor, Hull, Cohasset, Hingham, Scituate, and other South Shore locations
27 Departures	South Boston (Fan Pier), Roxbury, Jamaica Plain, South End, West Roxbury, Roslindale, Brookline, Hyde Park, and other points South and West
4L/4R Departures, 22L/22R Arrivals	East Boston (Bayswater, Orient Heights), Winthrop (Court Road), Revere, and Nahant
9 Departures and 27 Arrivals	Winthrop (Point Shirley), Boston Harbor, and other points North
33L Departures and 15R Arrivals	East Boston (Eagle Hill), Chelsea, Everett, Medford, Somerville, Arlington, Cambridge, Belmont, and other points South and West

Source: Massport.

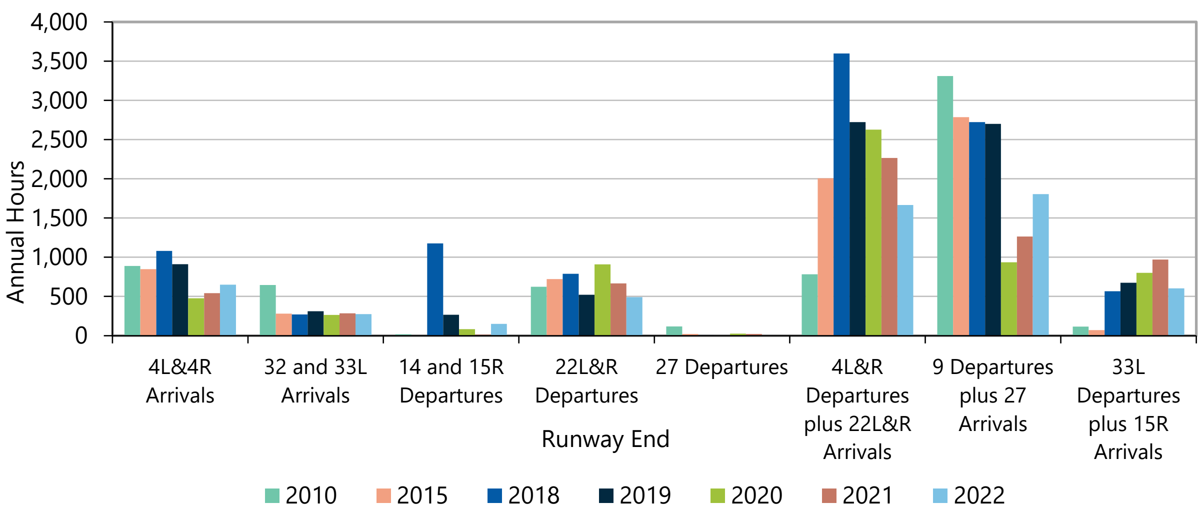
21 U.S. DoT, FAA. 2002. Logan Airside Improvements Planning Project Final Environmental Impact Statement.

Figure I-14 Comparison of Annual Hours of Dwell Exceedance by Runway End



Source: HMMH, 2023.

Figure I-15 Comparison of Annual Hours of Persistence Exceedance by Runway End



Source: HMMH, 2023.

I.3.4 Time Above (TA) and Time Above Night (TAN)

Massport annually reports the amount of time that aircraft noise is above each of three predefined threshold sound levels for each of the thirty community noise monitor locations. The measure is referred to as TA, and the threshold sound levels used in the analysis are 65, 75, and 85 dBA. Like DNL values. These times are computed using the AEDT model for an annual average 24-hour day as well as for the average nine-hour nighttime period (10:00 PM to 7:00 AM). The threshold sound levels of 65, 75, and 85 dBA correlate to levels that may cause speech interference, as discussed in The Effects of Aircraft Noise on People section of this appendix. **Table I-24** and **Table I-25** present a summary of the AEDT-calculated TA values for 2019, 2021, and 2022 at each of the monitor locations.

Table I-24 Time Above (TA) dBA Thresholds in a 24-Hour Period for Average Day

Site[1]	Distance[2] (mi)	Minutes above Threshold									Modeled DNL (dB)[3]		
		2019			2021			2022			2019	2021	2022
		85 dBA	75 dBA	65 dBA	85 dBA	75 dBA	65 dBA	85 dBA	75 dBA	65 dBA			
1	3.7	0.0	0.1	16.2	0.0	0.1	10.4	0.0	0.0	6.8	56.4	52.2	52.4
2	2.9	0.0	1.6	25.0	0.0	0.8	16.0	0.0	0.9	11.3	59.7	55.5	56.2
3	2.5	0.0	2.7	72.7	0.0	0.4	38.5	0.0	1.8	71.8	61.8	58.0	60.5
4	1.6	8.0	45.7	116.0	3.9	22.6	56.8	8.1	41.0	97.0	71.8	69.0	71.2
5	1.9	0.1	15.4	94.2	0.0	8.9	46.3	0.0	16.4	81.2	64.9	61.7	64.6
6	0.8	0.0	0.9	61.6	0.0	1.1	42.1	0.0	0.9	53.8	62.4	60.0	61.7
7	1.0	0.7	9.5	101.3	0.1	6.4	68.6	0.6	8.7	98.4	67.3	63.5	65.4
8	1.6	0.0	3.2	44.4	0.0	2.0	28.1	0.0	3.2	42.5	62.1	59.0	61.2
9	1.3	1.0	25.4	89.7	0.2	16.5	59.5	0.9	24.9	81.9	68.8	65.9	67.9
10	1.3	0.0	4.9	52.1	0.0	3.0	34.7	0.0	4.6	50.0	62.8	59.7	61.8
11	1.8	0.0	0.8	14.0	0.0	0.4	8.7	0.0	0.8	12.1	57.6	54.6	56.7
12	1.2	0.1	9.7	91.9	0.0	5.2	58.6	0.0	9.3	90.9	66.0	62.6	64.7
13	1.9	0.1	8.8	46.8	0.0	5.9	31.2	0.0	12.8	50.2	63.9	61.5	64.2
14	1.2	0.0	3.5	38.6	0.0	0.3	38.1	0.0	0.2	47.0	61.8	58.6	60.2
15	2.8	0.8	24.7	58.8	0.0	1.5	25.6	0.0	4.5	39.4	61.6	59.1	61.1
16	2.4	0.0	0.9	53.5	0.4	15.9	38.2	0.9	25.4	57.1	69.2	66.7	68.7
17	5.3	0.0	0.0	0.2	0.0	0.5	33.9	0.0	1.0	52.7	61.8	59.1	61.0
18	5.9	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.2	45.9	43.1	45.0
19	8.7	0.0	0.0	13.0	0.0	0.0	0.1	0.0	0.0	0.3	45.5	43.0	44.7
20	8.4	0.0	0.0	14.3	0.0	0.0	7.9	0.0	0.0	12.8	56.4	53.5	55.5
21	4.5	0.0	0.1	11.3	0.0	0.1	10.2	0.0	0.0	14.1	55.0	53.5	54.8
22	6	0.0	0.0	20.8	0.0	0.0	4.6	0.0	0.1	10.1	54.6	51.5	53.8
23	6.3	0.0	0.0	7.8	0.0	0.0	10.2	0.0	0.0	18.4	55.9	53.0	54.7
24	8.1	0.0	0.0	0.2	0.0	0.0	3.5	0.0	0.0	6.3	54.0	51.3	52.9
25	4.2	0.0	0.1	29.9	0.0	0.0	0.2	0.0	0.0	0.1	50.5	46.8	48.9
26	6	0.0	0.0	12.7	0.0	0.0	21.0	0.0	0.0	22.7	59.7	57.9	58.3
27	5.3	0.0	0.0	3.2	0.0	0.1	7.8	0.0	0.0	5.8	54.8	50.7	50.9

Table I-24 Time Above (TA) dBA Thresholds in a 24-Hour Period for Average Day

Site[1]	Distance[2] (mi)	Minutes above Threshold									Modeled DNL (dB)[3]		
		2019			2021			2022			2019	2021	2022
		85 dBA	75 dBA	65 dBA	85 dBA	75 dBA	65 dBA	85 dBA	75 dBA	65 dBA			
28	7.7	0.0	0.0	0.2	0.0	0.0	1.7	0.0	0.0	1.5	51.6	47.4	47.9
29	7.3	0.0	0.2	15.6	0.0	0.0	0.0	0.0	0.0	0.2	48.6	44.5	45.4
30	1.5	0.0	3.5	38.6	0.0	0.1	10.5	0.0	0.1	10.4	59.0	55.7	57.3
Average TA Value[4]		0.4	5.3	38.7	0.2	3.1	23.8	0.2	0.4	34.9	59.0	56.0	57.6

Source: HMMH, 2023

Notes: dBA - A-weighted decibel; dB – decibel; DNL - Day-Night Average Sound Level.

1 Site numbers correlate with the Figure 7-16 map and the addresses listed in Table 7-8

2 Distance from Logan Airport calculated from the Airport Reference Point.

3 2019 modeled with AEDT version 3c, 2020 with version 3d, and 2022 with version 3e.

4 Arithmetic average includes all noise monitoring sites.

Table I-25 Time Above (TA) dBA Thresholds in a Nine Hour Night Period for Average Day[3]

Site[1]	Distance[2] (mi)	Minutes above Threshold									Modeled DNL (dB)[4]		
		2019			2021			2022			2019	2021	2022
		85 dBA	75 dBA	65 dBA	85 dBA	75 dBA	65 dBA	85 dBA	75 dBA	65 dBA			
1	3.7	0.0	0.0	4.1	0.0	0.0	1.1	0.0	0.0	0.7	56.4	52.2	52.4
2	2.9	0.0	0.5	6.1	0.1	0.1	1.6	0.0	0.1	1.2	59.7	55.5	56.2
3	2.5	0.0	0.1	10.5	0.0	0.0	4.4	0.0	0.2	9.9	61.8	58.0	60.5
4	1.6	1.2	5.7	15.4	2.2	2.2	6.1	1.2	5.7	13.2	71.8	69.0	71.2
5	1.9	0.0	1.8	11.8	0.7	0.7	4.4	0.0	2.0	11.0	64.9	61.7	64.6
6	0.8	0.0	0.2	10.8	0.2	0.2	5.5	0.0	0.1	6.7	62.4	60.0	61.7
7	1	0.2	1.6	20.9	0.7	0.7	9.1	0.1	1.1	13.1	67.3	63.5	65.4
8	1.6	0.0	0.5	10.4	0.2	0.2	5.0	0.0	0.4	5.9	62.1	59.0	61.2
9	1.3	0.2	6.1	18.9	3.0	3.0	8.5	0.1	3.5	11.3	68.8	65.9	67.9
10	1.3	0.0	0.6	10.9	0.3	0.3	5.3	0.0	0.6	6.8	62.8	59.7	61.8
11	1.8	0.0	0.1	2.2	0.0	0.0	0.7	0.0	0.1	1.5	57.6	54.6	56.7
12	1.2	0.1	2.6	19.5	1.0	1.0	10.2	0.0	1.1	11.3	66.0	62.6	64.7
13	1.9	0.1	1.7	7.5	1.1	1.1	4.5	0.0	1.5	6.0	63.9	61.5	64.2
14	1.2	0.0	0.1	11.7	0.0	0.0	4.1	0.0	0.0	5.8	61.8	58.6	60.2
15	2.8	0.0	0.9	6.0	0.5	0.5	3.6	0.0	0.5	4.8	61.6	59.1	61.1
16	2.4	0.2	6.1	13.6	3.1	3.1	6.7	0.1	3.7	8.3	69.2	66.7	68.7
17	5.3	0.0	0.2	13.4	0.1	0.1	6.7	0.0	0.1	7.7	61.8	59.1	61.0
18	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.9	43.1	45.0
19	8.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	45.5	43.0	44.7

Table I-25 Time Above (TA) dBA Thresholds in a Nine Hour Night Period for Average Day[3]

Site[1]	Distance[2] (mi)	Minutes above Threshold									Modeled DNL (dB)[4]		
		2019			2021			2022			2019	2021	2022
		85 dBA	75 dBA	65 dBA	85 dBA	75 dBA	65 dBA	85 dBA	75 dBA	65 dBA			
20	8.4	0.0	0.0	3.9	0.0	0.0	1.9	0.0	0.0	1.9	56.4	53.5	55.5
21	4.5	0.0	0.0	2.5	0.0	0.0	1.6	0.0	0.0	1.7	55.0	53.5	54.8
22	6	0.0	0.0	2.2	0.0	0.0	1.1	0.0	0.0	1.2	54.6	51.5	53.8
23	6.3	0.0	0.0	3.0	0.0	0.0	1.9	0.0	0.0	2.7	55.9	53.0	54.7
24	8.1	0.0	0.0	1.1	0.0	0.0	0.6	0.0	0.0	0.9	54.0	51.3	52.9
25	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.5	46.8	48.9
26	6	0.0	0.0	9.3	0.0	0.0	6.3	0.0	0.0	3.2	59.7	57.9	58.3
27	5.3	0.0	0.0	3.2	0.0	0.0	0.8	0.0	0.0	0.6	54.8	50.7	50.9
28	7.7	0.0	0.0	0.9	0.0	0.0	0.2	0.0	0.0	0.2	51.6	47.4	47.9
29	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.6	44.5	45.4
30	1.5	0.0	0.0	4.0	0.0	0.0	1.3	0.0	0.0	1.3	59.0	55.7	57.3
Average TA		0.1	1.0	7.5	0.4	0.4	3.4	0.1	0.7	4.6	59.0	56.0	57.6

Source: HMMH, 2023

Notes: dBA - A-weighted decibel; dB – decibel; DNL - Day-Night Average Sound Level.

1 Site numbers correlate with the Figure 7-16 map and the addresses listed in Table 7-8.

2 Distance from Logan Airport calculated from the Airport Reference Point.

3 Nine-hour nighttime period from 10:00 PM – 7:00 AM.

4 2019 modeled with AEDT version 3c, 2020 with version 3d, and 2022 with version 3e.

5 Arithmetic average includes all noise monitoring sites.

I.4 Status of Mitigation Programs

I.4.1 Residential Sound Insulation Program

As discussed in Chapter 7, *Noise*, Massport has been working to restart its residential sound insulation program (RSIP). In 2022, no new dwelling units received sound insulation from Massport. A total of 5,467 residential buildings and 11,515 dwelling units have been sound insulated since 1986 when the program was first implemented. **Table I-26** lists the yearly progress of this mitigation effort.

Following 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 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 for $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 allowed Massport to continue the program with yearly additional funds through 2014.

The Logan Airside Improvements Project incorporated runway use changes due to the new Runway 14-32 which opened in late November 2006. The Logan Airside Improvements Project update expanded the focus of the sound insulation program into Chelsea to satisfy the mitigation commitments made in the Airside Improvements Program Record of Decision (ROD). Massport also contacted property owners that were still eligible within the RSIP boundaries that had previously declined to participate; those owners were offered a second chance to participate in the program.

As of 2015, the FAA requires airports to use the AEDT model to establish eligibility for sound insulation; therefore, Massport has been working with the FAA to develop a Noise Exposure Map (NEM) contour (including block rounding). The FAA accepted Massport's 2020 Noise Exposure Map in December, 2021, allowing Massport to move forward with the RSIP.

Table I-26 Residential Sound Insulation Program (RSIP) Status (1986-2022)

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
2011	62	114

Table I-26 Residential Sound Insulation Program (RSIP) Status (1986-2022)

Construction Year	Residential Buildings[1]	Dwelling Units[2]
20123	0	0
2013	45	76
2014	48	106
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	0	0
2022	0	0
Total	**5,467**	**11,515**

Source: Massport, 2022

1 Includes multiple units.

2 Individual units.

3 Federal funding was delayed in 2012.

Table I-27 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 I-27 Schools Treated Under Massport Sound Insulation Program

Boston: 27 total	**Winthrop: 3 total**
East Boston: 13 total	Winthrop Jr. High School
East Boston High	E. B. Newton
St. Mary's Star of the Sea	A. T. Cummings (Ctr.) School
St. Dominic Savio High	Revere: 1 total
St. Lazarus	Beachmont School
James Otis	**Chelsea: 5 total**
Samuel Adams	Shurtleff School
Curtis Guild	Williams School
Dante Alighieri	Chelsea High School
P.J. Kennedy	St. Rose Elementary
Donald McKay	St. Stanislaus
Hugh Roe O'Donnell	**Total Schools: 36**
E Boston Central Catholic	
Manassah Bradley	
South Boston: 6 total	
St. Augustine	
Cardinal Cushing	
Patrick Gavin	
St. Bridgid's	
Oliver Hazard Perry	
Condon School	
Roxbury and Dorchester: 8 total	
Samuel Mason	
Dearborn Middle	
Ralph Waldo Emerson	
Lewis Middle	
Nathan Hale Elem.	
Phillis Wheatley Elem.	
Davis Ellis Elem.	
Henry L. Higginson	

Source: Massport, 2015.

I.4.2 Noise Complaints

Table I-28 presents a detailed list by community of the total noise complaints made in 2019, 2021 and 2022, which can be filed either on Massport's Noise Complaint Line, through a form on Massport's website, or through the PublicVue flight track portal. 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[22] ask a range of questions such as "Why is this runway being used?"; "What time 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 FAA will receive a copy of the report.

In 2022, Massport received 272,943 noise complaints from 80 communities, an increase from 269,867 noise complaints from 84 communities in 2021. The number of individual complainants increased from 1,204 callers in 2021 to 1,301 callers in 2022. The increase in complaints from 2021 to 2022 was about 1 percent, with an increase in the number of individual callers of roughly 8 percent.

Recent technological advances in both Massport's noise complaint phone system and online complaint tracking system, as well as the incorporation of third-party complaint applications, have made it easier for community members to file a complaint and to receive information about particular noise events. In late 2018, Massport added the option to submit complaints through the Airnoise button[23] which has dramatically increased complaints logged in the system. In 2019, the average number of complaints per individual caller (the ratio of calls to callers) was 100.8. This ratio increased to an average 232 complaints per caller for 2020 and was an average 224 complaints per caller in 2021. In 2022, there were, on average, 210 complaints per caller.

Figure I-17 shows the call and callers data graphically. Massport's website, http://www.massport.com/logan-airport/about-logan/noise-abatement/complaints/), provides for additional general questions and answers regarding the Noise Complaint Line.

22 For clarity, the people logging the complaints are referred to here as "callers" despite most complaints arriving electronically (as opposed to by telephone calls).

23 Airnoise is a subscription service that allows the user to file an online noise complaint by clicking a button. The system finds the aircraft closest to the complainer and then files a detailed noise complaint directly with Massport. https://www.airnoise.io/

Table I-28 Noise Complaint Line Summary

Town Name	2019		2021		2022		Change in number of calls, 2021 to 2022	Change in number of calls, 2019 to 2022
	Calls	Callers	Calls	Callers	Calls	Callers		
Abington	0	0	1	1	0	0	-1	0
Allston	0	0	77	2	6	2	-71	6
Arlington	7,021	77	10,017	30	11,276	58	1,259	4,255
Ayer	0	0	49	1	0	0	-49	0
Belmont	1,132	41	1,152	32	920	47	-232	-212
Beverly	13	6	38	5	36	5	-2	23
Billerica	2	2	2	1	0	0	-2	-2
Boston	162	27	70	28	430	29	360	268
Boxford	10	4	0	0	1	1	1	-9
Braintree	126	5	2	2	1,010	5	1,008	884
Brighton	0	0	0	0	1	1	1	1
Brookline	2	2	3	2	2	2	-1	0
Burlington	0	0	1	1	0	0	-1	0
Cambridge	1,958	142	629	50	1,214	68	585	-744
Canton	5	2	1	1	4	3	3	-1
Carlisle	0	0	1	1	0	0	-1	0
Charlestown	65	14	20	10	51	19	31	-14
Chelmsford	1,931	2	1,201	3	1,093	1	-108	-838
Chelsea	1,605	47	232	15	103	35	-129	-1,502
Cohasset	975	9	732	5	571	4	-161	-404
Danvers	2	2	3	2	39	2	36	37
Dedham	2	2	2	1	0	0	-2	-2
Dorchester	28	15	37	15	19	11	-18	-9
Dover	8	1	1	1	2	2	1	-6
Duxbury	287	2	8	1	23	1	15	-264
East Boston	3,803	70	139	49	191	56	52	-3,612
East Bridgewater	0	0	1	1	0	0	-1	0
Easton	0	0	0	0	12	1	12	12
Essex	4	2	0	0	1	1	1	-3
Everett	58	23	8	5	18	12	10	-40
Framingham	8	1	13	2	28	2	15	20
Gloucester	2	2	0	0	30	1	30	28
Grafton	7	2	0	0	1	1	1	-6
Hamilton	187	11	1	1	3	3	2	-184
Hingham	15	6	66	3	6	4	-60	-9
Holbrook	1	1	4	1	1	1	-3	0

Table I-28 Noise Complaint Line Summary

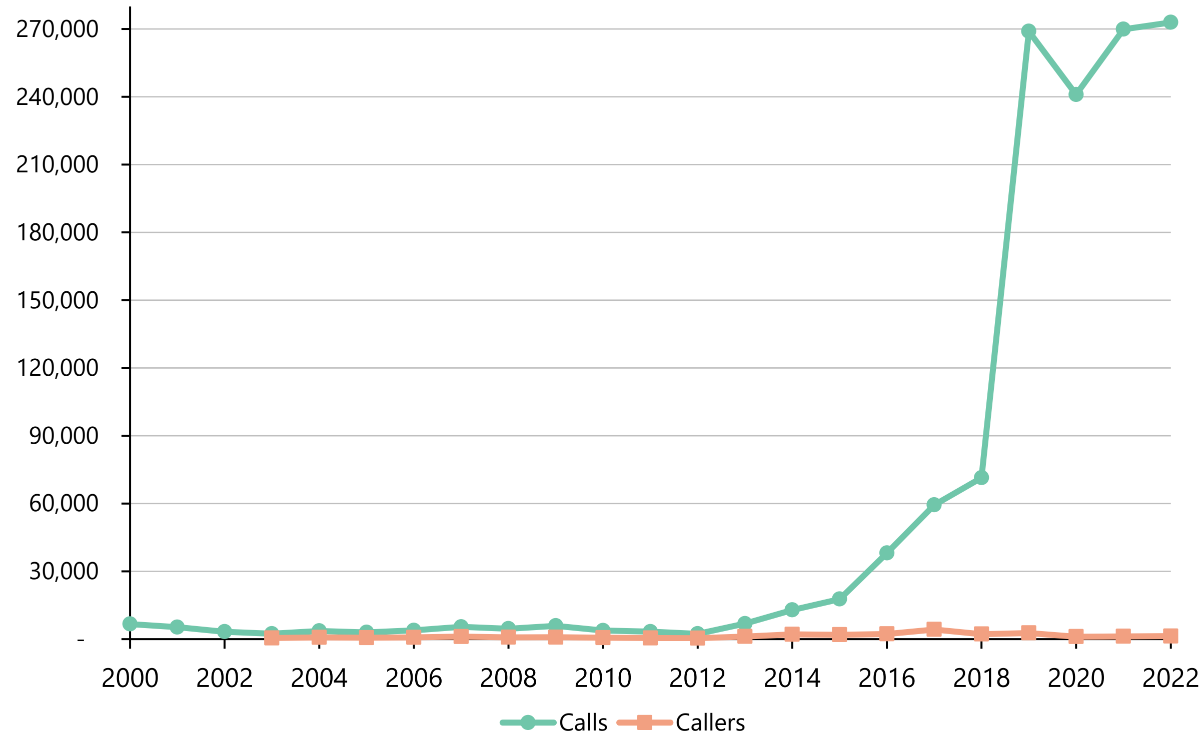
Town Name	2019		2021		2022		Change in number of calls, 2021 to 2022	Change in number of calls, 2019 to 2022
	Calls	Callers	Calls	Callers	Calls	Callers		
Holliston	0	0	1	1	0	0	-1	0
Hopkinton	0	0	0	0	1	1	1	1
Hull	1,047	97	796	31	650	33	-146	-397
Hyde Park	1,514	11	11	5	7	2	-4	-1,507
Ipswich	139	8	2	2	16	2	14	-123
Jamaica Plain	17,132	108	1,975	56	224	30	-1,751	-16,908
Lawrence	0	0	0	0	332	1	332	332
Littleton	0	0	0	0	1	1	1	1
Lynn	60	21	64	16	72	18	8	12
Malden	15,414	34	6,324	24	3,265	9	-3,059	-12,149
Marblehead	1,291	14	2,742	16	2,807	6	65	1,516
Marlborough	0	0	11	1	3	1	-8	3
Marshfield	5	4	5	3	20	6	15	15
Medford	98,021	712	102,182	210	73,912	211	-28,270	-24,109
Melbourne	0	0	2	1	0	0	-2	0
Melrose	1,967	4	1,488	3	1,008	2	-480	-959
Middleton	5	2	0	0	7	2	7	2
Millis	12	1	8	1	1	1	-7	-11
Milton	41,575	219	17,454	77	17,420	110	-34	-24,155
Nahant	73	20	219	36	134	26	-85	61
Needham	9	3	49	2	1	1	-48	-8
Newington	5	1	38	1	153	2	115	148
Newton	208	18	124	6	38	11	-86	-170
North Andover	0	0	72	1	0	0	-72	0
North Easton	0	0	0	0	19	1	19	19
Norton	2	2	3	1	3	2	0	1
Norwell	2	1	3	2	7	2	4	5
Peabody	29	10	24	4	11	8	-13	-18
Pepperell	0	0	1	1	0	0	-1	0
Princeton	0	0	1	1	0	0	-1	0
Quincy	7	6	12	5	21	8	9	14
Randolph	3	3	0	0	6	1	6	3
Reading	1	1	47	1	2	2	-45	1
Revere	291	95	12,389	29	10,200	27	-2,189	9,909
Roslindale	2,975	78	4,157	40	350	16	-3,807	-2,625
Roxbury	5,151	24	3,548	21	1,586	6	-1,962	-3,565

Table I-28 Noise Complaint Line Summary

Town Name	2019		2021		2022		Change in number of calls, 2021 to 2022	Change in number of calls, 2019 to 2022
	Calls	Callers	Calls	Callers	Calls	Callers		
Salem	82	16	176	8	326	12	150	244
Saugus	1	1	2	2	0	0	-2	-1
Scituate	946	5	0	0	4	3	4	-942
Somerville	28,070	229	26,565	108	40,372	155	13,807	12,302
South Boston	448	48	53	27	25	18	-28	-423
South End	5,309	27	359	14	3,347	7	2,988	-1,962
Stoneham	3	3	2	1	-23	0	-2	-3
Stoughton	65	1	23	1	0	0	-23	-65
Sudbury	21	2	5	2	0	0	-5	-21
Swampscott	8	6	24	15	16	7	-8	8
Tewksbury	0	0	1	1	0	0	-1	0
Topsfield	33	2	6	1	0	0	-6	-33
Upton	0	0	0	0	1	1	1	1
Wakefield	23	2	6	2	30	1	24	7
Waltham	3	3	1	1	2	2	1	-1
Watertown	3,709	28	2,710	18	3,661	28	951	-48
Wellesley	0	0	1	1	0	0	-1	0
Wenham	537	5	39	2	479	5	440	-58
West Roxbury	5,239	27	1,097	11	50	8	-1,047	-5,189
Westford	0	0	9	1	0	0	-9	0
Weston	0	0	1	1	1	1	0	1
Westwood	192	2	0	0	1	1	1	-191
Weymouth	152	7	183	4	696	6	513	544
Whitman	0	0	0	0	1	1	1	1
Winchester	9,143	15	15,329	19	8,466	9	-6,863	-677
Winthrop	8,121	201	54,166	85	84,748	103	30,582	76,627
Woburn	387	8	846	9	1,346	5	500	959
Total	268,929	2,669	269,867	1,204	272,943	1,301		

Source: Massport, HMMH 2023.
Note: Negative numbers are shown in parentheses ( ).

Figure I-17 Noise Complaint Line Calls and Callers by Year



Source: Massport and HMMH, 2023.

I.4.3 Noise and Operations Monitoring System

Massport installed its first automated monitoring system in 1973, which consisted of 12 fixed remote noise monitors (expanded to 18 in 1980), data acquisition and reporting software, a teletype-style printer, a public display panel consisting of lights on a map representing the locations of the noise monitors and analog displays indicating the real-time noise level at each noise monitor, and a separate system to monitor and record Automated Terminal Information Service (ATIS) transmissions and radio communications between the pilots and Air Traffic Control Tower staff with a time-search capability to research aircraft reported to cause community annoyance.

In 1989, Massport awarded a contract to Larson Davis Laboratories (LD) to install a fully integrated Noise and Operations Monitoring System (NOMS), which included 36 fixed remote noise monitors (30 installed to measure noise from aircraft operating at BOS and 6 for BED), 20 wind speed and direction sensors installed select noise monitoring sites (18 for BOS and two for BED), three humidity and temperature sensors installed at select noise monitoring sites (two for BOS and one for BED), two portable noise monitoring kits, hourly airport weather data, runway operating configuration data, flight track and aircraft identification data for aircraft operating at BOS, software running on servers at BOS and BED, and an independent public web portal providing 10-minute-delayed flight tracks.

In 2004, Massport began to replace the NOMS with their current hosted system, which was completed in 2008. The system is being maintained and supported by the Harris Corporation (now Passur) and consists of the following principal components:

- Noise monitoring installations at 30 locations in the BOS environs and six locations in the BED environs. All 36 installations include a Brüel & Kjaer Model 3639 permanent noise monitor equipped with B&K Model 4952 microphones and other required permanent monitor elements (e.g., wind screen, cabling, batteries, power supplies, mounting pole elements, equipment enclosures, etc.). All 36 B&K permanent noise monitors capture 1/3 octave-band levels and audio recordings for the noise events. The system downloads these monitors via dial-up telephone connections, over analog telephone lines at 31 installations, and via cellular connections at the remaining installations.
- LD Model 2140 wind velocity (speed and direction) monitors at 20 of the monitoring sites (18 BOS and 2 BED).
- LD Model 2142 humidity and temperature sensors at three of the monitoring sites (two BOS and one BED).
- Two portable noise monitoring equipment sets, including a B&K Model 2250 analyzer equipped with B&K Model 4189 microphones and UA1404 preamplifiers.
- Hourly weather data (time, sky condition, wind direction, wind speed, and wind gust speed) collected by an automated weather observation station at BOS, imported from WSI Corporation each business day via a dial-up telephone connection, using an MS-DOS command line interface.
- Runway operating configuration data manually entered into the system from ATCT records.
- The Flight operations data is provided by Harris via a real-time connection to the NextGen data link. For BED the NextGen data link is augmented with information obtained from the Harris multi-lateration flight track sensors.
- A hosted web-based software application, Symphony EnvironmentalVue, provided by Harris for use at BOS and BED offices. During nighttime hours when the BOS and BED offices are not staffed, Plane Noise accepts and processes aircraft noise complaints.
- The Harris Symphony PublicVue web portal for the community to view near real-time flight operations, replay flight operations and submit aircraft noise complaints.

Massport evaluated the current system in early 2018 and went out to bid for an upgraded NOMS in late 2018. The prior vendor (L3Harris) was selected and in 2019, L3Harris began upgrading the system, including additional reports and the option for Virtual Noise Monitors (VNM). Massport has replaced the equipment for all permanent noise monitors. The monitor at Site 1 was removed in May 2017; Massport (in collaboration with the South End community) relocated Site 1 to the Union Park Street Playground in April 2023.

I.4.4 Airbus A320 Vortex Generators

Vortex Generator Device by Port on Wing

Massport encourages operators to use idle or reduced reserve thrust during landing, and to retrofit the Airbus A319/320/321 family of aircraft with vortex generators, which reduce tonal noise on approach. A vortex generator is a small device that disrupts wind over ports on the wing. Without the device, the wind can produce a "whistling" tone during the aircraft's approach into an airport. All Airbus A319/320/321 built after 2014 already come equipped with the Vortex Generator. United Airlines announced it was retrofitting its aircraft in 2017 as they went in for service. In a press release in October 2018, jetBlue Airways (the largest air carrier operator at Logan Airport) announced plans to retrofit its older Airbus fleet with Vortex Generators. The picture above shows an example of the device. American Airlines also completed the upgrade to their fleet. These changes reflect the partnership between Massport and the airlines to reduce aircraft noise to benefit surrounding communities. As airlines retrofit aircraft and transition to the newer models of the A320 family, the number of aircraft operating at Logan Airport without the vortex generators is expected to decrease.

I.4.5 FAA and Massport RNAV Pilot Project

Over the last several years, FAA implementation of Performance-Based Navigation (PBN) procedures – including RNAV – has resulted in a concentration of flights. On October 7, 2016, FAA signed a Memorandum of Understanding (MOU) with Massport[24] to frame the process for analyzing opportunities to reduce noise through changes or amendments to PBN. Massport worked with FAA and others to develop test projects designed to help address the concentration of noise from PBN. Massport proposed several ideas for a test program with FAA to better define the implications of flight concentration on the community. This program, supported by the FAA, studied possible strategies to address neighborhood concerns. This was a first-in-the-nation project between FAA and an airport operator that includes analyzing the feasibility of changes to some RNAV approaches and departures from Logan Airport. FAA and Massport committed to: (1) analyze the feasibility; (2) measure and model the benefits and impacts of changing some RNAV approaches; and (3) test and develop an implementation plan, which will include environmental analysis and community/public outreach.

24 Massport. October 7, 2016. Massport and FAA Work to Reduce Overflight Noise. https://www.massport.com/news-room/news/massport-and-faa-work-to-reduce-overflight-noise/.

The project was structured in two phases, or “blocks”. Block 1 recommendations were those that would not result in shifting noise from one area to another, and that would not have significant operational/technical implications. A report on Block 1 recommendations was completed in December 2017. Block 2 recommendations were those that could result in noise increases in some areas or face technical barriers that would require further review. The RNAV technical team, led by MIT, released the Block 2 report released in December 2021.

I.4.5.1 Block 1

Following the completion of Block 1, the Massport CAC voted to approve and recommend implementation of the four Block 1 procedures. On December 20, 2017, Massport sent a request for FAA review and implementation of the Block 1 recommendations. Massport provided a copy of the letter in the *2017 ESPR*. Two of the recommendations have not moved forward (restricting climb speed to 220 knots due to flyability issues and modifications to Runway 22 RNAV SIDs due to airspace conflicts). The other two recommendations have progressed; the development of an RNAV visual approach to Runway 33L and the modification of the Runway 15R RNAV SID which would shift departures further away from Hull. The Runway 33L RNAV approach is similar to the jetBlue Airways RNAV visual Special to Runway 33L already in place but would be a published procedure for all airlines to use. A copy of the Massport request to FAA from April 2017 was also published in the *2017 ESPR*. Since the Block 1 recommendations were sent, FAA and Massport have further refined the procedures and presented the FAA’s recommended options to the Massport CAC in January of 2020. On November 12, 2020, Massport submitted a request to the FAA for review and implementation of two procedures at Logan Airport. These include modifying the existing RNAV SID from Runway 15R to move tracks over water, and a new over-water Required Navigational Performance (RNP)[25] approach for users with the capability to utilize this more precise PBN procedure. A copy of the Block 1 letter is included as **Figure I-18**. The FAA completed development of these procedures and published the procedures in December 2021.

I.4.5.2 Block 2

The RNAV study team completed the evaluation of the Block 2 options in June 2021. Block 2 procedures were more complex due to potential operational/technical barriers or equity issues. Procedures considered as part of Block 2 were RNAV or RNP approaches to Runway 22L and Runway 4R, continuous descent RNAV profiles, heading-based departures from Runway 22L and Runway 22R, and dispersed headings from Runway 33L and 27. The Runway 33L, Runway 22L and Runway 22R departure concepts were presented to major airline representatives and FAA in May 2020.

At the request of the Massport CAC, FAA agreed to take an initial look at the feasibility of these options by August 2020. FAA assembled a panel of stakeholders consisting of representatives from the airline industry, the FAA Air Traffic Organization (Mission Support Services, Air Traffic Services, System

25 Required Navigational Performance (RNP) procedures provide a precise flight path both laterally and vertically for aircraft on approach.

Operations, and the National Air Traffic Controllers Association), the FAA Office of Environment and Energy, and FAA Flight Standards. FAA and industry stakeholders completed their initial review of the proposed procedures and determined that none of the procedures would be recommended for further evaluation.

The RNAV study team and FAA worked to revise several of the procedures for possible implementation and developed several additional procedures. Massport presented these during a public meeting in September 2021 and to the Massport CAC for review. Massport and MIT completed the RNAV study at the end of 2021 and the Massport CAC considered each measure during its December 2021 meeting. In January 2022, the Massport CAC put forth two of the procedures for further study and implementation by FAA. The Block 2 report can is available on the MIT website.[26] On January 19, 2022, Massport submitted a request to the FAA for review and implementation of two Block 2 procedures at Logan Airport. These include modifying the existing RNAV SID from Runways 22R and 22L to enable an earlier turn to the east and adding a new over-water RNAV approach for Runway 22L. A copy of the Block 2 letter is included as **Figure I-19**. Massport continues to coordinate with the Massport CAC, the FAA, and MIT on targeted, follow-on technical questions and reviews.

In 2022, Massport completed the study. The FAA's letter sunsetting the MOU is reproduced as **Figure I-20**.

26 MIT Libraries. Block 2 Procedure Recommendations for Boston Logan Airport Community Noise Reduction. September 8, 2021. https://dspace.mit.edu/handle/1721.1/131242.

Figure I-18 Massport Request to FAA for Block 1 Recommendations

massport

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

November 12, 2020

Colleen D'Alessandro
Regional Administrator
Federal Aviation Administration New England Region
1200 District Avenue
Burlington, MA 01803-5299

Re: Request to implement procedures at Boston Logan related to FAA\MPA MOU

Dear Ms. D'Alessandro:

Consistent with the Memorandum of Understanding (MOU) executed in September 2016 between the Federal Aviation Administration (FAA) and the Massachusetts Port Authority (Massport) related to Precision Based Navigation (PBN), I am writing to request that the FAA review and implement the following procedures at Boston Logan International Airport (Boston Logan):

- 1-D2 R15R RNAV SID Modification Final FAA Redesign. This procedure modifies the existing RNAV SID from R15R to move tracks overwater, away from populated areas.
- RNAV R33L RNP Only Option. This is a new overwater RNP approach for users with the capability to utilize this more precise PBN procedure.

These procedures were developed as part of the MOU which outlines the actions that Massport and the FAA intend to undertake in seeking reductions to overflight noise impacts of aircraft operations at Logan Airport that result from the FAA's implementation of NexGen PBN procedures including RNAV. These two procedures were originally designed by Massachusetts Institute of Technology (MIT), revised with FAA input, and approved by the Massport Community Advisory Committee (MCAC) at their quarterly meeting on November 5, 2020.

It is our hope that the FAA will be able to undertake final review and publish these procedures as expeditiously as possible.

On behalf of Massport, I want to thank the FAA for its commitment to this very important and unique study, the MIT team for their innovative technical work, and the MCAC for their constructive engagement. Please feel free to contact me directly or Flavio Leo, Director of Aviation Planning and Strategy, with any further questions.

Sincerely,

Edward C. Freni
Director of Aviation
Massachusetts Port Authority

Cc: K. Knopp (FAA), D. Carlon (MCAC), J. Hansman (MIT), L. Wieland, F. Leo, A. Coppola

Figure I-19 Massport Request to FAA for Block 2 Recommendations

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

January 19, 2022

Colleen D'Alessandro
Regional Administrator
Federal Aviation Administration New England Region
1200 District Avenue
Burlington, MA 01803-5299

Re: Request to implement Block 2 procedures at Boston Logan related to FAA and Massport MOU related to Precision Based Navigation (PBN)

Dear Ms. D'Alessandro:

Consistent with the Memorandum of Understanding (MOU) executed in September 2016 between the Federal Aviation Administration (FAA) and the Massachusetts Port Authority (Massport) related to Precision Based Navigation (PBN), I am writing to request that the FAA review and implement the following procedures at Boston Logan International Airport (Boston Logan):

- MIT Recommended 2-D1 (MCAC Motion 2-D1) Runway 22L/R RNAV SID. This procedure modifies the existing RNAV SID from R22L/R with speed restriction to enable an earlier turn to the east, shifting tracks north away from the Town of Hull.

- MIT Recommended 2A-1 (MCAC Motion 2A-1) new overwater RNAV approach for Runway 22L. This new approach crosses the Nahant Causeway from the east to join a 4-mile final to R22L. Consistent with the MCAC motion, Massport also requests an initial operational 12-month test. During the test, Massport will work closely with MIT and the FAA to collect appropriate data including noise complaints, weather, runway use, and radar flight tracks. We will also work with MIT to assess the feasibility to conduct aviation related noise measurements and report findings to the MCAC for review and feedback.

These procedures were developed as part of the MOU which outlines the actions that Massport and the FAA intend to undertake in seeking reductions to overflight noise impacts of aircraft operations at Logan Airport that result from the FAA's implementation of NexGen PBN procedures including RNAV. These two procedures were originally designed by Massachusetts Institute of Technology (MIT), revised with FAA input, and approved by the Massport Community Advisory Committee (MCAC) at their quarterly meeting on December 9, 2021 (see attached MCAC transmittal letter to Massport).

Figure I-20 Massport Request to FAA for Block 2 Recommendations (*continued*)

On behalf of Massport, I want to thank the FAA for its commitment to this very important and unique study, the MIT team for their innovative technical work, and the MCAC for their constructive engagement. We look forward to collaborating with you and MIT during the review and implementation process for these two procedures.

Please feel free to contact me directly or Flavio Leo, Director of Aviation Planning and Strategy, with any further questions.

Sincerely,

Edward C. Freni
Director of Aviation
Massachusetts Port Authority

Cc: K. Knopp (FAA); R. Bongiovanni (MCAC); J. Hansman (MIT); L. Wieland, A. Coppola, T. Butler, F. Leo (Massport)

Attachment

Figure I-21 FAA Letter to Massport, Sunsetting the MOU

U.S. Department of Transportation
Federal Aviation Administration

Office of the Regional Administrator
New England Region

1200 District Avenue
Burlington, MA 01803

June 27, 2022

Mr. Edward C. Freni
Director of Aviation
Massachusetts Port Authority
One Harborside Drive, Suite 2005
East Boston, MA 02128

Dear Mr. Freni:

The Memorandum of Understanding (MOU) between the Federal Aviation Administration (FAA) and the Massachusetts Port Authority (Massport), which was executed in September 2016, established a framework for cooperation between the parties to explore changes or amendments to Performance Based Navigation (PBN) procedures used by aircraft operating at Boston Logan International Airport (BOS).

Exploration and development of procedures was separated into two sequential blocks, known as Block 1 and Block 2. Block 1 publication occurred in December 2021. Block 1 changes included the approach procedure to runway 33L (BOS RNAV (RNP) X RWY 33L) and Standard Instrument Departure (SID) transitions from runway 15R (BLZZR5, BRUWN6, CELTK6, HYLND6, LBSTA7, PATSS6 and REVSS5). These procedure changes reduced impacts from aircraft noise, while maintaining the safety and efficiency benefits of PBN procedures at BOS.

Concerning Block 2, the Massachusetts Institute of Technology (MIT) report included four recommendations, two of which the Massachusetts Community Advisory Committee (MCAC)recommended for implementation—specifically, the Runway 22L/R RNAV SID and Runway 22L overwater RNAV Approach. Of the other two recommendations, one was rejected (Runway 33L departure) by the MCAC and one remains for further review by MCAC.

As part of our agency-wide focus on horizontal integration and community engagement, FAA facilitated and conducted internal and external outreach throughout the duration of the MOU. This outreach resulted in a strong partnership between the FAA, Massport, and the community. The MOU collaboration model amongst FAA, Massport, and the community was the first of its kind and was successful in developing workable solutions to community concerns. We also recognize the technical contributions of MIT and Harris Miller Miller & Hanson (HMMH) Inc. FAA continues to participate in community meetings with the leadership and members of the MCAC.

The FAA believes a positive working relationship has been developed between the parties and the community, and will continue through the consideration of the Block 2 procedures. In light of this progress, the FAA believes the purpose of the MOU has been met, and therefore pursuant to section 11 of the MOU, this letter conveys notice of termination of the MOU.

Figure I-20 FAA Letter to Massport, Sunsetting the MOU (continued)

The sun-setting of this MOU is a major accomplishment and is possible because of the partnership and positive collaboration and coordination between the parties and the community. The FAA looks forward to continued collaboration with Massport.

We are proud to move forward from this successful accomplishment and look forward to additional meaningful collaboration towards providing the safest most efficient aerospace system in the world.

Sincerely,

COLLEEN M D'ALESSANDRO

Digitally signed by COLLEEN M D'ALESSANDRO Date: 2022.06.27 12:15:42 -04'00'

Colleen M. D'Alessandro
Regional Administrator, New England Region

CC:
Lisa Wieland, Massport Chief Operating Officer
Flavio Leo, Massport Director Aviation Planning and Strategy
Gail Lattrell, FAA, Director New England Region Airports Division
Robert K. Jones, FAA, General Manager Boston District
Ryan Almasy, FAA, Director Eastern Service Center
Christopher Dorbian, FAA, Office of Environment and Energy
John Doyle, FAA, Attorney, Office of Chief Counsel

I.5 Flight Track Monitoring Report

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. However, as is true for any airport operator, Massport has no authority to control where individual aircraft fly. That remains the responsibility of FAA, while the individual pilots are responsible for safely executing 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 FAA's Tower Order (BOS TWR 7040.1).

Since 2002, Massport has prepared annual reports 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 1996 and was the subject of two Community Working Group workshops in September and October 1996. The information for 2020 and 2021 are repeated in this report for reference. The period covered by this *2022 ESPR* is January 1, 2022 through December 31, 2022.

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.

I.5.1 FAA Air Traffic Control (ATC) 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 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." Section 7.a.3 of the Order, subtitled "Turbojet Departure Noise Abatement Procedures," states that all turbojet departures shall be issued the Standard Instrument Departure (SID) procedure appropriate for the departure runway. Logan Airport has ten published SIDs; nine area navigation (RNAV) SIDs and one conventional SID.

The conventional SID is for aircraft that are not equipped to fly RNAV procedures. The conventional SID uses terms such as "BOS 2 DME" to indicate where aircraft should turn. Here, BOS refers to an aid to navigation known as the BOSTON VORTAC, a radio beacon physically located on Logan Airport near the eastern shoreline between the ends of Runways 27 and 33L (see **Figure I-21**). 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 BOS. Pilots are then "vectored" or assigned to fly a magnetic heading given by and at the discretion of FAA air traffic controller to maintain the safe separation of aircraft. All altitudes in feet listed below (unless otherwise noted) are in mean sea level (MSL) and indicate the aircraft altitude used both by the pilot in the cockpit and the air traffic controller on the ground.

During 2010, several of the conventional-only (or radar vector) and RNAV procedures from the *Boston Logan Airport Noise Study Categorical Exclusion* (CATEX)[27] were implemented. There are eight RNAV procedures for departures from Logan Airport. These eight procedures are used by aircraft departing Runways 4R, 9, 15R, 22L, 22R, 27, and 33L (Runways 27 and 33L were added in 2014). These procedures primarily affected departures flying over the North and South shores and were designed to increase the amount of jet traffic crossing back over land above 6,000 feet to minimize noise impacts to communities. A ninth RNAV procedure, which is used by Runway 27, has been modified several times.

Figure I-21 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 aircraft 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 analysis captures the direction of the flights (in or out of the gate). The edges of each gate in **Figure I-21** point in the direction that the aircraft is coming from. The gate analysis information is used to evaluate the performance of the flight procedures off each runway end.

The RNAV procedures are still captured by the original flight track monitoring gates. Traffic crossing over the North Shore passes through the Revere, Swampscott and Marblehead Gates and traffic passing over the South Shore passes through the Hull 2, Hull 3, and Cohasset Gates. Turbojets departing Runway 27 on the RNAV pass through the Runway 27 gates and the Runway 33L RNAV flight tracks pass between (rather than through) the Somerville and Everett gates. The following pages present the jet aircraft gate crossing data by departure runway.

27 Federal Aviation Administration (FAA) *Boston Logan Airport Noise Study Categorical Exclusion Record of Decision* (CATEX ROD), Issued October 16, 2007.

Figure I-21 Logan Airport Flight Track Monitor Gates

Source: HMMH, MassGIS, USDA NAIP 2010

Logan Airport Flight Track Monitor Gates

I.5.2 Statistical Analyses of Flight Tracks - Runway 4R

Jet aircraft departures from Runway 4R remain on runway heading until 4 DME and then turn right, crossing the Nahant causeway. They gain altitude over the water, and then, as needed, turn to cross the shoreline and proceed to their destinations. The Nahant Gate (shown in **Figure I-21**) 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 I-29 through **Table I-31** show that Runway 4R departures for 2022 were concentrated, with more than 99 percent "over the Causeway," and the remainder split between the north and south ends of the gate.

Table I-29 Runway 4R Nahant Gate Summary for 2020

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North End of Gate	9	0.2%
Over Causeway	4,505	99.5%
South End of Gate	12	0.3%
Total	4,526	100.0%

Source: Massport, HMMH 2022

Table I-30 Runway 4R Nahant Gate Summary for 2021

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North End of Gate	16	0.3%
Over Causeway	4,566	99.3%
South End of Gate	16	0.3%
Total	4,598	100.0%

Source: Massport, HMMH 2022

Table I-31 Runway 4R Nahant Gate Summary for 2022

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North End of Gate	21	0.3%
Over Causeway	6,081	99.4%
South End of Gate	13	0.2%
Total	6,115	100.0%

Source: Massport, HMMH 2023

Table I-32 through **Table I-34** show how many of the shoreline crossings from Runway 4R were above 6,000 feet. For 2020, 97.8 percent of the flights were above 6,000 feet compared to almost 96.5 percent in 2021 and 95.5 percent in 2022. The Swampscott gate had the lowest percent of flights above 6,000 feet due to its proximity to the Nahant gate; aircraft crossing the Swampscott gate make an immediate left turn after crossing the Nahant causeway. Generally, less than 20 percent of Swampscott gate crossings are above 6,000 feet; in 2020, it was 38 percent. Crossings of the other four shoreline gates achieved altitudes over 6,000 feet over 98 percent of the time in 2022.

Table I-32 Runway 4R Shoreline Crossings Above 6,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	52	20	38.5%
Marblehead Gate	1,438	1,410	98.1%
Hull 2 Gate	260	259	99.6%
Hull 3 Gate	1,029	1,025	99.6%
Cohasset Gate	135	135	100.0%
Total	2,914	2,849	97.8%

Source: Massport, HMMH 2022

Table I-33 Runway 4R Shoreline Crossings Above 6,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	102	15	14.7%
Marblehead Gate	1,800	1,780	98.9%
Hull 2 Gate	247	247	100.0%
Hull 3 Gate	745	744	99.9%
Cohasset Gate	189	188	99.5%
Total	3,083	2,974	96.5%

Source: Massport, HMMH 2022

Table I-34 Runway 4R Shoreline Crossings Above 6,000 Feet for 2022

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	155	20	12.9%
Marblehead Gate	2,333	2,291	98.2%
Hull 2 Gate	333	333	100.0%
Hull 3 Gate	814	814	100.0%
Cohasset Gate	307	307	100.0%
Total	3,942	3,765	95.5%

Source: Massport, HMMH 2023

I.5.3 Statistical Analyses of Flight Tracks - Runway 9

Jets departing from Runway 9 maintain runway heading and gain altitude before turning back to cross the shoreline and proceed to their destinations. The Winthrop 1 and Winthrop 2 gates (shown in **Figure I-21**) 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 I-35 through **Table I-37** show 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 2020 and 2021, 13 and 14 tracks crossed these gates respectively and in 2022, 25 tracks crossed these gates. The compliance rate for avoiding the early turns was 99.9 percent in 2020, 2021 and 2022.

Table I-35 Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2020

	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	8	<0.1%
Winthrop 2 Gate	5	<0.1%
Neither gate	16,543	99.9%
Total	16,556	100.0%

Source: Massport, HMMH 2022

Table I-36 Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2021

	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	8	<0.1%
Winthrop 2 Gate	6	<0.1%
Neither gate	27,038	99.9%
Total	27,052	100.0%

Source: Massport, HMMH 2022

Table I-37 Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2022

	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	13	<0.1%
Winthrop 2 Gate	12	<0.1%
Neither gate	45,310	99.9%
Total	45,335	100.0%

Source: Massport, HMMH 2023

Table I-38 through **Table I-39** indicate that over 99 percent of Runway 9 departures were above 6,000 feet when crossing the shoreline in 2020, 2021 and 2022. In 2022, approximately 69 percent of aircraft departing Runway 9 that cross back over the shoreline did so over the South Shore, as opposed to about 31 percent over the North Shore. Those percentages are close to what was observed in 2021 and recent previous years. In 2020, the split was approximately 59 percent over the south shore and 41 percent over the north shore, with significantly lower traffic levels.

Table I-38 Runway 9 Shoreline Crossings Above 6,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	11	9	81.8%
Swampscott Gate	307	307	100.0%
Marblehead Gate	4,296	4,291	99.9%
Hull 2 Gate	102	101	99.0%
Hull 3 Gate	1,642	1,615	98.4%
Cohasset Gate	4,778	4,773	99.9%
Total	11,136	11,096	99.6%

Source: Massport, HMMH 2021

Table I-39 Runway 9 Shoreline Crossings Above 6,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	40	31	77.5%
Swampscott Gate	412	376	91.3%
Marblehead Gate	5,862	5,836	99.6%
Hull 2 Gate	1,510	1,500	99.3%
Hull 3 Gate	2,427	2,370	97.7%
Cohasset Gate	8,798	8,786	99.9%
Total	19,049	18,899	99.2%

Source: Massport, HMMH 2020

Table I-40 Runway 9 Shoreline Crossings Above 6,000 Feet for 2022

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	24	11	45.8%
Swampscott Gate	773	715	92.5%
Marblehead Gate	9,451	9,413	99.6%
Hull 2 Gate	2,921	2,918	99.9%
Hull 3 Gate	5,220	5,121	98.1%
Cohasset Gate	14,971	14,959	99.9%
Total	33,360	33,137	99.3%

Source: Massport, HMMH 2023

I.5.4 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 over the shore through the Swampscott and Marblehead Gates (shown in **Figure I-21**) to the north, or through the Hull 2, Hull 3, and Cohasset Gates to the south. Massport uses the Hull 1 Gate to monitor departures from Runways 22R and 22L as well as from Runway 15R as they make their initial turn over Boston Harbor. The initial turn and success rate in avoidance of Hull overflights is shown in **Table I-41** through **Table I-43**. The percent of tracks from Runway 15R crossing north of the Hull peninsula as they passed through the Hull 1 Gate remained above 99 percent for 2020 through 2022.

Table I-41 Runways 15R Hull 1 Gate Summary for 2020

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull	5,830	99.8%
Over Hull	13	0.2%
Total	5,843	100.0%

Source: Massport, HMMH 2022

Table I-42 Runways 15R Hull 1 Gate Summary for 2021

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull	6,378	99.7%
Over Hull	22	0.3%
Total	6,400	100.0%

Source: Massport, HMMH 2022

Table I-43 Runways 15R Hull 1 Gate Summary for 2022

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull	7,782	99.7%
Over Hull	22	0.3%
Total	7,804	100.0%

Source: Massport, HMMH 2023

Table I-44 through **Table I-46** indicate that over 99 percent of Runway 15R departures were above 6,000 feet when crossing the shoreline in 2022. The proportion of flights over 6,000 feet is usually lowest at the Hull 3 gate, due to that gate's proximity to the runway end. Very few departures from Runway 15R cross back over the Hull 2 gate, which is even closer to the runway end and requires a tight turn with rapid climb to achieve.

Table I-44 Runway 15R Shoreline Crossings Above 6,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	190	189	99.5%
Marblehead Gate	1,290	1,289	99.9%
Hull 2 Gate	13	13	100.0%
Hull 3 Gate	308	297	96.4%
Cohasset Gate	2,062	2,061	100.0%
Total	3,863	3,849	99.6%

Source: Massport, HMMH 2022

Table I-45 Runway 15R Shoreline Crossings Above 6,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	133	132	99.2%
Marblehead Gate	1,401	1,401	100.0%
Hull 2 Gate	16	16	100.0%
Hull 3 Gate	322	299	92.9%
Cohasset Gate	2,175	2,174	100.0%
Total	4,047	4,022	99.4%

Source: Massport, HMMH 2022

Table I-46 Runway 15R Shoreline Crossings Above 6,000 Feet for 2022

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	213	211	99.1%
Marblehead Gate	1,737	1,734	99.8%
Hull 2 Gate	15	14	93.3%
Hull 3 Gate	230	207	90.0%
Cohasset Gate	2,224	2,219	99.8%
Total	4,419	4,385	99.2%

Source: Massport, HMMH 2023

I.5.5 Statistical Analyses of Flight Tracks - Runways 22R and 22L

Jet aircraft departures from Runways 22R and 22L make an immediate left turn. They gain altitude over the water, and then, as needed, turn to cross the shoreline and proceed to their destinations. The Squantum 2 and Hull 1 Gates (shown in **Figure I-21**) are used to monitor the turn to 140 degrees over Boston Harbor and then passage north of Hull. The shoreline gates are used to monitor shoreline crossings, as described for Runways 4R, 9, and 15R.

Table I-47 through **Table I-52** show the dispersion of the jet departures from Runways 22R and 22L as they pass through the Squantum 2 Gate. The first segment of the 27,000-foot-wide gate is the northernmost segment and is primarily over Boston Harbor. The subsequent segments extend southward toward Quincy. The percentage of tracks passing through the first two segments of this gate, representing compliance with the noise abatement procedures, is consistently about 93 percent.

Table I-47 Runways 22R and 22L Squantum 2 Gate[1] Summary for 2020

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	790	2.6%
12,000 - 14,000 ft	26,983	90.0%
14,000 - 21,000 ft	2,173	7.2%
21,000 - 27,000 ft	28	0.1%
Total	29,974	100.0%

Source: Massport, HMMH 2021
1 The 27000-foot-wide Squantum 2 Gate is divided into four segments, identified in this table by distance from the northernmost point.

,

Table I-48 Runways 22R and 22L Squantum 2 Gate[1] Summary for 2021

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	1,336	3.8%
12,000 - 14,000 ft	32,040	90.5%
14,000 - 21,000 ft	1,997	5.6%
21,000 - 27,000 ft	23	0.1%
Total	35,396	100.0%

Source: Massport, HMMH 2021

1 The 27,000-foot-wide Squantum 2 Gate is divided into four segments, identified in this table by distance from the northernmost point.

Table I-49 Runways 22R and 22L Squantum 2 Gate[1] Summary for 2022

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	3,854	6.6%
12,000 - 14,000 ft	52,589	89.5%
14,000 - 21,000 ft	2,296	3.9%
21,000 - 27,000 ft	31	0.1%
Total	58,770	100.0%

Source: Massport, HMMH 2023

1 The 27,000-foot-wide Squantum 2 Gate is divided into four segments, identified in this table by distance from the northernmost point.

Departures from Runways 22R and 22L Massport are also monitored by Hull 1 Gate as they make their initial turn over Boston Harbor. **Tables I-27a**, **I-27b** and **I-27c** show that the percent of tracks crossing north of the Hull peninsula as they passed through the Hull 1 Gate is consistently about 99

Table I-50 Runways 22R, and 22L Hull 1 Gate Summary for 2020

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	29,627	99.1%
Over Hull	280	0.9%
Total	29,907	100.0%

Source: Massport, HMMH 2022

Table I-51 Runways 22R, and 22L Hull 1 Gate Summary for 2021

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	34,914	98.8%
Over Hull	409	1.2%
Total	35,323	100.0%

Source: Massport, HMMH 2022

Table I-52 Runways 22R, and 22L Hull 1 Gate Summary for 2022

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	58,188	99.1%
Over Hull	507	0.9%
Total	58,695	100.0%

Source: Massport, HMMH 2023

Table I-53 through **Table I-55** indicate the percent of Runway 22R and 22L departures that were above 6,000 feet when crossing the shoreline. Combined compliance for all the gates was 99.7 percent or better for all three years shown. The Hull 2 gate, closest to the Airport on the south shore, had the fewest crossings and also the lowest compliance rate.

Table I-53 Runways 22R and 22L Shoreline Crossings Above 6,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	105	105	100.0%
Swampscott Gate	1,004	994	99.0%
Marblehead Gate	6,855	6,846	99.9%
Hull 2 Gate	24	23	95.8%
Hull 3 Gate	306	306	100.0%
Cohasset Gate	10,695	10,695	100.0%
Total	18,989	18,969	99.9%

Source: Massport, HMMH 2021

Table I-54 Runways 22R and 22L Shoreline Crossings Above 6,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	98	97	99.0%
Swampscott Gate	890	884	99.3%
Marblehead Gate	8,073	8,069	100.0%
Hull 2 Gate	25	20	80.0%
Hull 3 Gate	1,823	1,774	97.3%
Cohasset Gate	13,272	13,266	100.0%
Total	24,181	24,110	99.7%

Source: Massport, HMMH 2021

Table I-55 Runways 22R and 22L Shoreline Crossings Above 6,000 Feet for 2022

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	91	90	98.9%
Swampscott Gate	1,429	1,425	99.7%
Marblehead Gate	13,290	13,285	100.0%
Hull 2 Gate	34	31	91.2%
Hull 3 Gate	3,705	3,623	97.8%
Cohasset Gate	21,732	21,720	99.9%
Total	40,281	40,174	99.7%

Source: Massport, HMMH 2023

I.5.6 Statistical Analyses of Flight Tracks - Runway 27

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

In 2012, for the first time since 1997 when flight track monitoring began, each gate (Gates A through E) averaged over 68 percent for every month in which the Airport had all runways open and for the annual average. The percent of flight tracks through all gates (a number tracked but not required per the 1996 ROD) rounded up to 68 percent for the last two months of 2011 and continued for all of 2012. FAA had discussed these data internally and concluded that acceptable flight track dispersion had been achieved and that no subsequent action by FAA is required per the 1996 ROD requirements.[28]

Massport continues to provide information on the Runway 27 departure corridor in the subsequent annual reports. **Table I-56** presents the conformance results for the Runway 27 corridor for 2020 and **Table I-57** and **Table I-58** for 2021 and 2022 respectively. Gate A is closest to the airport, with each subsequently labeled gate further from the runway. The gates increase in width as the distance is increased along the flight path, together forming a noise abatement corridor. A consistent percentage of traffic through each gate means that flights are not entering the corridor late or exiting the corridor too early. The average percentage of tracks through the entire corridor fell considerably from over 80 percent in 2020 and 2021 to 60.2 percent in 2022. The average percent through each gate followed a similar trend and went from 94.3 percent in 2020 and 90.5 percent in 2021 to 82.0 percent in 2022.

Table I-56 Runway 27 Corridor Percent of Tracks Through Each Gate for 2020

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A 1,400[1]	Gate B 2,200[1]	Gate C 2,900[1]	Gate D 4,700[1]	Gate E 6,300[1]	Average Percent Through Each Gate
January	2,561	2,289	89.4%	2,330	2,506	2,540	2,556	2,539	97.4%
February	2,104	1,729	82.2%	1,796	1,873	1,895	1,892	1,871	88.7%
March	2,054	1,843	89.7%	1,892	1,998	2,026	2,029	2,015	97.0%
April	657	574	87.4%	594	627	639	646	643	95.9%
May	249	221	88.8%	225	237	239	243	242	95.3%
June	-	-	-	-	-	-	-	-	-
July	-	-	-	-	-	-	-	-	-
August	574	474	82.6%	484	501	512	515	512	87.9%
September	294	220	74.8%	227	234	235	239	238	79.8%
October	603	540	89.6%	552	586	591	593	594	96.7%
November	993	919	92.5%	944	964	976	984	978	97.6%
December	914	802	87.7%	830	856	871	877	870	94.2%
Total	11,003	9,611	87.3%	9,874	10,382	10,524	10,574	10,502	94.3%

Source: Massport, HMMH 2022

Note: Runway 9-27 was closed from late May until mid-August in 2020 for a runway safety improvement project

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

Table I-57 Runway 27 Corridor Percent of Tracks Through Each Gate for 2021

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A	Gate B	Gate C	Gate D	Gate E	Average Percent Through Each Gate
				1,400[1]	2,200[1]	2,900[1]	4,700[1]	6,300[1]	
January	499	456	91.4%	469	477	491	495	490	97.1%
February	821	752	91.6%	772	793	811	813	807	97.3%
March	1,244	1,116	89.7%	1,163	1,190	1,216	1,224	1,216	96.6%
April	1,292	1,080	83.6%	1,099	1,148	1,161	1,168	1,166	88.9%
May	1,169	991	84.8%	1,024	1,056	1,076	1,080	1,071	90.8%
June	734	660	89.9%	678	710	725	730	720	97.1%
July	1,142	906	79.3%	949	997	1,009	1,003	980	86.5%
August	838	571	68.1%	590	598	603	605	594	71.4%
September	1,361	1,096	80.5%	1,118	1,165	1,175	1,179	1,166	85.3%
October	1,777	1,577	88.7%	1,621	1,716	1,749	1,752	1,729	96.4%
November	2,589	2,235	86.3%	2,271	2,398	2,426	2,432	2,415	92.3%
December	1,988	1,304	65.6%	1,324	1,490	1,896	1,981	1,972	87.2%
Total	15,454	12,744	82.5%	13,078	13,738	14,338	14,462	14,326	90.5%

Source: Massport, HMMH 2022

Table I-58 Runway 27 Corridor Percent of Tracks Through Each Gate for 2022

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A	Gate B	Gate C	Gate D	Gate E	Average Percent Through Each Gate
				1,400[1]	2,200[1]	2,900[1]	4,700[1]	6,300[1]	
January	2,797	1,656	59.2%	1,685	1,929	2,467	2,587	2,577	80.4%
February	1,316	726	55.2%	731	851	1,078	1,139	1,137	75.0%
March	1,939	1,220	62.9%	1,231	1,421	1,827	1,926	1,921	85.9%
April	1,568	887	56.6%	899	1,078	1,418	1,481	1,471	81.0%
May	879	565	64.3%	578	651	827	867	857	86.0%
June	630	384	61.0%	394	438	560	580	576	80.9%
July	362	252	69.6%	258	276	344	354	351	87.5%
August	4	4	100.0%	4	4	4	4	4	100.0%
September	288	195	67.7%	199	221	278	287	283	88.1%

Table I-58 Runway 27 Corridor Percent of Tracks Through Each Gate for 2022

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A	Gate B	Gate C	Gate D	Gate E	Average Percent Through Each Gate
				1,400[1]	2,200[1]	2,900[1]	4,700[1]	6,300[1]	
October	132	77	58.3%	79	97	119	127	128	83.3%
November	302	186	61.6%	189	224	289	300	298	86.1%
December	-	-	-	-	-	-	-	-	-
Total	10,217	6,152	60.2%	6,247	7,190	9,211	9,652	9,603	82.0%

Source:Massport, HMMH 2023

I.5.7 Statistical Analyses of Flight Tracks - Runway 33L

Jets departing from Runway 33L fly in a corridor along the north side of the Mystic River until 5 DME or reaching an altitude of 3,000 feet and then turn on course to their destinations. The Somerville and Everett Gates (shown in **Figure I-21**) extend from BOS 2 DME to BOS 5 DME and are used to monitor the departure procedure for Runway 33L. Early turns to the left would pass through the Somerville Gate below 3,000 feet. Early turns to the right would pass through the Everett Gate below 3,000 feet.

Table I-59 through **Table I-61** indicate that the percentage of tracks below 3,000 feet turning before BOS 5 DME increased from 1.3 percent in 2020 to 2.5 percent in 2021, then decreased to 2.0 percent in 2022. The portion of flights complying with the prescribed departure procedure in 2020 was 98.7, in 2021 was 97.5 percent, and in 2022 was 98.0 percent.

Table I-59 Runway 33L Gates — Passages Below 3,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 3,000 ft	Number Below 3,000 ft	Percentage Through Gate When Below 3,000 ft
Everett Gate	91	29	62	0.3%
Somerville Gate	240	59	181	1.0%
Neither gate	18,139			
Total	18,470	88	243	1.3%

Source: Massport, HMMH 2021

Table I-60 Runway 33L Gates — Passages Below 3,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 3,000 ft	Number Below 3,000 ft	Percentage Through Gate When Below 3,000 ft
Everett Gate	108	18	90	0.4%
Somerville Gate	580	85	495	2.1%
Neither gate	22,863			
Total	23,551	103	585	2.5%

Source: Massport, HMMH 2021

Table I-61 Runway 33L Gates — Passages Below 3,000 Feet for 2022

	Number of Tracks Through Gate	Number Above 3,000 ft	Number Below 3,000 ft	Percentage Through Gate When Below 3,000 ft
Everett Gate	149	50	99	0.3%
Somerville Gate	819	158	661	1.7%
Neither gate	38,055			
Total	39,023	208	760	1.9%

Source: Massport, HMMH 2023

I.6 2022 DNL Levels for Census Block Group Locations

Table I-62 reports the DNL value for each Census Block Group down to DNL 50 dB, computed with AEDT for 2022. A Census Block Group represents the outer limits of a group of US Census Blocks. The Average Block DNL provided below is the arithmetic average of the DNL calculated for the centroid of each US Census Block in that group. The DNL at centroid represents the DNL calculated at the geographic center of the Block Group.

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250250203041	Boston	1283	827	50.2	50.2
250250203042	Boston	623	329	49.7	49.6
250250203051	Boston	1378	1135	49.5	49.6
250250301001	Boston	1197	785	51.3	51.2

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250250301002	Boston	918	596	50.8	50.8
250250302001	Boston	825	522	50.9	50.9
250250302002	Boston	990	621	50.6	50.6
250250303011	Boston	1103	723	53.2	53.2
250250303012	Boston	282	178	52.7	52.6
250250303021	Boston	1844	1249	51.0	50.6
250250304001	Boston	599	388	51.8	51.8
250250304002	Boston	1025	658	51.3	51.4
250250304003	Boston	978	650	51.2	51.2
250250304004	Boston	1558	940	51.9	51.8
250250305001	Boston	823	458	52.5	52.2
250250305002	Boston	1067	698	52.0	51.9
250250305003	Boston	825	516	51.8	51.8
250250401001	Boston	1052	561	50.9	50.8
250250401002	Boston	1308	694	50.3	50.4
250250402001	Boston	636	297	53.1	53.1
250250402002	Boston	958	407	51.8	51.8
250250403001	Boston	774	371	52.1	52.0
250250403002	Boston	1486	666	51.1	50.9
250250403003	Boston	739	367	51.2	51.2
250250403004	Boston	699	338	51.6	51.7
250250403005	Boston	827	373	50.6	50.6
250250404011	Boston	1957	825	50.0	49.9
250250404012	Boston	965	485	49.8	49.6
250250406001	Boston	1760	1095	50.9	51.2
250250408011	Boston	1190	533	52.4	52.5
250250408012	Boston	765	266	54.8	55.2
250250408013	Boston	2081	1323	52.8	53.4
250250501011	Boston	1643	563	62.7	62.8
250250501012	Boston	1389	628	59.9	59.7
250250501013	Boston	1885	687	61.6	61.8
250250502001	Boston	2140	785	60.1	60.2

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250250502002	Boston	1238	556	59.1	59.2
250250502003	Boston	788	286	63.6	63.6
250250502004	Boston	1031	367	63.8	63.7
250250503001	Boston	1475	805	56.7	56.1
250250503002	Boston	777	317	55.6	55.5
250250503003	Boston	1006	807	55.1	55.1
250250504001	Boston	603	235	56.3	56.3
250250504002	Boston	1769	876	56.8	56.9
250250505001	Boston	2174	972	58.9	59.0
250250506001	Boston	1162	487	58.2	58.2
250250506002	Boston	912	392	57.1	57.5
250250507001	Boston	1766	663	59.3	59.5
250250507002	Boston	1341	496	61.5	61.4
250250507003	Boston	1413	521	62.9	62.6
250250509011	Boston	1421	452	66.7	67.5
250250509012	Boston	1860	717	65.2	65.4
250250509013	Boston	961	335	65.3	66.5
250250510001	Boston	2134	900	63.8	63.6
250250510002	Boston	1055	483	58.5	57.4
250250510003	Boston	1128	461	63.1	62.7
250250511011	Boston	1803	670	58.8	58.0
250250511012	Boston	1831	746	56.6	56.5
250250511013	Boston	1727	636	62.3	62.9
250250511014	Boston	1099	392	60.3	57.4
250250512001	Boston	833	499	57.2	58.5
250250512002	Boston	1703	737	59.1	58.8
250250512003	Boston	918	509	57.8	57.9
250250601011	Boston	1171	551	60.3	60.3
250250601012	Boston	667	373	59.3	59.2
250250601013	Boston	1067	518	59.6	59.6
250250601014	Boston	768	438	58.8	58.5

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250250602001	Boston	996	466	56.7	56.8
250250602002	Boston	1332	653	55.8	55.6
250250603011	Boston	1491	815	54.6	54.5
250250603012	Boston	810	368	54.2	54.2
250250603013	Boston	1308	646	54.8	54.6
250250604001	Boston	1139	589	53.2	53.3
250250604002	Boston	1152	596	53.3	53.5
250250604003	Boston	1014	513	53.0	53.0
250250604004	Boston	1224	693	52.5	52.4
250250604005	Boston	666	317	53.3	53.2
250250605011	Boston	886	475	55.8	55.8
250250605012	Boston	936	523	54.7	54.7
250250605013	Boston	1162	623	54.6	54.6
250250605014	Boston	840	371	57.7	57.4
250250605015	Boston	909	458	54.6	54.6
250250606011	Boston	2006	1165	55.5	55.6
250250606021	Boston	331	246	58.0	57.7
250250606031	Boston	1502	1185	59.5	60.0
250250606041	Boston	1814	1515	57.5	60.8
250250606042	Boston	989	1002	56.5	56.4
250250607001	Boston	997	333	55.4	55.4
250250607002	Boston	692	271	55.0	55.0
250250608001	Boston	733	360	53.9	53.9
250250608002	Boston	960	486	53.9	53.9
250250608003	Boston	1243	639	54.8	54.8
250250608004	Boston	1923	1051	54.2	54.3
250250610001	Boston	1170	566	53.0	53.0
250250610002	Boston	535	227	52.7	52.6
250250610003	Boston	711	308	52.5	52.5
250250611011	Boston	682	302	51.9	51.9
250250611012	Boston	2028	964	51.2	51.1

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250250612011	Boston	2013	1038	53.1	53.8
250250612031	Boston	2686	1444	55.5	55.4
250250612041	Boston	937	673	56.4	56.0
250250701021	Boston	897	542	50.3	50.2
250250701022	Boston	2202	934	50.3	50.3
250250701023	Boston	588	173	50.4	50.5
250250701031	Boston	751	379	53.3	53.2
250250701041	Boston	890	600	53.6	54.1
250250701042	Boston	610	312	52.5	52.4
250250701043	Boston	1362	804	51.0	51.0
250250702011	Boston	932	372	51.1	51.1
250250702012	Boston	3058	717	50.4	50.5
250250702021	Boston	4325	2437	51.7	51.7
250250702022	Boston	1135	456	52.1	52.2
250250703012	Boston	1165	662	50.1	50.1
250250703021	Boston	806	453	50.1	50.0
250250704021	Boston	2049	1462	52.9	52.8
250250704022	Boston	1512	716	51.3	51.3
250250705011	Boston	1149	660	51.1	51.1
250250705012	Boston	1074	601	51.6	51.7
250250705021	Boston	1067	585	50.6	50.6
250250705022	Boston	2326	1259	50.4	50.4
250250706001	Boston	1161	647	49.8	49.6
250250709011	Boston	1165	568	49.6	49.5
250250709021	Boston	1211	670	50.0	49.8
250250709022	Boston	1089	583	50.2	49.9
250250711011	Boston	1540	728	51.5	52.0
250250711012	Boston	916	557	51.3	51.4
250250711013	Boston	996	639	51.6	51.5
250250711014	Boston	659	348	52.4	52.3
250250712011	Boston	1013	546	52.3	52.3

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250250712012	Boston	1231	506	53.1	53.3
250250712013	Boston	192	388	52.7	52.7
250250712014	Boston	1078	459	51.6	51.7
250250801001	Boston	2125	547	52.6	52.9
250250801002	Boston	775	314	52.0	52.0
250250803001	Boston	686	290	51.9	51.8
250250803002	Boston	1550	581	51.3	51.4
250250804011	Boston	1910	680	50.8	50.9
250250815002	Boston	1364	579	49.6	49.6
250250817001	Boston	623	218	51.0	51.1
250250817002	Boston	995	475	51.1	51.1
250250817003	Boston	882	299	50.2	50.2
250250817004	Boston	950	375	50.2	50.3
250250817005	Boston	691	314	50.3	50.2
250250818001	Boston	1313	596	51.5	51.5
250250818002	Boston	1006	471	51.7	51.7
250250818003	Boston	1248	419	51.3	51.3
250250819001	Boston	1090	451	50.7	50.8
250250819002	Boston	644	278	50.3	50.5
250250819003	Boston	816	287	50.3	50.3
250250819004	Boston	1121	455	50.2	50.2
250250820001	Boston	1498	620	50.7	50.8
250250820002	Boston	747	308	50.7	50.7
250250820003	Boston	950	424	50.9	50.9
250250821001	Boston	1323	521	50.3	50.4
250250821002	Boston	1543	595	50.0	50.1
250250821003	Boston	2358	1034	50.5	50.5
250250901001	Boston	1610	674	49.5	49.4
250250902003	Boston	984	319	49.7	49.6
250250903001	Boston	1033	339	49.6	49.6
250250903002	Boston	1681	566	49.7	49.8

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250250903003	Boston	1081	391	50.4	50.4
250250904001	Boston	921	322	51.0	51.1
250250904002	Boston	1462	521	50.9	50.8
250250904003	Boston	898	274	51.4	51.5
250250904004	Boston	820	311	51.7	51.7
250250906001	Boston	1099	370	52.0	52.0
250250906002	Boston	1351	470	52.2	52.2
250250907001	Boston	1171	517	49.9	50.0
250250907002	Boston	1260	654	50.9	50.8
250250907003	Boston	1178	562	49.9	50.0
250250907004	Boston	1064	677	52.0	52.2
250250909011	Boston	1403	624	50.9	50.3
250250909012	Boston	2197	1104	52.5	53.9
250250910013	Boston	748	363	49.9	51.0
250250912001	Boston	1057	455	49.5	49.7
250250912003	Boston	720	298	49.5	49.5
250250913001	Boston	1456	532	50.5	50.5
250250913002	Boston	1170	403	51.3	51.4
250250914001	Boston	1748	675	49.7	49.8
250250914002	Boston	1138	377	50.5	50.4
250250921011	Boston	1158	480	51.0	51.0
250250921013	Boston	914	349	51.2	51.8
250251006011	Boston	1027	495	52.2	52.1
250251006012	Boston	945	382	50.5	50.3
250251006031	Boston	1483	651	56.1	56.4
250251006032	Boston	689	300	57.7	58.7
250251007001	Boston	1078	516	54.5	54.4
250251007002	Boston	1008	543	56.9	57.5
250251007003	Boston	724	296	56.0	56.3
250251007004	Boston	839	388	52.9	53.0
250251007005	Boston	683	304	52.2	52.2

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250251008002	Boston	983	407	50.2	50.0
250251008003	Boston	924	423	50.3	50.3
250251008004	Boston	1033	624	50.4	52.4
250259812022	Boston	6	1	60.9	64.0
250259816001	Boston	2	1	67.3	70.0
250235001011	Boston/Hull	1501	859	54.2	51.6
250259815021	Boston/Revere	7	4	54.9	54.1
250259813001	Boston/Winthrop	79	35	64.8	78.4
250173548002	Cambridge	1241	609	50.2	50.3
250251601021	Chelsea	798	339	58.1	58.1
250251601022	Chelsea	1613	420	58.8	59.0
250251601023	Chelsea	864	302	60.3	60.2
250251601024	Chelsea	548	159	59.6	59.7
250251601031	Chelsea	1599	430	62.2	62.2
250251601032	Chelsea	1081	285	64.1	64.2
250251601033	Chelsea	994	383	60.7	60.8
250251601034	Chelsea	972	249	63.6	64.0
250251602001	Chelsea	1393	386	61.3	61.4
250251602002	Chelsea	1063	372	62.8	62.9
250251602003	Chelsea	852	260	64.1	64.2
250251602004	Chelsea	846	325	63.3	63.5
250251603001	Chelsea	728	375	62.9	60.9
250251603002	Chelsea	2025	1093	60.6	60.1
250251604001	Chelsea	1209	418	62.4	62.7
250251604002	Chelsea	931	306	60.1	59.8
250251604003	Chelsea	890	507	56.4	56.4
250251604004	Chelsea	848	375	59.8	59.4
250251605011	Chelsea	2159	670	55.1	55.0
250251605012	Chelsea	1338	403	55.5	55.7
250251605013	Chelsea	1009	308	57.0	57.0
250251605014	Chelsea	721	395	55.9	55.8

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250251605015	Chelsea	878	322	54.6	54.7
250251605021	Chelsea	1820	602	55.1	55.0
250251605023	Chelsea	1616	499	53.7	52.8
250251605024	Chelsea	1263	523	52.6	52.6
250251605025	Chelsea	905	305	55.6	56.2
250251606011	Chelsea	296	21	53.0	53.1
250251606012	Chelsea	1101	590	51.8	51.5
250251606013	Chelsea	1784	593	52.6	52.0
250251606014	Chelsea	1150	397	52.7	52.9
250251606021	Chelsea	1415	492	52.5	52.2
250251606022	Chelsea	968	349	50.3	50.0
250251606024	Chelsea	877	291	50.3	50.1
250251606025	Chelsea	1108	430	51.1	50.9
250251706012	Chelsea/Revere	1719	641	50.7	50.9
250173424012	Everett	1398	537	57.1	57.1
250235001012	Hull	775	463	51.3	50.4
250235001013	Hull	1341	738	50.0	49.9
250235001042	Hull	929	499	49.7	47.5
250250406002	Hull	1923	924	51.0	51.1
250092051001	Lynn	1434	538	51.7	52.5
250092051002	Lynn	1275	424	52.4	52.6
250092051003	Lynn	1074	364	54.3	54.5
250092051004	Lynn	1653	576	54.1	54.5
250092051005	Lynn	692	261	54.9	55.2
250092052001	Lynn	869	424	52.8	52.8
250092052002	Lynn	805	285	55.3	55.2
250092052003	Lynn	1607	577	55.1	55.2
250092052004	Lynn	1603	496	56.0	56.1
250092052005	Lynn	1041	390	52.6	55.0
250092055001	Lynn	2391	762	52.5	51.2
250092055002	Lynn	3109	1034	56.7	56.6

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250092058001	Lynn	1124	364	52.1	52.3
250092058002	Lynn	1220	342	52.3	52.6
250092058003	Lynn	1381	508	50.8	50.5
250092059001	Lynn	1952	581	52.2	52.3
250092059002	Lynn	1398	453	51.2	51.3
250092060001	Lynn	1630	478	56.3	56.5
250092060002	Lynn	2074	685	54.9	55.2
250092061001	Lynn	1998	795	56.4	56.9
250092061002	Lynn	2201	684	57.2	57.4
250092062001	Lynn	1352	361	54.8	54.9
250092062002	Lynn	2507	811	56.5	56.9
250092062003	Lynn	2020	578	55.5	55.0
250092063001	Lynn	1220	388	51.7	51.6
250092063002	Lynn	1137	376	53.6	53.9
250092063003	Lynn	1018	325	50.7	50.2
250092063004	Lynn	839	258	52.4	52.8
250092064004	Lynn	1578	499	50.6	50.4
250092068001	Lynn	1982	719	51.3	51.2
250092068002	Lynn	2443	1062	53.3	53.2
250092069001	Lynn	1006	672	50.9	50.8
250092069003	Lynn	1809	967	50.6	50.6
250092070001	Lynn	966	614	55.2	54.3
250092070002	Lynn	1323	440	57.8	57.9
250092071001	Lynn	1581	455	55.9	56.1
250092071002	Lynn	1176	326	57.1	57.3
250092071003	Lynn	1050	338	54.5	54.6
250092072001	Lynn	1443	409	57.3	59.1
250092072002	Lynn	1560	713	57.9	58.0
250173412004	Malden	1737	736	51.7	51.8
250173396005	Medford	897	373	52.6	52.6
250173397001	Medford	654	296	54.0	54.4

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250173400003	Medford	704	304	52.7	52.7
250092106001	Peabody	1809	744	50.1	51.1
250092106002	Peabody	2615	1033	50.2	50.2
250092107002	Peabody	1062	509	49.7	49.7
250092107003	Peabody	1271	545	50.2	50.5
250092107004	Peabody	787	286	50.0	50.0
250251701013	Revere	856	317	49.5	49.7
250251704001	Revere	1398	500	50.1	48.7
250251704002	Revere	1266	544	49.9	50.1
250251705021	Revere	1122	473	59.4	59.9
250251705022	Revere	1424	937	56.3	58.4
250251705023	Revere	861	369	60.8	60.9
250251705031	Revere	1698	840	55.4	56.8
250251705041	Revere	2105	1515	56.4	56.8
250251705042	Revere	1052	323	53.3	52.7
250251706014	Revere	1172	386	50.3	50.2
250251707011	Revere	1181	575	56.0	54.7
250251707012	Revere	1521	629	60.8	62.3
250251707021	Revere	1242	383	53.6	53.2
250251707022	Revere	1867	600	55.0	54.9
250251707023	Revere	2015	625	52.0	52.0
250251707024	Revere	1282	415	53.1	53.3
250251707025	Revere	1589	640	55.7	55.4
250251708001	Revere	1974	807	64.8	63.9
250251708002	Revere	1572	582	64.4	65.8
250251708003	Revere	1184	464	62.4	64.4
250251708004	Revere	1043	455	63.3	61.1
250092047011	Salem	1014	402	51.8	53.6
250173391011	Winthrop	1286	696	52.1	52.2
250173391012	Winthrop	872	323	50.9	51.0
250173391013	Winthrop	1109	806	52.2	52.0

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250173391022	Winthrop	1314	600	51.6	51.6
250173391023	Winthrop	1435	452	50.0	50.3
250173394001	Winthrop	1098	541	50.3	50.0
250173394002	Winthrop	666	266	50.9	50.8
250173394003	Winthrop	772	382	50.5	50.6
250173394004	Winthrop	943	418	50.2	50.1
250173395001	Winthrop	2982	600	51.9	52.0
250173395002	Winthrop	1214	555	52.6	52.6
250173395003	Winthrop	677	297	51.4	51.2
250173395004	Winthrop	789	309	51.5	51.6
250173396001	Winthrop	844	388	52.9	52.8
250173396002	Winthrop	892	377	53.2	53.2
250173396003	Winthrop	1000	450	52.9	53.0
250173396004	Winthrop	843	370	52.9	53.1
250173396006	Winthrop	978	435	52.2	52.3
250173397002	Winthrop	1622	686	53.6	53.8
250173397003	Winthrop	753	354	53.8	53.8
250173397004	Winthrop	887	375	53.1	53.1
250173398021	Winthrop	1490	703	55.6	55.7
250173398022	Winthrop	680	253	53.6	53.7
250173398023	Winthrop	761	275	54.4	54.4
250173398024	Winthrop	2554	1420	54.8	55.5
250173398031	Winthrop	1043	620	56.6	56.9
250173398032	Winthrop	2340	1431	56.3	56.3
250173398041	Winthrop	695	265	56.1	56.2
250173398042	Winthrop	535	240	55.7	55.8
250173398043	Winthrop	1030	429	55.2	54.9
250173399001	Winthrop	1577	671	53.8	53.9
250173399002	Winthrop	943	382	53.7	53.7
250173399003	Winthrop	1073	459	52.6	52.6
250173399004	Winthrop	812	347	53.1	53.2

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250173399005	Winthrop	922	382	52.9	52.9
250173400001	Winthrop	1108	461	52.1	52.1
250173400002	Winthrop	778	379	52.1	52.2
250173401002	Winthrop	1589	510	49.6	49.3
250173401003	Winthrop	1535	639	51.6	51.7
250173401005	Winthrop	857	327	50.7	50.8
250173412001	Winthrop	2216	903	49.8	49.8
250173412002	Winthrop	1022	472	53.2	53.4
250173412003	Winthrop	937	369	53.0	53.1
250173412005	Winthrop	1076	392	51.0	50.9
250173414003	Winthrop	2032	723	49.6	49.7
250173414004	Winthrop	1827	634	50.3	50.2
250173414005	Winthrop	781	392	52.1	52.0
250173421011	Winthrop	1706	599	49.6	49.8
250173421012	Winthrop	1227	402	50.2	50.3
250173421014	Winthrop	1052	377	49.9	49.8
250173422011	Winthrop	1682	602	50.0	49.8
250173422012	Winthrop	1351	488	50.8	50.8
250173423011	Winthrop	1460	513	51.8	51.5
250173423012	Winthrop	1782	625	52.5	52.5
250173423021	Winthrop	2003	710	53.2	53.3
250173423022	Winthrop	805	287	54.9	54.8
250173423023	Winthrop	1740	620	53.1	53.1
250173424011	Winthrop	2148	897	56.1	56.1
250173424013	Winthrop	1058	407	53.5	53.3
250173424021	Winthrop	1387	674	57.9	58.0
250173424022	Winthrop	1413	630	56.9	56.0
250173424023	Winthrop	842	402	57.2	57.3
250173424024	Winthrop	22	9	58.8	58.5
250173425011	Winthrop	2291	843	53.3	53.3
250173425012	Winthrop	2449	991	55.9	55.7

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250173425021	Winthrop	1607	575	51.4	51.5
250173425022	Winthrop	1473	513	49.9	50.0
250173426001	Winthrop	1368	428	52.4	52.3
250173426002	Winthrop	1076	363	54.2	54.4
250173426003	Winthrop	2525	960	53.2	53.3
250173501051	Winthrop	1181	530	54.1	54.3
250173501061	Winthrop	1660	1006	53.7	53.8
250173501071	Winthrop	1355	553	51.0	51.2
250173501081	Winthrop	2655	1049	53.0	52.9
250173501082	Winthrop	1519	725	51.6	51.7
250173501091	Winthrop	2176	882	52.0	51.7
250173502011	Winthrop	602	243	49.5	49.5
250173502012	Winthrop	1328	532	49.5	49.7
250173502013	Winthrop	769	319	50.3	50.3
250173502021	Winthrop	1361	586	50.7	50.8
250173502022	Winthrop	1379	601	49.7	49.7
250173502023	Winthrop	1120	564	50.8	50.8
250173503001	Winthrop	900	429	51.1	50.7
250173503002	Winthrop	1118	528	50.6	50.7
250173503003	Winthrop	966	407	51.7	51.6
250173504001	Winthrop	1054	397	52.5	52.6
250173504002	Winthrop	1380	601	51.8	51.8
250173504003	Winthrop	1077	468	51.2	51.2
250173504004	Winthrop	1491	732	51.6	51.6
250173504005	Winthrop	899	392	52.2	52.2
250173505001	Winthrop	874	391	51.9	51.9
250173505002	Winthrop	869	395	51.7	51.8
250173506001	Winthrop	1779	9	52.2	52.2
250173506002	Winthrop	984	391	51.7	51.7
250173506003	Winthrop	743	241	51.4	51.4
250173506004	Winthrop	1282	507	52.0	52.0

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250173507011	Winthrop	1109	466	51.2	51.2
250173507012	Winthrop	1048	476	50.8	51.0
250173507013	Winthrop	843	468	51.0	51.1
250173507022	Winthrop	1298	678	50.6	50.6
250173507023	Winthrop	866	421	50.2	49.8
250173508001	Winthrop	1045	507	51.4	51.4
250173508002	Winthrop	1031	461	51.5	51.5
250173509001	Winthrop	875	408	50.8	50.9
250173509002	Winthrop	1312	581	50.2	50.3
250173509003	Winthrop	1344	718	51.0	51.1
250173510021	Winthrop	878	445	49.8	49.9
250173510022	Winthrop	1174	511	50.2	50.2
250173514031	Winthrop	674	286	50.4	50.4
250173514032	Winthrop	928	391	49.9	49.8
250173514033	Winthrop	597	317	50.0	49.9
250173514034	Winthrop	1121	434	49.9	49.8
250173514035	Winthrop	623	280	49.7	49.7
250173546011	Winthrop	5	0	49.9	50.0
250173546021	Winthrop	1742	827	49.6	49.7
250173547001	Winthrop	1428	647	49.7	49.8
250173548001	Winthrop	1082	522	50.9	50.9
250173549012	Winthrop	964	567	50.2	50.2
250173549013	Winthrop	1477	854	49.6	49.7
250173549021	Winthrop	1311	567	50.7	50.8
250173549022	Winthrop	1318	623	50.5	50.5
250173549023	Winthrop	2070	808	50.3	50.3
250173549024	Winthrop	917	445	50.4	50.4
250173550001	Winthrop	883	423	50.5	50.6
250173550002	Winthrop	1309	677	51.0	51.0
250173550003	Winthrop	937	445	50.9	51.1
250173561002	Winthrop	1482	691	50.0	50.1

Table I-62 2022 DNL Values at U.S. Census 2020 Block Groups

Census Block Group ID	Name	Population	Housing units	2022 Average Block DNL	2022 DNL at centroid
250173567011	Winthrop	1444	636	50.0	50.0
250214161011	Winthrop	1269	439	53.2	54.0
250214161013	Winthrop	275	99	52.3	52.1
250214164002	Winthrop	201	66	53.9	54.1
250214164003	Winthrop	751	272	51.9	54.4
250214164005	Winthrop	205	79	54.1	55.3
250214164006	Winthrop	473	136	53.1	56.0
250214172013	Winthrop	540	164	49.6	50.4
250214172014	Winthrop	750	406	52.0	53.2
250214173001	Winthrop	2704	1726	52.4	53.9
250214175023	Winthrop	231	104	50.2	49.8
250251801011	Winthrop	1426	628	53.3	53.4
250251801012	Winthrop	1292	738	51.7	51.1
250251801013	Winthrop	766	476	54.5	54.7
250251801014	Winthrop	2320	1004	55.0	55.1
250251802001	Winthrop	1429	526	58.8	59.1
250251802002	Winthrop	749	311	56.8	56.7
250251802003	Winthrop	695	347	58.4	58.3
250251802004	Winthrop	1453	666	60.7	61.2
250251803011	Winthrop	661	266	60.0	59.9
250251803012	Winthrop	838	369	61.0	60.8
250251803013	Winthrop	812	303	63.1	62.9
250251803014	Winthrop	858	343	61.5	61.5
250251804001	Winthrop	1016	486	57.9	56.0
250251804002	Winthrop	912	358	58.6	58.2
250251805001	Winthrop	1277	616	55.5	56.6
250251805002	Winthrop	628	266	64.8	64.3
250251805003	Winthrop	1244	663	59.8	58.5
250251805004	Winthrop	940	455	66.3	67.3

Source: HMMH, 2023.

I.7 Airline Fleet Improvements

Commercial air carrier and cargo operators are deploying the newest engine technology at Logan Airport. **Table I-63** reports the percent of an airline's fleet that is Stage 3, Stage 4 equivalent, or Stage 5 equivalent for 2019, 2020, and 2021. All the major U.S. airlines at Logan Airport are using a fleet composed of 100 percent originally manufactured Stage 3, Stage 4, or Stage 5 aircraft. The majority of air carriers at Logan Airport in 2020 and 2021 are using Stage 4 or Stage 5 equivalent aircraft. As reported in **Table 7-3**, the new FAA Stage 5 requirements were met by about 34 percent of Logan Airport jet operations for 2022.

Massport previously made terminal and airfield improvements to accommodate FAA Airplane Design Group VI aircraft, which are the largest aircraft in terms of wingspan and tail height. Use of those larger aircraft, such as the 747-800 and the A380, increased from 2017 to 2019 but dropped in 2020 and 2021 due to the pandemic. Some use of the A380 (348 operations) and a few 747-800 flights (12 operations) occurred at Logan Airport in 2022; for comparison, there were over 1,100 operations by those aircraft (combined) in 2019.

Use of new engine technology aircraft has also been increasing as seen in the A320neo family with the addition of Frontier Airline flights in 2019 and with jetBlue Airways A321neo and A220 operations. Additionally, Delta Air Lines introduced Airbus A220 flights and use of Boeing 787 models. Due to the COVID-19 pandemic, several airlines accelerated the retirement of older and louder aircraft models such as the Airbus A330-200/300, A340, and Boeing 747, 757, 767, McDonnell Douglas MD-88, Embraer 190, and the smaller Bombardier CRJ200 regional jet. Examination of the 2022 radar data reveals a collective 9- to 10-fold increase in the A320neo/A321neo aircraft and in A220 aircraft as compared to the 2019 fleet operations. Simultaneously, there was an approximate 32 percent reduction of operations by the above-named older aircraft from 2019 to 2022.

Table I-63 Percentage of Airline Operations in Stage 3, 4 or 5 Aircraft

Airlines with more than 100 flights in 2022	2019[1]	2021[1]	2022[1]	2019[2]			2021[2]			2022[2]		
				Stage 3	Stage 4	Stage 5	Stage 3	Stage 4	Stage 5	Stage 3	Stage 4	Stage 5
jetblue Airways	114,091	61,898	91,803	0%	98%	2%	0%	39%	61%	0%	44%	56%
Delta Air Lines	42,218	28,826	46,893	2%	86%	12%	0%	92%	8%	0%	72%	28%
Republic Airlines	21,832	29,990	46,247	0%	100%	0%	0%	100%	0%	0%	100%	0%
American Airlines	50,333	28,474	41,255	1%	87%	12%	0%	93%	7%	0%	58%	42%
United Airlines	27,318	14,393	22,123	0%	61%	39%	0%	76%	24%	0%	83%	17%
Southwest Airlines	19,907	8,916	10,535	0%	99%	1%	0%	95%	5%	0%	91%	9%
Spirit Airlines	9,838	5,689	6,717	0%	16%	84%	0%	3%	97%	0%	26%	74%
Federal Express	3,775	4,892	4,722	4%	96%	0%	1%	99%	0%	0%	100%	0%
Endeavor Air	10,520	2,973	4,621	0%	100%	0%	0%	100%	0%	0%	100%	0%
Alaska Airlines	5,920	2,882	4,404	0%	92%	8%	0%	83%	17%	0%	98%	1%
Jazz Air Inc.	2,922	2,274	4,166	0%	52%	48%	1%	99%	1%	0%	100%	0%
Piedmont Airlines	3,087	1,439	2,955	0%	0%	100%	0%	0%	100%	0%	2%	98%
United Parcel Service	2,096	2,183	2,114	0%	97%	3%	0%	100%	0%	0%	99%	1%
Envoy Airlines	396	528	2,039	0%	1%	99%	100%	0%	0%	0%	100%	0%
Aer Lingus	1,860	655	1,910	0%	93%	7%	0%	45%	55%	0%	68%	32%
British Airways	2,650	991	1,703	0%	23%	77%	0%	10%	90%	0%	90%	10%
Frontier Airlines, Inc.	1,211	1,036	1,489	6%	30%	64%	0%	35%	65%	0%	33%	67%
Icelandair	1,044	1,122	1,450	0%	85%	15%	0%	49%	51%	0%	49%	51%
Lufthansa	1,703	867	1,446	0%	14%	86%	0%	1%	99%	0%	28%	72%
Allegiant Air	0	1,063	1,154	N/A	N/A	N/A	0%	100%	0%	0%	100%	0%
TAP - Air Portugal	644	526	965	0%	28%	72%	0%	0%	100%	0%	98%	2%
Air France	856	616	961	0%	7%	93%	0%	2%	98%	0%	3%	97%
Swiss Air	978	328	804	0%	0%	100%	0%	3%	97%	0%	0%	100%

Table I-63 Percentage of Airline Operations in Stage 3, 4 or 5 Aircraft

Airlines with more than 100 flights in 2022	2019[1]	2021[1]	2022[1]	2019[2]			2021[2]			2022[2]		
				Stage 3	Stage 4	Stage 5	Stage 3	Stage 4	Stage 5	Stage 3	Stage 4	Stage 5
SkyWest Airlines	4,880	250	782	100%	0%	0%	0%	99%	1%	0%	100%	0%
Turkish Airlines	674	500	742	0%	0%	100%	0%	0%	100%	0%	0%	100%
Japan Airlines	728	644	730	0%	0%	100%	0%	0%	100%	0%	0%	100%
Qatar Airways	730	528	728	0%	100%	0%	0%	0%	100%	0%	2%	98%
Emirates Airlines	719	456	702	0%	57%	43%	0%	100%	0%	0%	99%	1%
Iberia Air Lines Of Spain	859	158	696	0%	59%	41%	0%	72%	28%	0%	99%	1%
Virgin Atlantic	1,361	391	670	0%	0%	100%	0%	0%	100%	0%	0%	100%
SATA International Airlines	809	409	648	0%	1%	99%	0%	0%	100%	0%	0%	100%
Air Canada	1,908	0	625	0%	100%	0%	N/A	N/A	N/A	0%	5%	95%
Italia Trasporto Aereo S.p.A.	0	0	484	N/A	N/A	N/A	N/A	N/A	N/A	0%	100%	0%
Fly Play Corp	0	0	453	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%	100%
Hawaiian Airlines	426	380	422	0%	0%	100%	0%	0%	100%	0%	0%	100%
MN Airlines, LLC	288	358	416	0%	100%	0%	0%	100%	0%	0%	100%	0%
Scandinavian Airlines	369	0	389	0%	88%	12%	N/A	N/A	N/A	0%	0%	100%
Korean Air Lines Co., Ltd.	367	314	366	0%	0%	100%	0%	11%	89%	0%	51%	49%
KLM Royal Dutch Airlines	263	304	364	0%	98%	2%	0%	99%	1%	0%	98%	2%
Kalitta Air (Cargo)	0	316	349	N/A	N/A	N/A	100%	0%	0%	100%	0%	0%
Compañía Panameña de Aviación	962	283	228	0%	100%	0%	0%	100%	0%	0%	100%	0%
El Al Israel Airlines Ltd.	296	0	164	0%	97%	3%	N/A	N/A	N/A	0%	99%	1%

Table I-63 Percentage of Airline Operations in Stage 3, 4 or 5 Aircraft

Airlines with more than 100 flights in 2022	2019[1]	2021[1]	2022[1]	2019[2]			2021[2]			2022[2]		
				Stage 3	Stage 4	Stage 5	Stage 3	Stage 4	Stage 5	Stage 3	Stage 4	Stage 5
ABX Air, Inc.	0	0	147	N/A	N/A	N/A	N/A	N/A	N/A	95%	5%	0%
WestJet Airlines Ltd.	0	0	144	N/A	N/A	N/A	N/A	N/A	N/A	0%	100%	0%
Condor Flugdienst GmbH	0	0	104	N/A	N/A	N/A	N/A	N/A	N/A	0%	52%	48%

Source: Massport and HMMH, 2023.

N/A Not available.

1 Operations for some carriers differ with those in Chapter 3, *Activity Levels and Forecasting*, and Chapter 8, *Air Quality and Greenhouse Gas Emissions,* because the table only includes jet aircraft, not turboprops, and it includes both scheduled and unscheduled air carriers.

2 Original Stage 3 means originally manufactured as a certificated Stage 3 aircraft under FAR Part 36. Stage 4 equivalent or Stage 5 equivalent means the aircraft meets Stage 4 or Stage 5 requirements, even if it is not certificated as such

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J. Air Quality, Greenhouse Gases and Emissions Reductions

This appendix provides the following detailed information and data tables in support of Chapter 8, *Air Quality and Greenhouse Gas Emissions*:

J.1 Fundamentals of Air Quality

This section contains a summary of air quality and air emissions with a particular emphasis on airport-related emissions where appropriate. This material is intended to supplement and provide background information for the materials contained in Chapter 8, *Air Quality and Greenhouse Gas Emissions*.

J.1.1 Pollutant Types and Standards

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for a select group of "criteria air pollutants" designed to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. Listed alphabetically, these pollutants are briefly described below. The NAAQS are listed in Section II, *Regulatory Framework* of this appendix.

- **Carbon monoxide (CO)** is a colorless, odorless, tasteless gas. It may temporarily accumulate, especially in cool, calm weather conditions, when fuel use reaches a peak and CO is chemically most stable due to the low temperatures. CO from natural sources usually dissipates quickly, posing no threat to human health. Transportation sources (e.g., motor vehicles), energy generation, and open burning are among the predominant anthropogenic (i.e., man-made) sources of CO.
- **Lead (Pb)** in the atmosphere is generated from industrial sources including waste oil and solid waste incineration, iron and steel production, lead smelting, and battery and lead manufacturing. The lead content of motor vehicle emissions, which was the major source of lead in the past, has significantly declined with the widespread use of unleaded fuel. Low-lead fuel used in some general aviation (GA) aircraft is still a source of airport-related lead.
- **Nitrogen dioxide (NO_2)**, nitric oxide (NO), and the nitrate radical (NO_3) are collectively called oxides of nitrogen (NO_X). These three compounds are interrelated, often changing from one form to another in chemical reactions, and NO_2 is the compound commonly measured for comparison to the NAAQS. NO_X is generally emitted as NO, which is oxidized to NO_2. The principal man-made source of NO_X is fuel combustion in motor vehicles and power plants – aircraft engines are also a source. Reactions of NO_X with other atmospheric chemicals can lead to formation of ozone (O_3) and acidic precipitation.
- **Ozone (O_3)** is a secondary pollutant, formed from daytime reactions of NO_X and volatile organic compounds (VOCs) in the presence of sunlight. VOCs, which are a subset of hydrocarbons (HC) and have no NAAQS, are released in industrial processes and from evaporation of gasoline and solvents. Sources of NO_X are discussed above.
- **Particulate matter (PM_{10}/$PM_{2.5}$)** comprises very small particles of dirt, dust, soot, or liquid droplets called aerosols. The NAAQS for PM_{10}/$PM_{2.5}$ is segregated by sizes (i.e., equal to or less than 10 and equal to or less than 2.5 microns as PM_{10} and $PM_{2.5}$, respectively). PM_{10}/$PM_{2.5}$ is formed as an exhaust product in the internal combustion engine or can be generated from the breakdown and dispersion of other solid materials (e.g., fugitive dust).

- **Sulfur oxides (SO_X)** are primarily composed of sulfur dioxide (SO_2) which is emitted in natural processes and by man-made sources such as combustion of sulfur-containing fuels and sulfuric acid manufacturing.
- Additionally, there are gases that trap heat in the atmosphere that are called greenhouse gases (GHGs). GHGs are also associated with airport activities. The primary GHGS that are associated with Logan Airport operations are listed and described below.
- **Carbon dioxide (CO_2)** enters the atmosphere through burning fossil fuels (i.e., coal, natural gas, and oil), solid waste, trees, and other biological materials, and also as a result of certain chemical reactions (e.g., cement production). Carbon dioxide is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.
- **Methane (CH_4)** is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, land use, and the decay of organic waste in municipal solid waste landfills.
- **Nitrous oxide (N_2O)** is emitted during agricultural, land use, and industrial activities; combustion of fossil fuels and solid waste; as well as during treatment of wastewater.
- Currently there are no specific U.S. laws or regulations that call for the regulation of GHGs for airports directly.

J.1.2 Sources of Airport Air Emissions

Large metropolitan airports generate air emissions from the following general source categories: aircraft, auxiliary power unit (APUs), ground service equipment (GSE), motor vehicles traveling to, from, and moving about the airport; fuel storage and transfer facilities; a variety of stationary sources (e.g., steam boilers, back-up generators); an assortment of aircraft maintenance activities (e.g., painting, cleaning, repair); routine airfield, roadway, and building maintenance activities (e.g., painting, cleaning, repair); and periodic construction activities for new projects or improvements to existing facilities.

Table J-1 provides a summary listing of airport-related sources of air emissions, the associated pollutants, and their characteristics.

Table J-1 Airport-related Sources of Air Emissions

Sources	Emissions	Characteristics
Aircraft	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, VOCs and GHGs	Exhaust products of fuel combustion vary depending on aircraft engine type, number of engines, power setting, and period of operation. Emissions are also emitted by an aircraft's auxiliary power unit (APU).
Motor vehicles	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, VOCs and GHGs	Exhaust products of fuel combustion from patron and employee traffic approaching, departing, and moving about the airport site. Emissions vary depending on vehicle type, distance traveled, operating speed, and ambient conditions.
Ground service equipment (GSE)	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, VOCs and GHGs	Exhaust products of fuel combustion from service trucks, tow tugs, belt loaders, and other portable equipment.
Fuel storage and handling	VOCs	Formed from the evaporation and vapor displacement of fuel from storage tanks and fuel handling facilities. Emissions vary with fuel usage, type of storage tank, refueling method, fuel type, vapor recovery, climate, and ambient temperature.
Stationary sources	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, VOCs and GHGs	Exhaust products of fossil fuel combustion from boilers dedicated to indoor heating requirements and emissions from incinerators used for waste reduction. Emissions are generally well controlled with operational techniques and post-burn collection methods. Sources include boilers and hot water generators, emergency generators, incinerators, surface coating operations, welding operations, and firefighting facilities.
Construction Activities[1]	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, VOCs and GHGs	Construction projects may have associated emissions from dust generated during excavation and land clearing, exhaust emissions from construction equipment and motor vehicles, and evaporative emissions from asphalt paving and painting. The amount of particulate emissions varies with the material type, the amount of area exposed, and meteorology. The construction of airport and airfield improvement projects at airports represents temporary sources of emissions.

Source: CMT, 2024.

Notes: CO - carbon monoxide; GHGs – greenhouse gases; NO_2 - nitrogen dioxide; $PM_{10}/PM_{2.5}$ - particulate matter equal to or less than 10 microns in diameter (PM_{10}) and equal to or less than 2.5 microns in diameter ($PM_{2.5}$); $SO_{2.5}$ - sulfur dioxide; and VOC - volatile organic compounds.

Air emissions associated with construction activities at Logan Airport were not computed for the 2022 analysis.

J.2 Regulatory Framework

The federal Clean Air Act (CAA), National Ambient Air Quality Standards (NAAQS), and similar state laws govern air quality issues in Massachusetts. The NAAQS and the Massachusetts State Implementation Plan (SIP), a document that describes measures to attain and maintain compliance with the NAAQS, regulate air quality in the Boston Metropolitan Area and other areas of the state. These regulations as well as those associated with GHGs are discussed in the following sections.

J.2.1 National Ambient Air Quality Standards (NAAQS)

The NAAQS for these criteria air pollutants are subdivided into the Primary Standards (designed to protect human health) and the Secondary Standards (designed to protect the environment and human welfare) and are listed below in **Table J-2**. Exceedances of these values constitute violations of the NAAQS.

Table J-2 NAAQS

Pollutant	Primary/ Secondary	Averaging Time	Standard		Form
			ppm	µg/m3	
Carbon Monoxide (CO)	Primary	8 hours	9	10,000	Not to be exceeded more than once a year.
		1 hour	35	40,000	Not to be exceeded more than once a year.
Lead (Pb)	Primary and Secondary	Rolling 3-Month Average	—	0.15	Not to exceed this level.
Nitrogen Dioxide (NO_2)	Primary	1 hour	0.100	188	The 3-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.
	Primary and Secondary	Annual	0.053	100	Not to exceed this level.
Ozone (O_3)	Primary and Secondary	8 hours[1]	0.070	—	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
Particulate Matter with a diameter ≤10µm (PM_{10})	Primary and Secondary	24 hours	—	150	Not to be exceeded more than once a year on average over 3 years.
Particulate Matter with a	Primary and Secondary	24 hours	—	35	The 3-year average of the 98th percentile for each population-oriented monitor within an area is not to exceed this level.

Table J-2 NAAQS

Pollutant	Primary/ Secondary	Averaging Time	Standard		Form
			ppm	µg/m3	
diameter ≤2.5µm ($PM_{2.5}$)	Primary	Annual	—	12	The 3-year average of the weighted annual mean from single or multiple monitors within an area is not to exceed this level.
	Secondary	Annual	—	15	The 3-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)	Primary	1 hour	0.075	196	The 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed this level.
	Secondary	3 hours	0.5	1,300	Not to be exceeded more than once a year.

Source: U.S. Environmental Protection Agency (EPA), "NAAQS Table." August 21, 2023, (https://www.epa.gov/criteria-air-pollutants/naaqs-table).

Note: There are no NAAQS standards for NO_X. µg/m^3 - micrograms per cubic meter; ppm - parts per million.

1 Final rule signed October 1, 2015, and effective December 28, 2015. A 2008 O_3 standard remains in effect in some areas.

J.2.2 Air Quality Designation Status

EPA, state, and local air quality agencies maintain outdoor air monitoring networks to measure air quality conditions and gauge compliance with the NAAQS. Based upon the data collected by these agencies, all areas throughout the country are designated by U.S.EPA with respect to their compliance with the NAAQS. **Table J-3** provides the definitions of each of these designations.

Table J-3 EPA Air Quality Designations

Attainment	Maintenance	Nonattainment Area	Unclassifiable
Any area that meets the NAAQS established for each criteria air pollutant.	Any area that is in transition from formerly being a Nonattainment area to an Attainment area (referred to as a Maintenance area).	Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) one or more of the NAAQS.	Any area that cannot be classified based on available information as meeting or not meeting the NAAQS.

Source: CMT, 2024.

For O_3, CO, PM_{10}, and $PM_{2.5}$, the nonattainment designations are further classified by the severity, or degree, of the violation of the NAAQS. For example, in the case of O_3, these classifications range from highest to lowest as extreme, severe, serious, marginal, and moderate.

The nonattainment designation of an area has a bearing on the emission control measures required and the time periods allotted by which a State Implementation Plan (SIP) must demonstrate attainment of the NAAQS. It is also important to note that the degree of nonattainment determines the thresholds that are "*de minimis,*" or levels below which a formal SIP General Conformity Determination is not required.

Finally, the boundaries of nonattainment areas are generally determined based on Core Based Statistical Areas (CBSA) as defined by U.S. census data (air monitoring station locations and contributing emission sources also play a role). Regional pollutants such as O_3 can encompass multiple CBSAs and can extend across state lines. Nonattainment areas for localized pollutants, such as lead and CO, typically only comprise a partial CBSA or a local "hot-spot."

Logan Airport is in the Boston Metropolitan Area. In accordance with the CAA, all areas within Massachusetts are designated as either attainment, nonattainment, or maintenance with respect to the NAAQS.[1,2] The regulatory air quality designation statuses for the Boston Metropolitan Area, as of the publication of this *2022 ESPR*, are listed in **Table J-4**. As shown, the area is designated to be in attainment of all pollutants, except for CO, which is designated to be in maintenance. Notably, there has not been a measured exceedance of the CO standards since 1995 (28 years) and, in 2018, the Massachusetts Department of Environmental Protection (MassDEP) published a Second 10-Year Limited Maintenance Plan for CO that details the agency's plans to maintain levels of CO below the standards.[3]

Table J-4 Air Quality Designation Status for the Boston Metropolitan Area

Pollutant		Designation
Ozone (O_3)	2008 Standard	Attainment
	2015 Standard	Attainment
Carbon Monoxide (CO)		Maintenance[1]
Nitrogen Dioxides (NO_2)		Attainment
Particulate Matter (PM_{10})		Attainment
Particulate Matter ($PM_{2.5}$)		Attainment

1 U.S.EPA, Nonattainment Areas for Criteria Pollutants (Green Book). https://www.epa.gov/green-book.

2 An area with air quality levels that meet or are below the NAAQS is designated as attainment; an area with air quality levels that are above the NAAQS is designated as nonattainment; and an area that has attained the NAAQS but remains subject to certain requirements of the CAA is designated as maintenance. An area may also be designated as unclassifiable when there is 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.

3 Commonwealth of Massachusetts, Massachusetts Department of Environmental Planning, Revision to the Massachusetts State Implementation Plan for Carbon Monoxide, Second 10-Year Limited Maintenance Plan for the Boston Metropolitan Area, Lowell, Springfield, Waltham, and Worcester. February 9, 2018.

Table J-4 Air Quality Designation Status for the Boston Metropolitan Area

Pollutant	Designation
Sulfur Dioxide (SO_2)	Attainment
Lead (Pb)	Attainment

Source: U.S.EPA, "Nonattainment Areas for Criteria Pollutants (Green Book)," August 30, 2023, https://www.epa.gov/green-book.

1 The Boston Metropolitan Area was redesignated to a maintenance area for CO on April 1, 1996. Although the 20-year maintenance period has lapsed, the details/requirements of the maintenance plan that are in the SIP continue to be in the SIP until the State/Area makes a SIP revision requesting removal of such a maintenance plan.

Historically, the Boston Metropolitan Area, as well as other areas of Massachusetts, was designated nonattainment for O_3 standards that were promulgated in 1979 and 1997 and were subsequently revoked.[4] Due to the requirements of the CAA, MassDEP remains obligated to enforce SIP elements that address O_3. The current O_3 standard for which the area is designated attainment was promulgated in 2015. The 2015 O_3 NAAQS is a revision to the 2008 O_3 NAAQS. The 2015 revision strengthened (i.e., lowered) the standard by which areas would be designated attainment or nonattainment. From the time that the 2008 NAAQS was promulgated, there have been no exceedances of either NAAQS.[5]

While the Boston Metropolitan Area is designated attainment for O_3, the entire state of Massachusetts, along with 10 other states and a Consolidated Metropolitan Statistical Area that includes the District of Columbia and northern Virginia, comprise an Ozone Transport Region (OTR).[6] Because Massachusetts is in the OTR, the state is required to submit a SIP to the U.S.EPA and provide a certain level of controls on the sources that emit the pollutants that form O_3, even though the area is designated attainment for the pollutant. Within the Boston Metropolitan Area, major new or modified sources must comply with Reasonably Available Control Technology (RACT) requirements of the SIP to lower emissions of the O_3-forming pollutants (i.e., NO_X and VOC).

J.2.3 State Implementation Plans (SIPs)

For the purposes of this summary explanation of SIPs, it is sufficient to characterize SIPs as the principal instrument by which a state formulates and implements its strategies for bringing Nonattainment or Maintenance areas into compliance with the NAAQS. In equally broad terms, the SIP contains the necessary emission limitations, control measures and timetables for achieving this objective. Therefore,

4 The 1979 standard was revoked on June 15, 2005 (https://www.epa.gov/green-book/designation-and-naaqs-information-related-1-hour-ozone-1979-standard-naaqs-revoked), and the 1997 standard was revoked on April 6, 2015 (https://www.epa.gov/green-book/designation-and-naaqs-information-related-8-hour-ozone-1997-standard-naaqs-revoked).

5 The 2008 O_3 NAAQS was promulgated by the U.S.EPA on May 12, 2012 (Federal Register, Vol 77, No. 98, Page 30160).

6 Ozone can travel with the wind over long distances, creating air quality problems far downwind of pollution sources and can be transported across state borders. Therefore, the Ozone Transport Commission (OTC), which is a multi-state organization, was created under the CAA. The OTC is responsible for advising U.S.EPA on transport issues and for developing and implementing regional solutions to the ground-level ozone problem in the Northeast and Mid-Atlantic regions known as the OTR. The OTR encompasses 11 states, including Massachusetts. The CAA sets out specific requirements for the OTR states. These requirements entail submitting a SIP and installing a certain level of controls for the pollutants that form ozone (VOC and NO_X), even if they meet the ozone standards.

the SIP development process is delegated to state air quality agencies that may in turn rely on regional, county, and local agencies to help prepare emission inventories that include airport-related emissions.

The SIPs prepared for Massachusetts detail the State's regulatory plans for maintaining levels of CO and O_3 below the NAAQS. The SIPs that are applicable to the Boston Metropolitan Area are listed in **Table J-5**. Included in the SIPs is a measure to control the growth of parking spaces which was meant to decrease the number of VMT in the South Boston neighborhood of Boston. The number of commercial and employee 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 SIP under the CAA (42 U.S.C. §7401 et seq. [1970]).

The intent of the Logan Airport Parking Freeze is to reduce air emissions by shifting air passengers to travel modes that require fewer vehicle trips. However, survey data since the 1970s has consistently shown that constrained parking has the unintended consequence of shifting air passengers to travel modes with higher numbers of vehicle trips, despite Massport's extensive efforts to provide and encourage the use of HOV travel modes. An amendment to increase the Logan Airport Parking Freeze by 5,000 on-Airport commercial parking spaces was finalized on March 6, 2018, and effective on April 5, 2018. For additional information, see Chapter 6, *Ground Access*.

Table J-5 SIPs for the Boston Metropolitan Area

Standard	Title	Status	Comments
Carbon Monoxide (CO)	Maintenance Plan	Published February 2018	This second 10-year Maintenance Plan is required for any area that was formerly designated as nonattainment to show that it will not regress to a nonattainment status. The current maintenance plan meets the requirements of Section 175A of the CAA and conforms to U.S.EPA guidance for CO maintenance plans.[1]
Ozone (O_3)	2008 SIP	Certified February 2018	In February 2018, MassDEP's transport SIP was certified. This Certification fulfilled the interstate transport requirements in Section 110(a)(2)(D)(i) of the CAA and completed MassDEP's Infrastructure SIP Certification in accordance with Sections 110(a) (1) and (2) of the CAA for the 2008 O_3 NAAQS.[2]
	2015 SIP	Certified September 2018	In October 2015, U.S.EPA lowered (i.e., made stricter) the NAAQS for O_3. In September 2018, MassDEP's infrastructure SIP was certified. This certification fulfilled the infrastructure requirements of CAA Sections 110(a)(1) and (2), as well as interstate transport requirements in Section 110(a)(2)(D)(i).[3]

Table J-5 SIPs for the Boston Metropolitan Area

Standard	Title	Status	Comments
	2008 and 2015 SIP	Published October 2018	MassDEP prepared this revision to the Massachusetts SIP to address RACT requirements for the 2008 and 2015 8-hour O_3 NAAQS. For certain source categories, MassDEP is submitting regulations that establish new or more stringent RACT controls. For other source categories, MassDEP is certifying that previously adopted RACT regulations and controls represent RACT for implementing the 2008 and 2015 O_3 NAAQS.[4]

Source: Commonwealth of Massachusetts, Massachusetts Department of Environmental Protection, "Massachusetts State Implementation Plans (SIPs)." August 30, 2023, https://www.mass.gov/lists/massachusetts-state-implementation-plans-sips#ozone-sip-.

Notes: The number of commercial and employee parking spaces allowed at Logan Airport is regulated by the Logan Airport Parking Freeze (310 Code of Massachusetts Regulations 7.30 and 40 Code of Federal Regulations 52.1120), which is an element of the State Implementation Plan (SIP) under the federal Clean Air Act (CAA).

CAA – Clean Air Act, U.S.EPA – Environmental Protection Agency, MassDEP – Massachusetts Department of Environmental Protection, CO – Carbon Monoxide, O_3 – Ozone, SIP – State Implementation Plan, NAAQS – National Ambient Air Quality Standards, and RACT – Reasonably Available Control Technology.

1 Commonwealth of Massachusetts, Massachusetts Department of Environmental Protection, Second 10-Year Limited Maintenance Plan for the Boston Metropolitan Area, Lowell, Springfield, Waltham, and Worcester, February 9, 2018.

2 Commonwealth of Massachusetts, Massachusetts Department of Environmental Protection, Certification of Adequacy of the Massachusetts State Implementation Plan with Clean Air Act Section 110(a)(2)(D)(i) Interstate Air Pollution Transport Requirements for the 2008 Ozone National Ambient Air Quality Standards, February 9, 2018.

3 Commonwealth of Massachusetts, Massachusetts Department of Environmental Protection, Certification of Adequacy of the Massachusetts State Implementation Plan Regarding Clean Air Act Sections 110(a)(1) and (2) for the 2015 Ozone National Ambient Air Quality Standards, September 27, 2018.

4 Commonwealth of Massachusetts, Massachusetts Department of Environmental Protection, Massachusetts Reasonably Available Control Technology State Implementation Plan Revision For the 2008 and 2015 Ozone National Ambient Air Quality Standards, October 18, 2018.

J.2.4 Logan Airport Air Quality Permits for Stationary Sources of Emissions

Massport received a Title V Air Quality Operating Permit for Logan Airport in September 2004, and the most recent renewal was issued in July 2015. At the time of this filing, Massport is in the process of renewing its Title V Operating permit.[7] This permit covers Massport-operated stationary sources including the Central Heating and Cooling Plant, snow melters, fuel dispensers, boilers, emergency generators, and fuel storage tanks.

J.2.5 Greenhouse Gas Policy and Guidelines

GHGs are known to contribute to climate change. In 2009, the U.S.EPA issued a proposed finding that GHGs also contribute to air pollution that may endanger public health or welfare. This action laid the initial legal groundwork for the regulation of GHG emissions nationwide under the CAA, although currently there are no specific U.S. laws or regulations that call for the regulation of GHGs for airports

7 Minor Modification (Application) No. MBR-95-OPP-094RM.

directly.[8] According to the U.S.EPA's most recent *Inventory of U.S. GHG Emissions and Sinks*, published in 2023, aircraft emissions represent 6.6 percent of the U.S. transportation sector GHG emissions. In turn, the transportation sector's GHG emissions are estimated to be 29 percent of total U.S. emissions compared with other sectors, including commercial and residential (30 percent), industry (30 percent), and agriculture (11 percent).[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, certain projects subject to review under MEPA (though not annual EDR/ESPR filings) are required to:

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

With respect to the *2022 ESPR* GHG emissions inventories,[12] the following information is noteworthy:

- Although the *2022 ESPR* is not subject to the MEPA GHG policy (because it does not propose any discrete projects), since the *2007 EDR,* Massport has voluntarily prepared an inventory of GHG emissions both directly and indirectly associated with the Airport.
- The emission source categories in the *2022 ESPR* comply with MEPA's requirement to analyze the environmental impacts of direct and indirect mobile and stationary source emissions.
- The 2022 GHG emissions inventories were prepared following methodological guidance by the Transportation Research Board's (TRB) Airport Cooperative Research Program (ACRP) Report 11: *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*[13] as well as the guidance of the Airports Council International (ACI) Airport Carbon Accreditation (ACA) Program.[14] The inventory assigns GHG emissions based on Scopes 1, 2, and 3, which are based on ownership or control (whether they are controlled by Massport, the airlines or other airport tenants, or the public).

8 GHG emission reduction measures have been adopted by the U.S.EPA for new aircraft engines, but these regulations do not apply directly to airports.

9 EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021*, (published 2023), https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021.

10 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Revised MEPA Greenhouse Gas Emissions Policy and Protocol, effective May 5, 2010, https://www.mass.gov/files/documents/2016/08/rp/ghg-policy-final-summary.pdf.

11 GHGs 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 [SF6], hydrofluorocarbons [HFCs], and perfluorocarbons [PFCs]). GHG emission sources associated with airports are generally limited to CO_2, CH_4, and N_2O.

12 This ESPR GHG inventory is one of three that Massport prepares annually; however, the other two comprise only stationary sources of GHGs and are filed with MassDEP and the U.S.EPA, respectively. These reports are for Massport-owned-and-operated equipment only, and do not cover any tenant-owned/operated-equipment or facilities.

13 National Academies of Sciences, Engineering, and Medicine 2009, Transportation Research Board, Airport Cooperative Research Program, Report 11: *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*, 2009, Washington, D.C.: The National Academies Press, https://nap.nationalacademies.org/catalog/14225/guidebook-on-preparing-airport-greenhouse-gas-emissions-inventories.

14 ACA, https://aci-lac.aero/airport-carbon-accreditation/.

- Massport has direct ownership or control over a small percentage of the GHG emission sources (which include Massport fleet vehicles, stationary sources, and electrical consumption within Massport buildings). As with most commercial service airports, the majority of the GHG emission sources are owned or controlled by the airlines, other airport tenants (such as rental car companies), and the public (such as passenger motor vehicles).
- Massport also prepares two other GHG emissions inventories for stationary sources at Logan Airport:
- A GHG emissions inventory for the MassDEP GHG Emissions Reporting Program for those sources meeting the criteria for Category 1 and Scope 1 (only those sources under the direct ownership and control of Massport);[15,16] and
- A U.S.EPA Greenhouse Gas Summary Report. [17]

Consistent with ACRP and ACA guidelines, the GHG emissions in the *2022 ESPR* are based on ownership and control and are delineated as follows:

- **Scope 1/Direct** – GHG emissions from sources that are owned and controlled by the reporting entity (in this case, Massport), such as stationary sources and Airport-owned fleet motor vehicles.
- **Scope 2/Indirect** – GHG emissions associated with the generation of electricity consumed but generated off-site at public utilities.
- **Scope 3/Indirect and Optional** – GHG emissions that are associated with the activities of the reporting entity (in this case, Massport), but are associated with sources that are owned and controlled by others. These include aircraft-related emissions, emissions from Airport tenant activities, as well as ground transportation to and from the Airport.

J.3 Modeling Tools

The modeling tools and emission factor databases used to estimate emissions for calendar year 2022 and the Future Planning Horizon are described in the sections below.

J.3.1 FAA Aviation Environmental Design Tool (AEDT)

Massport uses the Federal Aviation Administration's (FAA's) Aviation Environmental Design Tool (AEDT, Version 3e)[18] for air quality modeling of aircraft-related emissions. AEDT replaced the FAA's legacy Emissions and Dispersion Modeling System (EDMS) tool in 2015. The AEDT model was used for the first time for the emission estimates reported in the *2016 EDR*.

15 Boston Logan International Airport. 2022. Massachusetts Department of Environmental Protection (MassDEP) GHG Emissions Reporting Program.
16 Starting with the 2016 reporting year MassDEP combined GHG Reporting with its Source Registration reporting program.
17 EPA, Greenhouse Gas Summary Report for Boston Logan International Airport for calendar year 2022.
18 U.S. Department of Transportation (DOT), Federal Aviation Administration, "Aviation Environmental Design Tool (AEDT)," https://aedt.faa.gov/. At the time of the preparation of the *2022 ESPR*, AEDT Version 3e (released on May 9, 2022) was the latest version of AEDT.

The AEDT noise and air quality model was released in 2015 and is FAA's approved computer model for calculating emissions from aircraft-related sources. As discussed in Chapter 7, *Noise*, AEDT is also designed to assess airport noise. The AEDT model was developed to incorporate the most up-to-date and best-available science. The latest version of AEDT at the time of the *2022 ESPR* emission estimates was AEDT3e, which was released in May of 2022.

AEDT3e introduced new features, improvements, and updates from the previous model version 3d used in the *2020/2021 EDR,* primarily aimed at the processes and inputs used to compute dispersion modeling. However, the model changes that may affect the results of the 2022 air quality emissions inventories are minor and consist of the following:[19]

- Updates to emissions calculations for boiler/heater, fuel tank, sand salt pile, and solvent degreaser based on the latest U.S.EPA approved methodologies, and
- Updates to the "Airport," "Fleet" and "Study" database within AEDT.

Furthermore, the earliest model applied was in the 1990 inventory which was prepared using the Logan Dispersion Modeling System (LDMS). The 1998 through 2015 inventories were prepared using EDMS (the version of which varied by year), and the 2016 through 2022 inventories used AEDT (multiple versions). As stated in the *2016 EDR*, there are significant differences in EDMS and AEDT that resulted in differences when comparing the results between the two models. The primary differences are described in the *2016 EDR* as being differences in the input data, variances in the aircraft operational characteristics, and differences in the aircraft times-in-mode (in particular those for aircraft climb out during which emissions of NO_X are greatest), emission factors, and a more robust airframe/engine database in AEDT. Additionally, there continue to be updates and variances between versions of AEDT.

J.3.2 EPA Motor Vehicle Emission Simulator (MOVES)

At the time that emission estimates were prepared for the *2022 ESPR*, MOVES Version 3.1 was the U.S.EPA's latest approved computer model for estimating emissions from mobile sources (i.e., on-road motor vehicles and most nonroad equipment).[20] MOVES estimates emissions at the national, county, and project level for criteria air pollutants/precursor pollutants, GHGs, and air toxics. Compared to the previous version (i.e., MOVES3.0.3), MOVES3.1 incorporates minor revisions. MOVES3.1 adds an inspection/maintenance (I/M) program benefit for Class 2b and 3 gasoline trucks with a gross vehicle weight rating of between 8,500 and 14,000 pounds (Regulatory Class 41). With this minor revision, these trucks will now receive the same proportional I/M benefit for exhaust emissions as lower-classification gasoline trucks. This benefit was missing in previous versions of MOVES.

19 U.S. DOT, Federal Aviation Administration, Aviation Environmental Design Tool, Version 3e, https://aedt.faa.gov/3e_information.aspx.

20 EPA, "MOVES3 Update Log", webpage accessed on August 21, 2023, https://www.epa.gov/moves/moves3-update-log.

According to the U.S.EPA release notes, this minor revision may decrease VOC, NO_X, and CO emissions in some areas, but it will not substantially change on-road criteria air pollutant emission rates in MOVES3 at the County Scale.[16]

J.3.3 GHG Emission Factors Hub

The GHG emissions inventory was prepared using U.S.EPA's GHG Emission Factors Hub (modified on April 1, 2022).[21] U.S.EPA's GHG Emission Factors Hub was designed to provide organizations with a regularly updated and easy-to-use set of default emission factors for organizational GHG reporting. Key sources for these emission factors include:

- EPA's Greenhouse Gas Reporting Program.
- EPA's Emissions & Generation Resource Integrated Database (eGRID).
- Inventory of U.S. Greenhouse Gas Emissions and Sinks.
- Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (AR4).

J.4 Emissions Inventory Data Inputs and Assumptions

The following sections provide the data inputs and assumptions associated with Logan Airport operations used to prepare the 2022 and Future Planning Horizon analyses. Air emissions associated with Logan Airport operations result from aircraft, GSE (including APUs), motor vehicles, and a source category called "other." Each of these sources of emissions for both years is presented in **Table J-6** along with the input data, assumptions, and brief descriptions of the assessment methodology.

J.4.1 Overall Data Inputs and Assumptions

Logan Airport operations result from aircraft, GSE (including APUs), motor vehicles, and a source category called "other." Each of these sources of emissions for the 2022 and Future Planning Horizon years are presented in **Table J-6** along with the input data, assumptions, and brief descriptions of the assessment methodology.

Notably, there are several limitations on the predictive ability of air quality models relating to years as distant as 10 to 15 years out. For example, the FAA's AEDT model used to conduct the aircraft and GSE analyses is often updated by FAA, but these updates do not account for future-year technological changes. The EDRs and ESPRs update assumptions and technological advances as they are available.

21 EPA, GHG Emission Factors Hub, accessed on November 20, 2023, https://www.epa.gov/climateleadership/ghg-emission-factors-hub.

Table J-6 Overall Data Inputs and Assumptions by Source

Source	Inputs	2022	Future Planning Horizon

Aircraft	*Operations and Fleet Mix*	• The Logan Airport aircraft fleet was grouped into four categories: commercial air carriers, commuter aircraft, GA, and cargo aircraft.
		• The 2022 aircraft fleet mix at Logan Airport was used as input to FAA's AEDT.
		• Where aircraft/engine type combinations operating at Logan Airport were not available in the AEDT database, substitutions were made based on the closest match of aircraft frame and engine types using professional judgment.
		• Total LTOs increased by 42.3 percent, from 2021 to 2022, with
		  o Air carrier LTOs increasing by 55.4 percent,
		  o Commuter LTOs increasing by 29.3 percent,
		  o Air cargo LTOs increasing by 14.6 percent, and
		  o GA LTOs increasing by 15.5 percent.
		• The increase in total LTOs is attributable to the recovery in demand for air travel in 2022 from pre-pandemic (2019) levels. However, 2022 LTOs are still below 2019 levels (11.4 percent less).
			• As with the 2022 emissions inventory, the most recent version, AEDT3e, was used to compute the future Logan Airport emissions inventory. While current aircraft and motor vehicle engine technologies are likely to change, become more efficient, and use alternative fuels not used currently, these changes cannot feasibly be accounted for, and thus are not included in the model. Similarly, the modeled aircraft reflect current technologies and cannot adequately characterize the low-emissions profiles of certain developing engine technologies. Thus, the predicted emissions represent a conservative estimate (likely over-estimate) of future conditions.
			• LTOs are forecasted to increase from 189,307 in 2022 (213,588 in 2019) to 247,501, with
			  o Air carrier LTOs increasing from 119,167 in 2022 (147,122 in 2019) to 171,709,
			  o Commuter LTOs increasing from 48,292 in 2022 (46,888 in 2019) to 49,028,
			  o Air cargo LTOs decreasing from 7,344 in 2022 (3,855 in 2019) to 6,725, and
			  o GA LTOs increasing from 14,504 in 2022 (15,731 in 2019) to 20,039.
			• Section J.4 of this appendix contains the input data that were used in AEDT, including aircraft category, aircraft types, aircraft engines, and LTOs.

	Taxi Times	• Updated aircraft taxi/delay times are based on data obtained from the FAA Aviation System Performance Metrics (ASPM) database for the year 2022. • According to ASPM, the average aircraft taxi/delay times at Logan Airport from 2021 to 2022 increased 5.5 percent from 22.3 minutes to 27.8 minutes. • The increase in aircraft taxi/delay times is due to the increase in aircraft operations at Logan Airport from 2021 to 2022.	• Aircraft taxi times for the Future Planning Horizon were developed from the Boston Logan Runway Incursion Mitigation (RIM) study and FAA's ASPM database, which provides the use of the Airport for each of the main runway configurations. • The average taxi time forecasted for the Future Planning Horizon is approximately two minutes less than the times reported for 2022 (i.e., 25.6 minutes).

Table J-6 Overall Data Inputs and Assumptions by Source

Source	Inputs	2022	Future Planning Horizon

Ground Service Equipment (GSE)	*Types and Time-in-mode (TIM)*	• GSE (including APUs) were modeled using FAA's AEDT.
		• Reductions attributable to Massport's AFV Program and the conversion of Massport and/or tenant GSE and fleet vehicles to CNG or electric were included in the analysis.
		• GSE types and TIM data was based on:
		  o Logan Airport-specific GSE TIM survey conducted in 2017,
		  o The GSE fuel use (i.e., gasoline, diesel, liquid petroleum gas, electric) data from Massport's 2022 Vehicle Aerodrome Permit Application Program for Logan Airport, and
		  o AEDT's aircraft specific GSE default data.
		• Recent data from a subset of airlines has suggested that Aerodrome data is not completely representative of the GSE at Logan Airport. This data is currently being evaluated and the findings will be presented in the next EDR.
			• The estimation of APU emissions was based on data from the 2017 on-site GSE TIM survey, as well as forecasted future aircraft fleet operations and assuming 100% of gates having ground power and pre-conditioned air.
			• 98 percent of the GSE fleet were assumed to be converted to eGSE by the Future Planning Horizon.

Motor Vehicles	*Emission Factors, Vehicle-Miles-Travelled (VMT), and Mode Share*	• Motor vehicle emission factors for cruise and idling modes were obtained from U.S.EPA's MOVES model (i.e., MOVES) combined with MassDEP-recommended motor vehicle fleet mix data, operating conditions, and other Massachusetts-specific input parameters. • In general, the emission factors obtained from MOVES decrease as years progress due to improved manufacturers' engine efficiencies. However, variances in model versions and vehicle mixes can affect emission factor outputs. In 2022 emission factors for VOCs and CO decreased and NO_X and PM_{10}/$PM_{2.5}$ increased from 2021 levels. • Example MOVES input/output files are included in Table J-9 and Table J-10, respectively, of this appendix.	• As with 2022, motor vehicle emission factors for the Future Planning Horizon were obtained from the most recent version of U.S.EPA's MOVES model (MOVES3.1). • County-specific data (fuel characteristics, I/M program, age distribution, etc.) were provided by MassDEP. • The MOVES model reflects the continuous reduction in motor vehicle emissions over time. • Example MOVES input/output files are included in Table J-9 and Table J-10, respectively, of this appendix. • Chapter 6 of the 2022 ESPR provides a discussion of the on-Airport VMT data and curbside/parking volumes used for the Future Planning Horizon analysis. • Curbside Idling times were assumed to be the same as 2022 analysis year.

Table J-6 Overall Data Inputs and Assumptions by Source

Source	Inputs	2022	Future Planning Horizon
		• Chapter 6, *Ground Access*, of the *2022 ESPR* provides a discussion of the on-Airport VMT data and curbside/parking volumes used for the 2022 analysis. • A curb idling survey to support the development of the *2022 ESPR* motor vehicle emissions inventories was conducted in July/August of 2023. • Vehicles mode share was based on the *2022 Logan Air Passenger Ground Access Survey* prepared in March 2023.	• Vehicles mode share were assumed to be the same as 2022 analysis year.
Other	*Emission Factors and Throughputs*	• Other sources include stationary sources at Boston-Logan such as fuel storage and handling facilities, boilers, snow melters, emergency generators, space heaters, and fire training activities. • Emissions at Logan Airport were based on annual fuel throughput records for 2022. • Emission factors were based on appropriate U.S.EPA emission factors such as: ○ Compilation of Air Pollution Emission Factors (AP42), ○ manufacturer provided emission factors, or ○ emission factors obtained from NO_X RACT compliance testing. Notably, emission factors used to estimate boiler emissions were based on the stack test data performed in March 2022. • In 2022, the Central Heating and Cooling Plant's natural gas usage has decreased by 40 percent and ultra-low sulfur diesel (ULSD) has increased by 76 percent.	• Emissions associated with fuel storage and handling, the Central Heating and Cooling Plant, snow melters, emergency generators, space heaters, and fire training at Logan Airport are based largely on fuel throughput, and are expected to become more fuel-efficient, less fuel-dependent, and emit fewer emissions in the Future Planning Horizon. • Boilers were assumed to be all electric in the Future Planning Horizon. • Emergency generators and space heaters were estimated using the average fuel throughput for the past five years, combined with the anticipated increase in terminal building square footage. • Snow melters were assumed to be 100 percent green hydrogen. • Fire training were based on the past five-year average usage. • The same emission factors used in 2022 were also assumed for the future condition.

Table J-6 Overall Data Inputs and Assumptions by Source

Source	Inputs	2022	Future Planning Horizon
		• Massport is planning to upgrade the Central Heating and Cooling Plant at Logan Airport to accommodate the anticipated increase in heating load for the Terminal E expansion project. This project will include replacing the existing dual-fuel Boiler 3 with a new natural gas-fired boiler of approximately the same capacity. • Massport is also planning to continue to further reduce the Central Heating and Cooling Plant emissions as part of a Net Zero Roadmap by 2031 strategy.	

Notes: APU – Auxiliary Power Unit, FAA – Federal Aviation Administration, AEDT – Aviation Environmental Design Tool, AFV – Alternative Fuel Vehicles, CNG – Compressed Natural Gas, EDR/ESPR – Environmental Data Report/ Environmental Data Report/Environmental Status and Planning Report, GA – General Aviation, MOVES – Motor Vehicle Emission Simulator (MOVES), NO_X RACT– Nitrous Oxide Reasonably Available Control Technology, and VMT – Vehicle-Mile-Travelled.

Massport undertakes a variety of programs to reduce Airport-related emissions that it does not directly own or control through its support of HOV initiatives, including subsidizing free outbound Silver Line Service from Logan Airport; supporting use of AFVs by airport taxis; providing eGSE charging stations and other initiatives to facilitate the replacement of gas- and diesel-powered GSE with eGSE; and providing 400-Hz power and PCA at all aircraft contact gates. Massport is also collaborating with the Massachusetts Clean Energy Center (MassCEC) to study opportunities to enable conversion of the ride-for-hire fleet (RideApp, Rental Car Taxi and limousine vehicles) that serves Logan Airport to transition to electric vehicles. In early 2022, MassCEC provided a grant to initiate this work and provided funding to enhance Logan's EV charging infrastructure.

J.4.2 Aircraft Fleet and Annual Landing and Takeoff (LTO) Data

FAA's AEDT Version 3e was used to prepare the 2022 and Future Planning Horizon Year air quality analyses as it was the most current version at the time of the preparation of the *2022 ESPR*. In December 2023, FAA released Version 3f of AEDT.

Table J-7 contains the data that were used in AEDT 3e to represent actual conditions at Logan Airport in 2022 and the Future Planning Horizon Year, respectively. These data include aircraft type, engine type, and the number of annual LTOs.[22] The aircraft are divided into four categories: air carrier (AC), cargo (CA), commuter (CO), and general aviation (GA).

22 One LTO is equal to two operations (i.e., arrival + departure).

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Air Carrier				
Embraer ERJ190-LR	CF34-10E6	19,490	13,520	AC
Airbus A321-100 Series	V2533-A5	17,967	20,050	AC
Airbus A320-200 Series	V2527-A5	8,050	7,788	AC
Airbus A321-100 Series	CFM56-5B3/P	6,369	--	AC
Airbus A220-300	PW1524G	5,857	12,570	AC
Boeing 737-900-ER	CFM56-7B27E/B1	5,537	5,010	AC
Airbus A220-100	PW1519G	5,192	9,760	AC
Boeing 737-800 Series	CFM56-7B27	5,066	5,780	AC
Boeing 737-800 Series	CFM56-7B26	3,771	--	AC
Boeing 737-9	LEAP-1B28/28B1/28B2/28B3	3,519	20,050	AC
Airbus A319-100 Series	V2522-A5	3,070	13,325	AC
Airbus A321-NEO	LEAP-1A35A/33/33B2/32/30	3,068	19,775	AC
Airbus A320-200 Series	V2527-A5 SelectOne™ Upgrade Package	2,890	--	AC
Airbus A319-100 Series	CFM56-5B6/P	2,727	--	AC
Boeing 737-700 Series	CFM56-7B24	1,874	2,105	AC
Airbus A321-NEO	PW1133G-JM	1,855	--	AC
Boeing 737-700 Series	CFM56-7B22	1,617	--	AC
Boeing 737-800 Series	CFM56-7B24/3	1,236	--	AC
Airbus A319-100 Series	CFM56-5A5	1,196	--	AC
Airbus A330-300 Series	CF6-80E1A4	1,095	--	AC
Boeing 737-8	LEAP-1B28/28B1/28B2/28B3	1,013	15,875	AC
Airbus A330-300 Series	Trent 772	969	--	AC
Airbus A320-NEO	PW1127G-JM	847	9,525	AC
Boeing 777-300 ER	GE90-115B	842	3,805	AC
Airbus A321-200 Series	CFM56-5B3/P	781	--	AC
Airbus A350-900 series	Trent XWB-84	721	1,990	AC
Airbus A330-300 Series	PW4168A	714	--	AC

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Boeing 787-9 Dreamliner	GEnx-1B76A/P2	643	2,045	AC
Airbus A319-100 X/LR	V2524-A5 SelectOne™ Upgrade Package	609	--	AC
Airbus A320-200 Series	CFM56-5B4/P	602	--	AC
Airbus A320-NEO	LEAP-1A26/26E1	588	--	AC
Boeing 767-300 ER	CF6-80C2B6F	569	--	AC
Boeing 767-300 ER	PW4060	525	--	AC
Airbus A321-NEO	PW1133GA-JM	472	--	AC
Embraer ERJ190	CF34-8E5	446	--	AC
Boeing 737-900-ER	CFM56-7B26/3	406	--	AC
Boeing 737-8	LEAP-1B25	400	--	AC
Boeing 777-200 Series	Trent 892	387	1,563	AC
Boeing 737-800 Series	CFM56-7B26/3	383	--	AC
Airbus A330-200 Series	CF6-80E1A4	353	1,745	AC
Airbus A320-200 Series	CFM56-5B3/3	349	--	AC
Airbus A330-900N Series (Neo)	Trent7000-72	321	2,955	AC
Boeing 767-400	CF6-80C2B8F	267	--	AC
Airbus A340-600 Series	Trent 556-61	256	--	AC
Boeing 737-700 Series	CFM56-7B24/3	250	--	AC
Airbus A320-200 Series	CFM56-5A3	222	--	AC
Airbus A321-NEO	CFM56-5B2/3	212	--	AC
Airbus A330-200 Series	Trent 772	211	--	AC
Boeing 747-400 Series	CF6-80C2B1F	205	--	AC
Boeing 737-900-ER	CFM56-7B26	177	--	AC
Airbus A380-800 Series	Trent 970-84	172	443	AC
Boeing 787-9 Dreamliner	Trent 1000-J3	170	--	AC
Airbus A340-300 Series	CFM56-5C4	157	--	AC
Airbus A320-200 Series	V2527E-A5	150	--	AC
Boeing 767-300 ER	CF6-80C2B7F	149	--	AC

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Airbus A320-200 Series	CFM56-5B4	139	--	AC
Airbus A330-300 Series	CF6-80E1A3	138	--	AC
Boeing 737-8	LEAP-1B27	135	--	AC
Airbus A220-300	PW1521G	133	--	AC
Boeing 737-900 Series	CFM56-7B26	122	--	AC
Boeing 777-200 Series	GE90-90B	113	--	AC
Airbus A319-100 Series	CFM56-5B6/3	110	--	AC
Boeing 737-800 Series	CFM56-7B27E/B1	110	--	AC
Airbus A330-900N Series (Neo)	Trent7000-72C	99	--	AC
Airbus A319-100 X/LR	V2527-A5M SelectOne™ Upgrade Package	93	--	AC
Airbus A330-200 Series	PW4168A	90	--	AC
Boeing 787-8 Dreamliner	GEnx-1B70/75/P2	81	--	AC
Boeing 767-300 ER	PW4056	80	--	AC
Airbus A320-200 Series	CFM56-5-A1	77	--	AC
Boeing 737-800 Series	CFM56-7B24	74	--	AC
Boeing 737-700 Series	CFM56-7B26	72	--	AC
Boeing 787-10 Dreamliner	Trent 1000-K2	68	1,555	AC
Airbus A321-200 Series	CFM56-5B3/3	60	--	AC
Boeing 757-300 Series	RB211-535E4B	49	--	AC
Airbus A350-1000 Series	Trent XWB-97	43	--	AC
Airbus A330-200 Series	CF6-80E1A2	42	--	AC
Boeing 737-400 Series	CFM56-3C-1	29	--	AC
Boeing 787-9 Dreamliner	Trent 1000-J2	27	--	AC
Airbus A330-200 Series	CF6-80E1A3	25	--	AC
Boeing 777-200-ER	GE90-94B	17	--	AC
Boeing 787-8 Dreamliner	Trent 1000-CE3	15	--	AC
Airbus A320-200 Series	V2522-D5	14	--	AC
Boeing 777-200-ER	GE90-90B	11	--	AC

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Airbus A340-300 Series	CFM56-5C4/P	10	--	AC
Boeing 737-700 Series	CFM56-7B24E	10	--	AC
Boeing 737-700 Series	CFM56-7B20	9	--	AC
Airbus A319-100 Series	V2527-A5	9	--	AC
Airbus A319-100 X/LR	CFM56-5B7/3	7	--	AC
Boeing 737-9	LEAP-1B28BBJ1	7	--	AC
Boeing 717-200 Series	BR700-715A1-30	6	--	AC
Boeing 757-300 Series	RB211-535E4B	6	--	AC
Boeing 747-8	GEnx-2B67	6	480	AC
Airbus A319-100 Series	CFM56-5B3/3	6	--	AC
Boeing 737-800 Series	CFM56-7B27/3	5	--	AC
Boeing 757-300 Series	PW2040	4	--	AC
Airbus A321-100 Series	CFM56-5B1/3	4	--	AC
Embraer ERJ190	CF34-10E6A1	3	--	AC
Airbus A320-200 Series	CFM56-5B4/2	3	--	AC
Boeing 777-200 Series	PW4084	3	--	AC
Boeing 777-200 Series	GE90-90B	3	--	AC
Boeing 787-8 Dreamliner	GENX-1B64	3	--	AC
Boeing 787-8 Dreamliner	GEnx-1B70	2	--	AC
Airbus A380-800 Series	GP7270	2	--	AC
Boeing 737-800 Series	CFM56-7B27E/F	2	--	AC
Boeing 787-10 Dreamliner	GEnx-1B76A/P2	1	--	AC
Airbus A320-NEO	PW1127GA-JM	1	--	AC
Airbus A318-100 Series	CFM56-5B9/3	1	--	AC
Airbus A320-200 Series	V2527-A5E SelectOne™ Upgrade Package	1	--	AC
Airbus A319-100 Series	CFM56-5B7/P	1	--	AC
Embraer ERJ190	CF34-10E7-B	1	--	AC
Airbus A319-100 Series	CFM56-5B4/2P	1	--	AC

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Total Air Carrier Aircraft LTOs		119,167	171,709	
Cargo				
Boeing 767-300 ER Freighter	CF6-80C2B6F	2,961	4,332	CA
Boeing 757-200 Series	PW2037	2,850	371	CA
Boeing 757-300 Series	RB211-535E4B	--	400	
Boeing 757-200 Series	RB211-535E4B	372	--	CA
Cessna 208 Caravan	PT6A-114	193	1,374	CA
Airbus A300F4-600 Series	CF6-80C2A5F	178	--	CA
Airbus A300B4-600 Series	PW4158	128	--	CA
Boeing 767-300BCF	CF6-80C2B6F	125	--	CA
Boeing 757-200 Series	RB211-535E4	81	--	CA
Boeing MD-11 Freighter	CF6-80C2D1F	65	--	CA
Cessna 208 Caravan	TPE331-12B	64	248	CA
Boeing 757-200 Series Freighter	RB211-535E4	64	--	CA
Boeing 767-300 Series	CF6-80C2B6F	55	--	CA
Boeing 767-200 Series Freighter	JT9D-7R4D, -7R4D1	29	--	CA
Boeing 767-200 Series Freighter	CF6-80A	28	--	CA
Boeing MD-11 Freighter	PW4060	22	--	CA
Boeing 757-200 Series Freighter	PW2040	20	--	CA
Boeing 757-200 Series	PW2040	20	--	CA
Boeing MD-11 Freighter	PW4062	19	--	CA
Boeing 767-300 Series	PW4060	16	--	CA
Airbus A300F4-600 Series	CF6-80C2A5	14	--	CA
Boeing 767-300 Series	PW4x52	12	--	CA
Boeing 767-300 ER Freighter	CF6-80C2B7F	7	--	CA
Boeing 767-300 Series	CF6-80C2B6	6	--	CA
Boeing 767-200 Series	CF6-80C2B7F	6	--	CA
Boeing 767-200 Series Freighter	CF6-80A2	3	--	CA

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Boeing 777-200-LR	GE90-115B	3	--	CA
Boeing 767-200 Series	PW4060	2	--	CA
Boeing MD-10-30	CF6-50C2	1	--	CA
Total Cargo Aircraft LTOs		**7,344**	**6,725**	
Commuter				
Embraer ERJ175	CF34-8E5	21,696	27,845	CO
Cessna 402	TIO-540-J2B2	13,922	--	CO
Embraer ERJ175-LR	CF34-8E5	3,559	939	CO
Bombardier CRJ-900	CF34-8C5	2,304	5,012	CO
Bombardier de Havilland Dash 8 Q400	PW150A	1,926	3,170	CO
Embraer Phenom 300 (EMB-505)	PW530	1,115	--	CO
Embraer ERJ170	CF34-8E5	790	175	CO
Embraer ERJ145-LR	AE3007A1	784	--	CO
Tecnam P2012 Traveller	TIO-540-J2B2	727	--	CO
Embraer ERJ145-LR	AE3007A	657	--	CO
Embraer ERJ170-LR	CF34-8E5	321	--	CO
Bombardier CRJ-705-LR	CF34-8C5	161	--	CO
Embraer ERJ170	CF34-8E5A1	115	--	CO
Bombardier Global 6000	BR700-710A2-20	112	--	CO
Embraer ERJ145-LR	AE3007A1P	36	--	CO
Bombardier CRJ-200	CF34-3B/-3B1	27	--	CO
Bombardier (Canadair) CRJ200 ExecLiner	CF34-3A1	23	--	CO
Bombardier CRJ-700	CF34-8C1	8	--	CO
Bombardier Challenger 850	CF34-3B/-3B1	4	--	CO
Bombardier Learjet 36	TFE731-2-2B	3	--	CO
Bombardier CRJ-700	CF34-8C5B1	2	--	CO

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Total Commuter Aircraft LTOs		**48,292**	**49,028**	
General Aviation				
Cessna 680-A Citation Latitude	PW306B	1,289	--	GA
Pilatus PC-12	PT6A-67	1,075	1,020	GA
Bombardier Challenger 350	AS907-2-1A (HTF7350)	1,062	--	GA
Pilatus PC-12	PT6A-67B	779	--	GA
Cessna 560 Citation Excel	PW530	449	2,775	GA
Dassault Falcon 2000	PW308C BS 1289	426	--	GA
Cessna 560 Citation XLS	PW530	402	--	GA
Bombardier Global Express	BR700-710A2-20	366	--	GA
Raytheon Super King Air 300	PT6A-67A	350	--	GA
Bombardier Challenger 300	AS907-2-1A (HTF7350)	338	--	GA
Raytheon Hawker 800	TFE731-2/2A	336	--	GA
Gulfstream G650ER	BR700-725A1-12	331	--	GA
Cessna 700 Citation Longitude	AS907-2-1S (HTF7700L)	321	--	GA
Gulfstream G-5 Gulfstream 5 / G-5SP Gulfstream G500	BR700-710C4-11	310	--	GA
Cessna CitationJet CJ/CJ1 (Cessna 525)	JT15D-1 series	307	--	GA
Bombardier Challenger 600	CF34-3A1	275	--	GA
Gulfstream G400	TAY 611-8C	256	--	GA
Embraer Praetor 500	AS907-3-1E-A1 (HTF7500E)	239	--	GA
Raytheon Beechjet 400	JT15D-5, -5A, -5B	225	--	GA
Cessna 680 Citation Sovereign	PW306B	223	--	GA
Cessna 750 Citation X	AE3007C1	218	3,820	GA
Bombardier Challenger 605	CF34-3B/-3B1	201	--	GA
Cirrus SR22 Turbo (FAS)	TIO-540-J2B2	200	--	GA
Kaman SH-2 Seasprite	T700-GE-401 -401C	197	221	GA
Bombardier Learjet 60	PW306A	193	--	GA
Bombardier Global 5000	BR700-710A2-20	186	--	GA

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Gulfstream G280	AS907-2-1G (HTF7250G)	179	--	GA
Pilatus PC-24	JT15D-5C	175	--	GA
Sikorsky S-76 Spirit	T700-GE-700	153	192	GA
Raytheon C-12 Huron	PT6A-41	137	--	GA
Cessna CitationJet CJ4 (Cessna 525C)	JT15D-5C	131	--	GA
Dassault Falcon 900-LX	TFE731-3	128	--	GA
Bombardier Learjet 45	TFE731-2/2A	123	--	GA
Cessna 750 Citation X	PW308A	116	--	GA
Raytheon Beech Baron 58	TIO-540-J2B2	116	--	GA
Cessna 680 Citation Sovereign	PW308C BS 1289	114	--	GA
Honda HA-420 Hondajet	PW610F	109	--	GA
Cessna 560 Citation V	JT15D-5, -5A, -5B	105	--	GA
Falcon 7X	PW307A	99	--	GA
Dassault Falcon 50-EX	TFE731-2/2A	89	--	GA
Gulfstream IV-SP	TAY Mk611-8	88	--	GA
Piper PA-31 Navajo	TIO-540-J2B2	80	--	GA
Bell 429	TPE331-1	78	--	GA
Gulfstream Aerospace Gulfstream G500 (G-7)	PW814GA	76	--	GA
CIRRUS SF-50 Vision	JT15D-1 series	74	--	GA
Bombardier Challenger 604	CF34-3B/-3B1	68	--	GA
Bombardier Learjet 35	TFE731-3	60	--	GA
Bombardier Learjet 31	TFE731-3	58	--	GA
Raytheon Beech Bonanza 36	TIO-540-J2B2	57	370	GA
Piper PA-34 Seneca	TSIO-360C	57	--	GA
Gulfstream G150	TFE731-3	54	--	GA
Gulfstream G600	PW815GA	54	--	GA
Cessna S550 Citation S/II	PW610F	53	--	GA
Raytheon Hawker 800	TFE731-3	52	--	GA

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Bombardier Learjet 75	TFE731-3	52	--	GA
Raytheon Beech 99	TPE331-6	43	--	GA
Embraer Praetor 600	AS907-3-1E-A3 (HTF7500E)	41	--	GA
Bombardier Global 7500	Passport20-19BB1A	41	--	GA
Piper PA-32 Cherokee Six	TIO-540-J2B2	40	--	GA
Gulfstream G550	BR700-710A1-10	37	--	GA
Gulfstream G200	TFE731-2/2A	37	--	GA
Raytheon Premier I	JT15D-4 series	33	--	GA
Gulfstream G450	TAY Mk611-8	30	--	GA
Bombardier Learjet 35	TFE731-2-2B	30	--	GA
Embraer ERJ135 Legacy Business	AE3007A1P	29	--	GA
Gulfstream G-5 Gulfstream 5 / G-5SP Gulfstream G500	BR700-710A1-10	29	--	GA
Raytheon Hawker 1000	PW306A	29	--	GA
Bombardier Challenger 601	CF34-3A	27	1,784	GA
Cessna 560 Citation Ultra	JT15D-5C	26	--	GA
SOCATA TBM 850	PT6A-66	26	--	GA
Bombardier Challenger 300	HTF7000 (AS907-1-1A)	25	--	GA
Aerospatiale SA-350D Astar (AS-350)	TPE331-3	25	--	GA
Gulfstream G100	TFE731-2/2A	24	--	GA
Cessna 414	TIO-540-J2B2	24	--	GA
Cirrus SR20	IO-360-B	23	463	GA
Bombardier Learjet 45	TFE731-2-2B	23	--	GA
Bombardier Learjet 55	TFE731-3	22	--	GA
Robinson R44 Raven / Lycoming O-540-F1B5	TIO-540-J2B2	22	--	GA
Embraer ERJ135 Legacy Business	AE3007A1E	21	--	GA
Bell 206 JetRanger	250B17B	21	--	GA
Piper PA46 Malibu (FAS)	TIO-540-J2B2	20	--	GA

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Cessna 421 Piston	IO-360-B	19	--	GA
Cessna 650 Citation III	TFE731-2/2A	19	--	GA
Dassault Falcon 8X	PW307D	19	--	GA
Cessna 182	IO-360-B	18	--	GA
Raytheon Hawker 4000 Horizon	PW308A	18	--	GA
Piper PA-24 Comanche	TIO-540-J2B2	17	--	GA
Cessna 210 Centurion	TIO-540-J2B2	16	--	GA
DAHER TBM 900/930	PT6A-66	16	--	GA
Cessna 400 (FAS)	TSIO-360C	16	--	GA
Embraer Phenom 100 (EMB-500)	PW530	15	--	GA
Eurocopter EC-T2 (CPDS)	TPE331-3	14	--	GA
Bombardier Learjet 40	TFE731-2/2A	14	--	GA
Piper PA-31T Cheyenne	PT6A-135A	13	--	GA
Dassault Falcon 900-EX	TFE731-3	12	--	GA
Eurocopter AS 355NP	250B17B	12	--	GA
Eurocopter EC-130	TPE331-3	11	--	GA
Piper PA-28 Cherokee Series	O-320	11	--	GA
Bell 407 / Rolls-Royce 250-C47B	250B17B	11	--	GA
Cessna 310	TIO-540-J2B2	11	--	GA
Cessna 182 R (FAS)	IO-360-B	10	--	GA
Gulfstream G200	PW306A	10	--	GA
Cessna 172 Skyhawk	O-320	10	--	GA
Raytheon Beech 99	PT6A-28	9	--	GA
Bombardier Learjet 70	TFE731-3	9	--	GA
Piper PA46-TP Meridian	PT6A-42	9	--	GA
Agusta A-109	250B17B	8	--	GA
Raytheon Super King Air 300	PT6A-60A	7	--	GA
Dornier 328 Jet	PW306B	7	--	GA

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Dassault Falcon 100	TFE731-3	6	--	GA
Eclipse 500 / PW610F	PW610F	6	--	GA
Dassault Falcon 50-EX	TFE731-3	6	--	GA
Bombardier Learjet 45-XR	TFE731-2-2B	6	--	GA
Raytheon Super King Air 200	PT6A-41	5	--	GA
Piaggio P.180 Avanti	PT6A-60	5	--	GA
Raytheon Beech 99	PT6A-36	5	--	GA
Cessna 206	TIO-540-J2B2	4	--	GA
Cessna 501 Citation ISP	PW610F	4	--	GA
Dassault Falcon 20-F	CF700-2D	4	--	GA
Dassault Falcon 200	TFE731-3	3	--	GA
Beech E-55 (FAS)	TIO-540-J2B2	3	--	GA
Cessna 340	TIO-540-J2B2	3	--	GA
Mooney M20-K	TSIO-360C	3	--	GA
Bombardier Challenger 601	CF34-3A1	2	--	GA
Cessna 441 Conquest II	TPE331-10UK	2	4,305	GA
Airbus A340-200 Series	CFM56-5C4	2	--	GA
Aerostar PA-60	TIO-540-J2B2	2	--	GA
Gulfstream G100	TFE731-3	2	--	GA
Bell 427	TPE331-1	2	--	GA
Cessna 500 Citation I	PW530	2	--	GA
CESSNA CITATION 510	PW530	2	--	GA
Diamond DA62	IO-360-B	2	--	GA
Gulfstream III (FAS)	SPEY Mk511	1	--	GA
Dassault Falcon 20-D	CF700-2D	1	--	GA
Raytheon Beech 1900-C	PT6A-67D	1	--	GA
Piper PA-30 Twin Comanche	IO-320-D1AD	1	--	GA
Cessna 560 Citation Encore	PW530	1	--	GA

Table J-7 Aircraft Fleet Mix and Annual LTOs by Aircraft Type

AEDT Aircraft Type	AEDT Engine Type	2022	Future	Category
Embraer ERJ140	AE3007A1P	1	--	GA
Airbus A340-500 Series	Trent 556-61	1	--	GA
Bell 206L-4T Long Ranger	250B17B	1	--	GA
Beech 23 Musketeer Sundowner (FAS)	O-320	1	--	GA
Raytheon King Air 90	PT6A-28	1	--	GA
Cessna 150 Series	O-200	1	--	GA
Cessna 425 Conquest I	PT6A-135A	1	--	GA
Cessna 441 Conquest II	TPE331-10GT	1	--	GA
Cessna 550 Citation Bravo	PW530	1	4,492	GA
Diamond DA40	IO-360-B	1	--	GA
Diamond DA42 Twin Star	IO-360-B	1	--	GA
Gulfstream II	SPEY Mk511	1	--	GA
Quest Kodiak 100	PT6A-34	1	--	GA
Mitsubishi MU-2	TPE331-5A	1	--	GA
Piper PA-27 Aztec	TIO-540-J2B2	1	--	GA
Piper PA-42 Cheyenne Series	TPE331-14	1	--	GA
Saab 2000	PW127-A	1	--	GA
EADS Socata TB-20 Trinidad	TIO-540-J2B2	1	--	GA
Velocity (FAS)	IO-360-B	1	--	GA
DeHavilland DHC-6-100 Twin Otter	PT6A-27	--	597	
Israel IAI-1124-A Westwind II	TFE731-3	1	--	GA
Total General Aviation Aircraft LTOs		**14,504**	**20,039**	
Total Fleet LTOs		**189,307**	**247,501**	

Source: CMT and HMMH, 2024.

Notes: LTOs – landing and takeoff cycles; AC – Air carrier; CA – Cargo; CO – commuter; and GA – general aviation.

J.4.3 Ground Service Equipment (GSE)/Auxiliary Power Unit (APU) Time-in-Mode (TIM) Survey

The most recent GSE/APU time-in-mode (TIM) survey conducted at Logan Airport was performed on June 27-28, 2017. Data from the survey as well as information developed from ACRP Report 149[23] and AEDT's default TIM data was used in support of the *2022 ESPR*. The purpose of a GSE/APU TIM survey is to provide up-to-date operating times, which directly affect GSE/APU emissions.

TIM is the average time that GSE and APUs operate during a single aircraft LTO cycle. The surveyed TIM data are used in place of the default TIM values in AEDT, thus yielding emissions that better reflect actual conditions at Logan Airport. The 2017 TIM survey focused on the most prevalent airlines (e.g., Southwest, JetBlue, American, Delta, and United) and the most common aircraft types, such as narrow-body air carriers (e.g., A320, A321, B737, B757) and large commuter aircraft (e.g., ERJ170, ERJ190, CRJ700, CRJ900). The GSE and APU TIM data for the surveyed aircraft are provided in **Table J-8**. GSE TIM data for the remaining aircraft within Logan's fleet are based on AEDT defaults.

APU operating times for wide-body/large commuter air carriers, and small commuter aircraft, were assumed to have a TIM of 7 minutes per LTO. GA aircraft in the fleet were not equipped with APUs. Cargo aircraft APU TIM data was based on AEDT defaults (i.e., 26 minutes per LTO).

Table J-8 GSE/APU TIM Data (minutes) By Aircraft Category

Source	Narrow-Body Air Carriers	Large Commuter Aircraft
Aircraft Tractor	6.37	7.13
Baggage Tractor	27.23	17.43
Belt Loader	26.85	14.88
Cabin Service Truck	2.07	0.53
Catering Truck	11.30	13.28
Hydrant Truck	3.73	2.53
Lavatory Truck	4.82	2.45
Service Truck	0.12	0.57
Water Service Truck	1.65	0.75
APUs	16.63	14.70

Source: GSE TIM survey conducted by CMT with assistance from Massport (security escorts) on June 27-28, 2017.
Note: APUs – Auxiliary power units.

23 National Academies of Sciences, Engineering, and Medicine 2009, Transportation Research Board, Airport Cooperative Research Program, Report 149: *Improving Ground Support Equipment Operational Data for Airport Emissions Modeling*, 2015, Washington, DC: The National Academies Press, https://crp.trb.org/acrpwebresource4/acrp-report-149-improving-ground-support-equipment-operational-data-for-airport-emissions-modeling/.

J.4.4 MOVES Example Input/Output Files

The version of U.S.EPA's MOVES that was the latest version at the time the analysis of motor vehicle emissions for 2022 and the Future Planning Horizon Year was performed (MOVES 3.1) was used.[24]

MOVES emission factors were multiplied by average daily vehicle miles traveled (VMT) to calculate daily emissions. The on-Airport traffic data are summarized in the VMT analyses of Appendix H, *Ground Access.*[25] In addition to estimating emissions from vehicles on roadways, MOVES was used to obtain vehicle emissions at idle to estimate parking and curbside motor vehicle emissions. Idling emissions were estimated by multiplying emission factors by an estimate of the total motor vehicle idling time in parking lots and at the arrival and departure curbsides at the Airport. Examples of MOVES, Version 3.1 input/output files are provided in **Table J-9** and **Table J-10**, respectively**.**

Table J-9 MOVES3.1 Example Input File


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24 U.S. Environmental Protection Agency, "MOVES3: Latest Version of MOtor Vehicle Emission Simulator (MOVES)," updated August 5, 2022, https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves.

25 Due to the modified 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.

Table J-9 MOVES3.1 Example Input File


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Table J-9 MOVES3.1 Example Input File

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<pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="18" processname="Refueling Displacement Vapor Loss"/>
<pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="19" processname="Refueling Spillage Loss"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="1" processname="Running Exhaust"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="15" processname="Crankcase Running Exhaust"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="2" processname="Start Exhaust"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="16" processname="Crankcase Start Exhaust"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="90" processname="Extended Idle Exhaust"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="91" processname="Auxiliary Power Exhaust"/>
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<pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10 - Total" processkey="15" processname="Crankcase Running Exhaust"/>
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Table J-9 MOVES3.1 Example Input File


```
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		<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="2" processname="Start Exhaust"/>
		<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="90" processname="Extended Idle Exhaust"/>
		<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="91" processname="Auxiliary Power Exhaust"/>
		<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="1" processname="Running Exhaust"/>
		<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="15" processname="Crankcase Running Exhaust"/>
		<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="2" processname="Start Exhaust"/>
		<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="16" processname="Crankcase Start Exhaust"/>
		<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="90" processname="Extended Idle Exhaust"/>
		<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
		<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="91" processname="Auxiliary Power Exhaust"/>
		<pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="1" processname="Running Exhaust"/>
		<pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="2" processname="Start Exhaust"/>
		<pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="90" processname="Extended Idle Exhaust"/>
		<pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="91" processname="Auxiliary Power Exhaust"/>
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		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="15" processname="Crankcase Running Exhaust"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="2" processname="Start Exhaust"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="16" processname="Crankcase Start Exhaust"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="90" processname="Extended Idle Exhaust"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="91" processname="Auxiliary Power Exhaust"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="11" processname="Evap Permeation"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="13" processname="Evap Fuel Leaks"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="18" processname="Refueling Displacement Vapor Loss"/>
		<pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="19" processname="Refueling Spillage Loss"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="1" processname="Running Exhaust"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="15" processname="Crankcase Running Exhaust"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="2" processname="Start Exhaust"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="16" processname="Crankcase Start Exhaust"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="90" processname="Extended Idle Exhaust"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="91" processname="Auxiliary Power Exhaust"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="11" processname="Evap Permeation"/>
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		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="18" processname="Refueling Displacement Vapor Loss"/>
		<pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="19" processname="Refueling Spillage Loss"/>
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	</databaseselections>
	<internalcontrolstrategies>
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Table J-9 MOVES3.1 Example Input File


```
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<geographicoutputdetail description="LINK"/>
<outputemissionsbreakdownselection>
    <modelyear selected="false"/>
    <fueltype selected="true"/>
    <fuelsubtype selected="false"/>
    <emissionprocess selected="false"/>
    <onroadoffroad selected="false"/>
    <roadtype selected="true"/>
    <sourceusetype selected="true"/>
    <movesvehicletype selected="false"/>
    <onroadscc selected="false"/>
    <estimateuncertainty selected="false" numberOfIterations="2" keepSampledData="false" keepIterations="false"/>
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    <engtechid selected="false"/>
    <hpclass selected="false"/>
    <regclassid selected="false"/>
</outputemissionsbreakdownselection>
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<outputvmtdata value="true"/>
<outputsho value="true"/>
<outputsh value="true"/>
<outputshp value="true"/>
<outputshidling value="true"/>
<outputstarts value="true"/>
<outputpopulation value="true"/>
<scaleinputdatabase servername="localhost" databasename="suffolk_county_avg_summer_2022_pcpt_in" description=""/>
<pmsize value="0"/>
<outputfactors>
    <timefactors selected="true" units="Hours"/>
    <distancefactors selected="true" units="Miles"/>
    <massfactors selected="true" units="Grams" energyunits="Joules"/>
</outputfactors>
<savedata>

</savedata>

<donotexecute>

</donotexecute>

<generatordatabase shouldsave="false" servername="" databasename="" description=""/>
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Table J-9 MOVES3.1 Example Input File

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	<lookuptableflags scenarioid="" truncateoutput="true" truncateactivity="true" truncatebaserates="true"/>
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Source: CMT and Massport, 2024.

Table J-10 MOVES3.1 Example Output File

```
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dTypeID;SCC;emissionQuant;activityTypeID;activity;emissionRate;massUnits;distanceUnits
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Table J-10 MOVES3.1 Example Output File


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1,1,2022,2,5,15,25,25025,250250,12,31,0,1,0,5,00;1;1;2022;2;5;15;25;25025;250250;12;119;\N;31;0;1;0;5;00;0;1;0.9496409893035889;0;g;mi
1,1,2022,2,5,15,25,25025,250250,11,31,0,5,0,5,00;1;1;2022;2;5;15;25;25025;250250;11;119;\N;31;0;5;0;5;00;0;1;0.0024370900355279446;0;g;mi
1,1,2022,2,5,15,25,25025,250250,11,31,0,2,0,5,00;1;1;2022;2;5;15;25;25025;250250;11;119;\N;31;0;2;0;5;00;0;1;0.0479217991232872;0;g;mi
1,1,2022,2,5,15,25,25025,250250,11,31,0,1,0,5,00;1;1;2022;2;5;15;25;25025;250250;11;119;\N;31;0;1;0;5;00;0;1;0.9496409893035889;0;g;mi
1,1,2022,2,5,15,25,25025,250250,10,21,0,5,0,5,00;1;1;2022;2;5;15;25;25025;250250;10;119;\N;21;0;5;0;5;00;0;1;0.000657199008855968 7;0;g;mi
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1,1,2022,2,5,15,25,25025,250250,10,21,0,1,0,5,00;1;1;2022;2;5;15;25;25025;250250;10;119;\N;21;0;1;0;5;00;0;1;0.992247998714447;0;g;mi
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1,1,2022,2,5,15,25,25025,250250,9,21,0,1,0,5,00;1;1;2022;2;5;15;25;25025;250250;9;119;\N;21;0;1;0;5;00;0;1;0.992247998714447;0;g;mi
```


Source: CMT and Massport, 2024.

J.4.5 Fuel Storage/Handling and Miscellaneous Sources Throughputs

The “ other source” category in the 2022 ESPR includes sources such as fuel storage/handling, boilers, snow melters, emergency generators, heaters, and firefighter training activities.

As in previous years, VOC emissions from fuel storage/handling were calculated using methods based on U.S.EPA's AP-42[26] document. Calculations account for evaporative emissions from breathing losses, working losses, and spillage from aboveground storage tanks, underground storage tanks, and aircraft refueling.

Emissions from the “miscellaneous” source category (i.e., stationary sources including the Central Heating and Cooling Plant boilers, other boilers, emergency generators, snow melters, space heaters, and sources associated with the fire training facility) were estimated using emission factors from U.S.EPA's AP-42 and

26 U.S. Environmental Protection Agency, “AP-42: Compilation of Air Pollutant Emission Factors,” updated March 22, 2022, https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

NO_X Reasonably Available Control Technology (RACT) compliance testing combined with the actual 2022 fuel throughputs of the stationary sources to obtain emissions of VOCs, NO_X, CO, and $PM_{10}/PM_{2.5}$. Emissions from fire training fuel used at Logan Airport (i.e., Tek Flame®) was calculated using default emission factors from AEDT and actual annual fuel usage.

Table J-11 presents Logan Airport's fuel storage/handling and stationary sources fuel throughputs by fuel category for the 2022 analysis year and, for comparison purposes, also includes years 2019 through 2021. The table also provides data for the Future Horizon Year. Throughputs for years prior to 2019 are provided in the *2020/2021 EDR*.

Table J-11 Fuel Storage/Handling and Stationary Sources Fuel Throughputs by Fuel Type[1]

Source	Fuel Type	2019	2020	2021	2022	Future
Fuel Storage/ Handling	Jet Fuel	542,314,657	220,004,260	302,650,342	443,381,606	579,678,349
	Aviation Gas[2]	430,155	238,339	296,120	550,441	719,648
	Auto Gas	7,411,444	3,204,579	4,840,631	6,099,594	159,493
	Diesel	1,270,852	773,590	660,178	1,023,860	26,772
Miscellaneous Sources5	Natural Gas	515,029,176	407,657,000	401,934,668	357,840,873	16,531,426
	Heating Oil No. 2[3]	52,491	20,435	16,534	0	0
	ULSD	165,208	87,553	123,608	178,007	38,288
	Fire Training Fuel[4]	7,375	6,460	7,757	9,236	7,639

Source: Massport, 2024.
All throughputs are in gallons except for natural gas which is represented in cubic feet.
Aviation gasoline throughput based on AEDT.
Massport is no longer using Heating Oil No. 2 instead it has converted to ultra-low sulfur diesel (ULSD).
Fire training fuel consist of Tek Flame® and aviation gasoline.
Includes fuel throughputs from boilers, heaters, emergency generators, snowmelters and fire training activities.

J.4.6 Greenhouse Gas Inputs and Emission Factors

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) has published the *MEPA* [Massachusetts Environmental Policy Act] *Greenhouse Gas Emissions Policy and Protocol*.[27] These guidelines require the quantification of greenhouse gases (GHGs) for certain proposed projects and the identification of measures to avoid, minimize, or mitigate increases in GHGs.[28] Even though the purpose of the *2020/2021 EDR* is not the assessment of a proposed project(s) and is therefore not subject to the GHG

27 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Revised MEPA Greenhouse Gas Emissions Policy and Protocol, effective May 5, 2010, https://www.mass.gov/files/documents/2016/08/rp/ghg-policy-final-summary.pdf.

28 These GHGs 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.

policy, Massport has prepared an emission inventory of GHG emissions directly and indirectly associated with Logan Airport.

In April 2009, the Transportation Research Board ACRP published Report 11. The guidebook provides recommended instructions to airport operators on how to prepare an airport-specific GHG emissions inventory.[29] The 20222 and Future Planning Horizon GHG emissions estimates for Logan Airport are prepared for aircraft (emissions occurring within the ground taxi/delay mode and up to 3,000 feet in altitude), GSE, APU, motor vehicles, a variety of stationary sources, and emissions that result from the generation of electricity. Aircraft cruise emissions that occur above 3,000 feet in altitude are not estimated. The GHG emission estimates were prepared following the EEA, ACRP, and ACI ACA Program guidelines and emission factors considered appropriate for preparing GHG inventories that are approved by the U.S.EPA and available within the GHG Emissions Factors Hub database.[30]

Airport GHG emissions are calculated the same way as emissions of the criteria air pollutants/precursors, are calculated. In other words, emissions are calculated using input data such as activity levels or material throughput rates (e.g., fuel usage, VMT, electrical consumption) that are applied to appropriate emission factors (in units of GHG emissions per gallon of fuel).

For the 2022 GHG emission estimates, the input data were either based on Massport records or data and information derived from the latest version of the FAA's AEDT. The Future Planning Horizon GHG emission estimates were based on forecasted data and represent a conservative analysis. **Table J-12** summarizes the data and information used to prepare the 2022 and Future Planning Horizon GHG emission inventories.

Estimated total GHG emissions at Logan Airport from 2007 through 2021 are provided in the Boston Logan International Airport *2020/2021 EDR*, published in November 2022.

Table J-12 GHG Inventory Input Usage Data

Activity	Fuel Type	2022	Future	Units	Source
Aircraft					
Aircraft Taxi	Jet A[1]	19,464,653	23,992,716	gallons	AEDT 3e
	AvGas[2]	58,556	43,404	gallons	AEDT 3e
Engine Startup	Jet A	460,757	598,980	gallons	AEDT 3e
Aircraft AGL to 3,000 feet	Jet A[1]	23,653,193	33,083,207	gallons	AEDT 3e

29 National Academies of Sciences, Engineering, and Medicine 2009, Transportation Research Board, Airport Cooperative Research Program, Report 11: *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*, 2009, Washington, DC: The National Academies Press, https://nap.nationalacademies.org/catalog/14225/guidebook-on-preparing-airport-greenhouse-gas-emissions-inventories.

30 U.S. Environmental Protection Agency, GHG Emissions Factors Hub (26 March 2020) for the 2020 analysis, and GHG Emissions Factors Hub (15 September 2021) for the 2021 analysis, https://www.epa.gov/climateleadership/ghg-emission-factors-hub.

Table J-12 GHG Inventory Input Usage Data

Activity		Fuel Type	2022	Future	Units	Source
		AvGas[2]	89,214	50,076	gallons	AEDT 3e
Aircraft Support Equipment						
Ground Service Equipment (GSE)		Diesel	737,205	19,276	gallons	Massport
		Gasoline	664,574	17,377	gallons	Massport
		Propane	114	3	gallons	Massport
		CNG	0	0	ft3	Massport
Auxiliary Power Units (APU)		Jet A	1,070,671	799,657	gallons	AEDT 3e
Motor Vehicles						
On-airport Vehicles[4]		Composite[3]	58,886,481	58,041,091	VMT	Massport
On-airport Parking/Curbsides		-	2,288,664	2,751,631	hours	Massport
Massport Shuttle Bus		CNG	168,919	250,401	GEG	Massport
		Diesel	Defleeted in 2014		gallons	Massport
Massport Express Bus		Diesel	400,156	0	gallons	Massport
NABI Articulated Buses		Diesel	121,000	0	gallons	Massport
Massport Fire Rescue		Diesel	9,275	9,275	gallons	Massport
Massport Fleet Vehicles	Fueled Onsite	Gasoline	167,325	0	gallons	Massport
		Diesel	53,735	0	gallons	Massport
	Fueled Offsite	Gasoline	133,804	0	gallons	Massport
Off-airport Vehicles[4]	Public	Composite[3]	128,941,855	163,960,023	VMT	Massport
	Airport Employees	Gasoline	3,725,925	3,051,076	VMT	Massport
	Tenant Employees	Gasoline	52,292,961	42,821,532	VMT	Massport
Other Sources						
Boilers and Space Heaters		ULSD	22,748	0	gallons	Massport
		Natural Gas	352	17	million ft^3	Massport
Generators		ULSD	28,443	38,288	gallons	Massport

Table J-12 GHG Inventory Input Usage Data

Activity		Fuel Type	2022	Future	Units	Source
Snow melters		ULSD	126,815	0	gallons	Massport
		Natural Gas	6	0	million ft^3	Massport
Fire Training Facility		Tekflame	7,861	6,680	gallons	Massport
		AvGas	1,375	958	gallons	Massport
Electrical Consumption	Massport	-	18,882,411	20,901,623	kWh	Massport
	Tenant/Common Area	-	158,395,949	175,334,199	kWh	Massport

Sources: Massport and CMT, 2024.

Notes: AGL – above ground level; AvGas – Aviation Gasoline; CNG – compressed natural gas; ft^3 – cubic feet; GEG – gasoline equivalent gallons; kWh – kilowatt hours; ULSD – ultra low sulfur diesel; VMT – vehicle miles traveled; AEDT – Aviation Environmental Design Tool.

1 Jet A density of 6.84 pounds per gallon.

2 AvGas density of 6.0 pounds per gallon.

3 Composite means gasoline, diesel, and ethanol-fueled motor vehicles.

4 Excludes VMT associated with electric vehicles and accounts for public transportation usage.

Emission factors were obtained from the latest available versions of U.S.EPA's MOVES and GHG Emission Factors Hub. **Table J-13** provides the emission factors for CO_2, N_2O, and CH_4 that were used to prepare the 2022 and Future Planning Horizon inventories.

Table J-13 GHG Emission Factors

Sources	Year	Fuel	CO_2	N_2O	CH_4	Units
Aircraft[1]	2022/Future	Jet A	21.5	0.00066	-[4]	lb/gallon
		AvGas	18.3	0.00024	0.01556	lb/gallon
Ground Support Equipment (GSE)/ Auxiliary Power Units (APUs)[1]	2022/Future	Diesel	22.5	0.00108	0.00037	lb/gallon
		Gasoline	19.4	0.00055	0.00569	lb/gallon
		Propane	12.5	0.00013	0.00062	lb/gallon
Motor Vehicles[1,2]	2022	Composite	205	0.00204	0.00500	g/mile
			2,842	0.04780	0.04000	g/hour-vehicle
		Gasoline	204	0.00197	0.00500	g/mile
			2,825	0.04649	0.03900	g/hour-vehicle
	Future	Composite	164	0.00166	0.00273	g/mile
			2,234	0.03903	0.02047	g/hour-vehicle
		Gasoline	163	0.00165	0.00270	g/mile

Table J-13 GHG Emission Factors

Sources	Year	Fuel	CO_2	N_2O	CH_4	Units
			2,220	0.00388	0.02027	g/hour-vehicle
Buses	2022/Future	Diesel	22.5	0.00018	0.00090	lb/gallon
		Gasoline	19.4	0.00018	0.00084	lb/gallon
Stationary Sources[1]	2022/Future	Natural Gas	120	0.00023	0.00226	lb/1000 ft^3
		ULSD	22.5	0.00018	0.00090	lb/gallon
Fire Training Facility[1]	2022/Future	Tekflame[3]	12.5	0.00013	0.00062	lb/gallon
		AvGas	18.3	0.00024	0.01556	lb/gallon
Electrical Consumption[1]	2022/Future	-	0.53	0.00001	0.00007	lb/kWh

Sources: Massport and CMT, 2024.

Notes: CNG – compressed natural gas; ULSD – Ultra Low Sulfur Diesel; CO_2 – carbon dioxide; N_2O – nitrous oxides; CH_4 – methane; g- grams; ft^3 – cubic feet; kWh – kilowatt hour; lb – pound.

1 U.S. Environmental Protection Agency, GHG Emissions Factors Hub (April 2022).

2 U.S. Environmental Protection Agency, MOVES3.1.

3 As propane.

4 Contributions of CH_4 emissions from commercial aircraft are reported as zero. Years of scientific measurement campaigns conducted at the exhaust exit plane of commercial aircraft gas turbine engines have repeatedly indicated that CH_4 emissions are consumed over the full emission flight envelope [Reference: Aircraft Emissions of Methane and Nitrous Oxide during the Alternative Aviation Fuel Experiment, Santoni et al., Environ. Sci. Technol., July 2011, Volume 45, pp. 7075-7082]. As a result, U.S.EPA published that: "…methane is no longer considered to be an emission from aircraft gas turbine engines burning Jet A at higher power settings and is, in fact, consumed in net at these higher powers." [Reference: U.S.EPA, Recommended Best Practice for Quantifying Speciated Organic Gas Emissions from Aircraft Equipped with Turbofan, Turbojet, and Turboprop Engines, May 27, 2009 [EPA-420-R-09-901], http://www.epa.gov/otaq/aviation.htm]. In accordance with the following statements in the 2006 IPCC Guidelines (IPCC 2006), FAA does not calculate CH_4 emissions for either the domestic or international bunker commercial aircraft jet fuel emissions inventories. "Methane (CH_4) may be emitted by gas turbines during idle and by older technology engines, but recent data suggest that little or no CH_4 is emitted by modern engines." "Current scientific understanding does not allow other gases (e.g., N_2O and CH_4) to be included in calculation of cruise emissions." (IPCC 1999).

J.5 GHG Emissions Normalized by Building Area

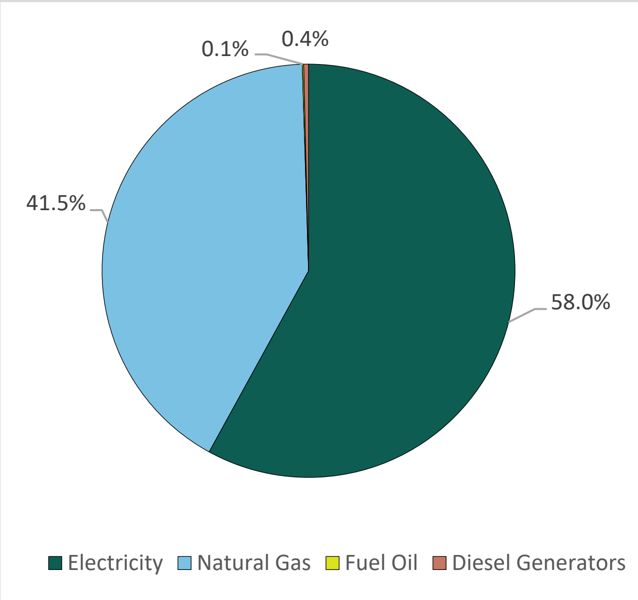
A building's energy use intensity, which is a measure of energy consumption per square foot. Massport is undertaking a reassessment of square footage across the Airport at the time of this filing, and thus accurate square footage data are not available for the *2022 ESPR*. Without accurate square footage data, the EUIs are not useful in displaying energy use intensity; therefore, this metric will be provided in future iterations of the EDRs and ESPRs, pending the update to the square footage assessment. Overall trends from 2007 to 2021 have shown a decrease in thousand British Thermal Unit (kBTU). These data demonstrate that Logan Airport is operating more efficiently over time, shifting to cleaner fuel sources, and serving more passengers in a larger building footprint with less energy. The following Massport initiatives have contributed to this success:

- Commitment to the Sustainable and Resiliency Design Standards and Guidelines (SRDSGs);

- Constructing and operating facilities to LEED® standards and other sustainability-rating systems;
- On-going energy efficiency projects, such as converting to light-emitting diode (LED) lighting and upgrading to energy-efficient heating, ventilation, and air conditioning (HVAC) equipment; and
- Installation of on-site renewable energy sources, including solar and wind.

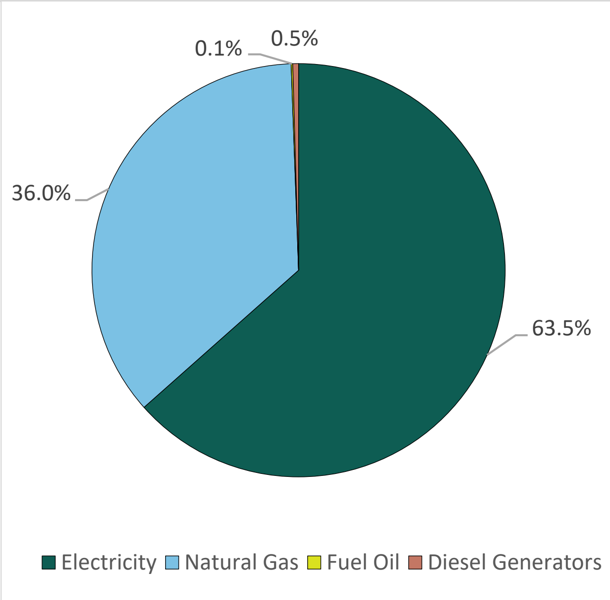
Building energy is provided from three sources: natural gas, fuel oil, and electricity, and also by diesel generators in times when emergency backup is needed. **Figure J-1** and **Figure J-2** show building energy by source and building GHG emissions by source.

Figure J-1 FY 2020 Building Energy Sources



Source: Massport, 2022

Figure J-2 FY 2020 Estimated Building GHG Emission Sources



Source: Massport, 2022

J.6 GSE Alternative Fuels Conversion

For the 2022 and Future Planning Horizon analyses, GSE emissions were calculated using AEDT emission factors in combination with the 2017 TIM survey, AEDT's default TIM data, and the GSE fuel types obtained from the 2022 Logan Airport Vehicle Aerodrome Permit Applications. Use of the data from the 2017 TIM survey and the applications provide the most up-to-date GSE fleet operational and fuel mix characteristics (including alternative fuels and electric-powered GSE). **Table J-14** presents the emission reductions of criteria air pollutants/precursor pollutants due to the use of GSE alternative fueled vehicles (AVFs) from 2019 to 2022. Emission reductions due to the use of AVFs at Logan Airport prior to 2019 are provided in the *2020/2021 EDR*.

Table J-14 GSE Alternative Fuel Conversion Summary (kg/day)

Year	Pollutant	Percent Reduction	Emissions without Reduction	Reduction from AFVs	Emissions with Reduction
2019	VOCs	6.6%	22	1	21
	NO_X	2.5%	152	4	148
	CO	11.5%	449	52	397
	$PM_{10}/PM_{2.5}$	1.7%	14	<1	14
2020	VOCs	10.3%	10	1	9
	NO_X	9.0%	33	3	30
	CO	12.7%	255	32	223
	$PM_{10}/PM_{2.5}$	8.1%	2	<1	2
2021	VOCs	12.3%	12	2	11
	NO_X	10.9%	38	4	34
	CO	15.1%	326	49	277
	$PM_{10}/PM_{2.5}$	10.0%	3	<1	3
2022	VOCs	13.8%	20	2	17
	NO_X	12.9%	56	6	49
	CO	17.3%	533	78	454
	$PM_{10}/PM_{2.5}$	12.8%	4	<1	3

Source: CMT and Massport, 2024.

Notes: Emission reductions may reflect rounding.

VOC – volatile organic compounds; NO_X – nitrogen oxides; CO – carbon monoxide; $PM_{10}/PM_{2.5}$ – particulate matter equal to or less than 10 microns in diameter (PM_{10}) and equal to or less than 2.5 microns in diameter ($PM_{2.5}$); and AFVs – alternative fuel vehicles.

J.7 Future Planning Horizon Sustainable Aviation Fuel (SAF) Reduction Methodology

The primary GHG emission reductions associated with the use of SAF occur over the lifecycle of the fuel. Generally, the lifecycle emissions of a fuel include the production, extraction, transport, and final burning of the fuel into exhaust.

The ICAO has developed the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which is a global market-based measure and cooperative international approach of initiatives to reduce GHG emissions in aviation. Through CORSIA, ICAO determines if fuels are CORSIA Eligible Fuels (CEF) and develops associated default life cycle emission reduction values for each CEF. GHG reductions from CEFs vary by feedstock and the fuel conversion process.

Additionally, the international standards organization, ASTM, has certified six fuel conversion processes for SAF use in aircraft based on the fuel feedstock and the associated technical specifications required to produce the fuel. ICAO has a set of procedures and requirements for a type of SAF to be certified as a CEF, and within the process, ICAO develops a life cycle emissions value (LSf). The LSf is a factor for each CEF that is used in the equation below to calculate the life cycle emissions reduction. The LSf is ratioed with a baseline life cycle emission factor (LC) for conventional aviation fuels (i.e., avgas and Jet-A). The LSf and LC both have units of grams of CO_2e per unit of energy in megajoules (g/CO_2e). Additionally, each fuel conversion process has an associated Fuel Conversion Factor (FCF) that is also applied. The emission reductions (ER) for GHGs are computed for metric tons of CO_2e based on the mass of the fuel consumed (MS) using the equation below:

$ER=FCF \times [MS \times (1- (LS_f/LC))]$

For the purposes of computing GHG emissions for the *2022 ESPR*, it will be assumed that the fuel consumed by aircraft will be in line with the FAA's projected percentage of aviation fuels that is expected to be SAF by the year 2030, which amounts to 10 percent. The variables for the equation above were determined based on the range of available SAF types currently being used in the United States. There are currently 14 CEFs that are produced in the U.S., and include feedstocks such as herbaceous energy crops, switchgrass, soybean oil, camelina oil, corn grain, and poplar. Based on a composite of U.S. SAF types, SAF usage for the Future Horizon Year will result in reductions of 43,707 MT CO_2e (see **Table 8-12** of Chapter 8, *Air Quality and Greenhouse Gas Emissions*).

J.8 Air Quality and GHG Emission Reduction Efforts

As part of implementing and advancing its on-going air quality management strategy for Logan Airport, Massport has established goals and objectives to address air emissions from Airport operations, including the minimization of Airport-related emissions through the reduction of GSE and Massport vehicle fleet emissions. This section presents an update on these initiatives at Logan Airport. This section further highlights updates on other on-going Logan Airport-related air quality and emission reduction efforts and current studies on aviation-related air quality and public health issues. MTCO_2e

J.8.1 Alternative Fuel Vehicles (AFV) Program

A component of Massport's Air Quality Management Program is the AFV Program. The AFV Program is designed to replace Massport's conventionally fueled fleet with alternatively fueled or powered vehicles, when feasible, to help reduce emissions associated with Logan Airport operations. Massport operates more than 100 vehicles powered by propane, E85 flex fuel, diesel/electric hybrid, gasoline/electric hybrid, and plug-in electric.

Table J-16 shows the number of Massport AFVs by vehicle type in 2022, not including GSE. As discussed in Chapter 1, *Introduction and Executive Summary,* several projects, and programs support AFVs at Logan Airport including:

- Massport continues its partnership with the MBTA to offer free Silver Line boardings at the Airport. The reduced dwell times and faster travel times through the terminal area led Massport to extend the free-fare program indefinitely. The MBTA operates ten Silver Line buses purchased by Massport in 2023 with Massport paying operating costs for portions of the Silver Line service directly servicing Airport Terminals.
- Operation for almost two decades of one of the largest privately operated, publicly accessible, CNG stations in New England.
- Massport is facilitating the replacement of gas- and diesel-powered ground service equipment with electric GSE (eGSE), if commercially available. In 2020, Massport was awarded an FAA Voluntary Airport Low Emission (VALE) Program grant for charging infrastructure at Terminal E and installing 10 eGSE charging stations at Signature Aviation Building 14.
- Massport provides more than 100 hybrid, EV, and AFV-only on-Airport parking spaces spread out among the Terminal and Economy Garage in preferred parking locations. Since 2007, Massport has offered preferred parking for customers driving hybrid and AFVs. Twenty-seven of these spaces provide EV charging locations convenient to the Terminals. While normal parking rates apply, there is currently no cost for electricity use. Real-time availability of spaces can be found on Massport's website (https://www.massport.com/logan-airport/getting-to-logan/parking). Currently, there are more than 100 charging ports installed at Logan Airport and its Logan Express sites.
- As part of its long-range emission reduction strategy, Massport is working with the airlines to replace conventional gasoline- and diesel-powered GSE with electric alternatives.
- At the time of this filing, Massport is piloting renewable diesel.

Table J-16 Massport's AFV Fleet Inventory at Logan Airport

Fuel Type	Vehicle	2022 Total Fleet Inventory
Diesel/Electric Hybrid	Shuttle Bus[1]	42
Compressed Natural Gas (CNG)	CNG NABI Bus[2]	31
Gasoline/Electric Hybrid	Ford C-MAX	1
Propane	Ford Taurus	1
E85 Flex Fuel	Explorer	5
	F-150	5
	F-250	6
	F-350	4
Plug-in Electric Hybrid	Chevy Volt[3]	8
	Ford C-MAX	1

Table J-16 Massport's AFV Fleet Inventory at Logan Airport

Fuel Type	Vehicle	2022 Total Fleet Inventory
Electric	Chevy Bolt	1
Total		**105**

Source: Massport, 2024.

1 The 32 diesel/electric hybrid shuttle buses, added to the fleet in 2013, replaced the diesel rental car buses. The MBTA recently procured and began operating a new fleet of Silver Line buses, and Massport purchased ten buses for the SL1 route between South Station and the Logan Airport terminals. Massport will purchase ten new Silver Line buses as part of a forthcoming (Spring 2023) MBTA procurement.

2 The CNG NABI buses replaced the 26 aging CNG shuttle buses.

3 The Chevy Volt plug-in electric hybrid vehicles replaced the CNG Honda Civics.

J.8.2 Massport Goal to the Net Zero Roadmap by 2031

In 2021, Massport prepared the Net Zero Roadmap by 2031, the goal is to reduce carbon emissions across all facilities and become Net Zero by 2031, coinciding with the Authority's 75th anniversary. The Roadmap to Net Zero focuses on 100% of the GHG emissions directly controlled by Massport-owned facilities, equipment, and purchased electricity, with continued influence in areas the Authority does not control. The plan outlines the steps Massport will take to reduce emissions within the decade, directly benefiting neighboring communities and further preparing the Authority for the impacts of climate change.

To reach this ambitious goal of achieving Net Zero GHG, Massport is evaluating a number of options, these include:

- Improving energy efficiency in buildings through design standards and operational controls.
- Transitioning to clean fuel sources such as renewable electricity, renewable natural gas, etc.
- Generating as much renewable energy as possible on-site and making off-site renewable energy purchases.
- Acquiring renewable energy credits, renewable identification numbers, and carbon offsets as a transition strategy, for the fossil fuel sources that cannot be reduced, electrified, or switched to renewable energy in the near-term.
- Implementing all remaining facility-specific initiatives identified to ultimately reach net zero.

For any areas where emissions cannot be reduced to zero, Massport will invest in carbon offsets to reach the target. Massport expects to be Net Zero without offsets by 2040. Carbon offsets are investments in GHG-reducing projects, such as a solar farm, which diminish the impact of an organization's own GHG emissions. Massport's aim would be to purchase offsets that benefit local projects within the Commonwealth.

Components of the phased plan controlled by Massport include items like upgrading lighting systems across all facilities to LEDs, which has already been started, to rehabilitating Logan Airport's Central Heating Plant, upgrading the Logan Express and shuttle bus fleet to electric vehicles, and installing more solar panels and renewable energy sources.

J.9 Air Quality Studies

Numerous air quality-related studies have taken place in the vicinity of Logan Airport. **Figure J-3** illustrates the approximate study location for these studies.

J.9.1 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 the 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 a focus on noise and air quality. This study was completed in May 2014 and consisted of an epidemiological survey combined with computer modeling of noise levels and air pollution concentrations. Massport has cooperated in this effort by providing funding to complete the study and Airport operational data in support of the study. In the spring of 2011, Massport also gave technical assistance in support of the DPH study by providing geographic information systems (GIS) analysis of the roadway network in and around Logan Airport in a format compatible with FAA's EDMS. Massport is working with DPH and the East Boston Neighborhood Health Center on implementing DPH recommendations related to Massport.

In response to the DPH study recommendations, Massport has renewed an agreement to provide funding to the East Boston Neighborhood Health Center to help expand the efforts of their Asthma and Chronic Obstructive Pulmonary Disease (COPD) Prevention and Treatment Program in East Boston and Winthrop that provides services including screenings for children, distribution of asthma kits, and home visits, among others.

The findings from this study can be viewed from DPH website at: https://www.mass.gov/doc/logan-airport-health-study-english-0/download.

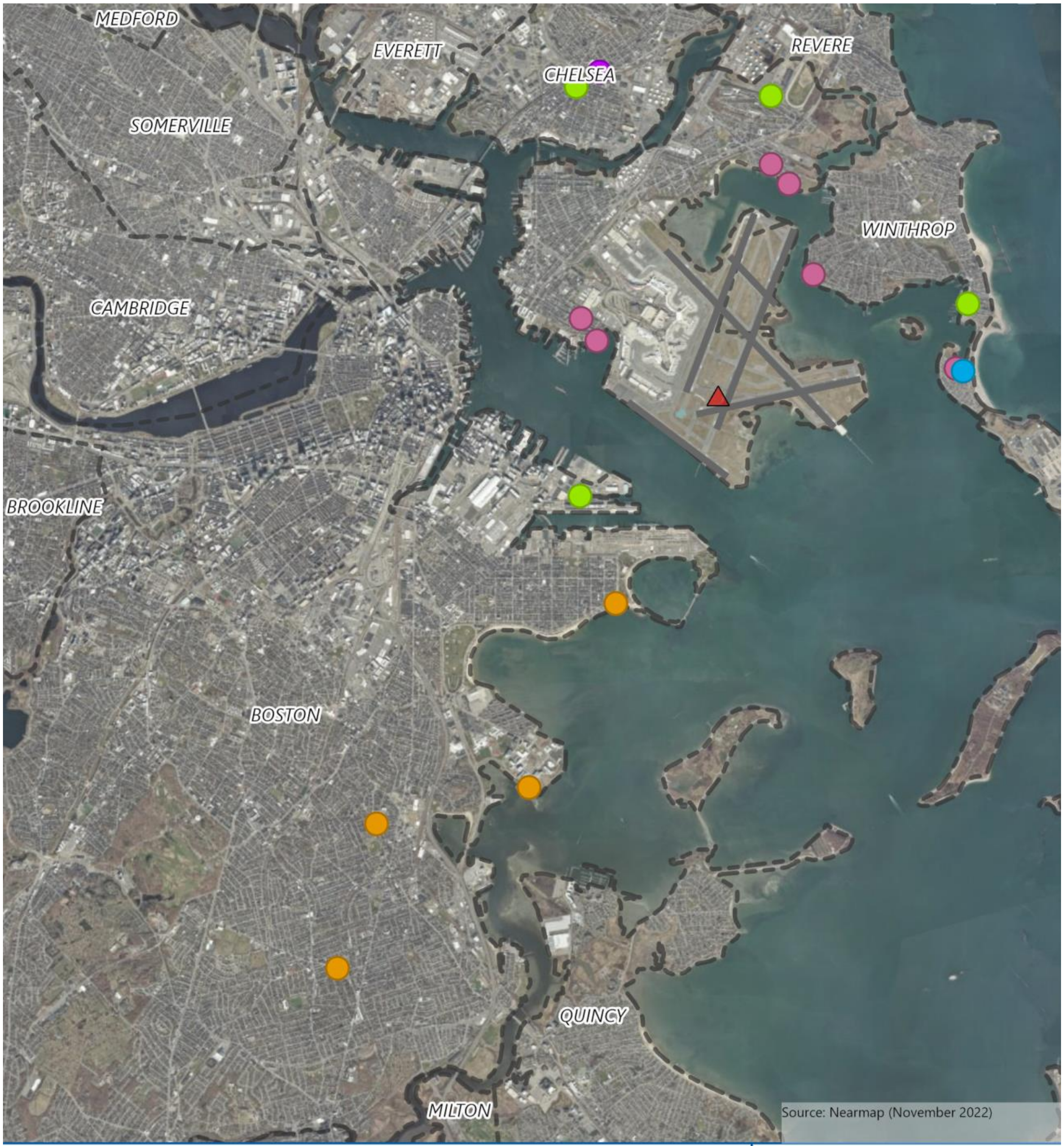


Figure J-5 Location of Air Quality Studies within Vicinity of Airport

2022 Environmental Status and Planning Report

Airport Reference Point
Tufts - Hudda et al. 2020
Olin, Air Inc., and Aerodyne Study
BU/Tufts FAA ASCENT Research
BU - Chung et al. 2023
Tufts - Mueller et al. 2022
Municipal Boundary

0 0.75 1.5 Miles

J.9.2 Recent Studies on Impacts of Aviation Emissions on Air Quality and Public Health

Massport continues to stay apprised of studies regarding the impact of aviation on air quality and public health. A recent study conducted by Tufts University, *Impacts of Aviation Emissions on Near-Airport Residential Air Quality*,[31] examined CO, CO_2, NO, NO_2, $PM_{2.5}$, UFPs, and BC at a residence near Logan Airport. The residence was located under a flight trajectory of the most utilized runway configuration. The study showed that gaseous and particulate pollutant concentrations were higher at the residence when it was downwind compared to when it was not.

Olin College is collaborating with Air Inc. and the Town of Winthrop to monitor air quality in the community. Monitors were placed in Winthrop to continuously measure pollutants such as CO, CO_2, nitric oxide (NO), NO_2, and O_3, as well as the mass concentration of $PM_{10}/PM_{2.5}$, and all relevant meteorological conditions. This study is on-going and Massport will continue to provide operational data and collaborate as needed.

Additionally, as discussed in previous sections, the University of Southern California and the University of Washington conducted two recent studies. The study performed by the University of Southern California indicated that there could be adverse health effects following exposure to airport and roadway traffic-related UFPs near Los Angeles International Airport. The study led by the University of Washington was conducted to understand the air quality impacts of air traffic for communities located near and below the flight paths of Seattle-Tacoma International Airport. The findings show key differences exist in the particle size distribution and the BC concentration for roadway and aircraft features.

Furthermore, research is underway for the update of TRB's ACRP Report 135: *Understanding Airport Air Quality and Public Health Studies Related to Airports* to include the latest information on the impact of airport operations (e.g., aircraft, GSE, ground transportation, and stationary sources) on air quality and public health. This research would aid airport operators in responding to concerns about air quality at airports and in their vicinity.

J.9.3 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 was an active member of the FAA Partnership for Air Transportation Noise and Emissions Reduction (PARTNER) program on reducing noise and emissions.[32] In 2009, Massport offered to

31 Neelakshi Hudda et al, "Impacts of Aviation Emissions on Near-Airport Residential Air Quality," Environ. Sci. Technol. 2020, 54, 8580−8588, doi.org/10.1021/acs.est.0c01859.

32 The Partnership for AiR Transportation Noise and Emissions Reduction (PARTNER) — was a leading aviation cooperative research organization headquartered at the Massachusetts Institute of Technology (MIT). An FAA Center of Excellence, PARTNER was sponsored by the FAA, NASA, Transport Canada, the U.S. Department of Defense, and the U.S.EPA. In December

facilitate a more detailed survey of pilots at Logan Airport by MIT 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. Massport continues to support the practice of single/reduced-engine taxiing and the use of idle reverse thrust.

MIT and the Center for Air Transportation Systems Research developed a methodology to account for single-engine taxi procedures during the taxi-in or -out modes.[33,34,35] Some of the single-engine taxi challenges noted in these studies include: (1) excessive thrust and associated issues; (2) maneuverability problems particularly related to tight taxiway turns and weather; (3) problems starting the second engine; and (4) distractions and workload issues. Thus, pilots do not use single-engine taxiing during each aircraft operation in practice, and when they do use it, it is not for the entire operation. Pilots use single-engine taxiing even less often when taxiing out.

When applying the MIT methodology and available data (such as aircraft pilot surveys) to the 2022 Logan Airport aircraft operational data, the results show a savings of approximately 2,075,172 gallons of jet fuel. This translates to a reduction of approximately 20,398 metric tons of CO_2e emissions associated with this initiative in 2022.

J.9.4 Engagement in Aviation-Related Environmental Issues

Massport maintains memberships and active participation in organizations that address aviation-related environmental issues, including air quality. These include environmental committees for TRB, the American Association of Airport Executives (AAAE), and the Airports Council International-North America (ACI-NA).

J.9.5 Black Carbon (BC)

Particulate matter of all sizes is comprised of multiple components, one of the more significant being BC. BC particles, also referred to as soot, form because of incomplete combustion, particularly at the higher temperatures at which aircraft burn fuel, making BC emissions common from aircraft. BC from aviation activities largely contributes to smaller particulate matter particles (i.e., $PM_{2.5}$ and UFPs). $PM_{2.5}$ is classified as a criteria air pollutant by U.S.EPA and regulated by NAAQS.

2015, PARTNER completed its Center of Excellence mandate and research. The ASCENT FAA Center of Excellence is now conducting similar research. Currently Massport is a member of the ASCENT Advisory Committee.

33 Massachusetts Institute of Technology. 2010. A Survey of Airline Pilots Regarding Fuel Conservation Procedures for Taxi Operations.

34 Massachusetts Institute of Technology. 2008. Opportunities for Reducing Surface Emissions through Airport Surface Movement Optimization.

35 Center for Air Transportation Systems Research. Analysis of Emissions Inventory for Single Engine Taxi-out Operations. 2009.

BC is known to have negative impacts on both human health and the environment. According to U.S.EPA, BC is associated with respiratory distress, cardiovascular disease, cancer, and birth defects. A 2009 study using air quality monitors near an airport showed that airports can contribute from 24 to 28 percent of total BC within 4 kilometers.[36] However, modeling studies, commonly used to ascertain the extent of impacts on human health and the environment, have shown the level of contribution by an airport to be less, only on the order of 2 to 5 percent. Researchers are working on understanding the reasons for this discrepancy. It may be an indication that emission estimates from airports need improvement.[37] A very recent study (September 2022) states that due to the complexity and cost of the instrumentation and the lack of reference modeling protocol, data availability on BC is limited.[38]

To fully understand the extent of impacts from airport-related BC emissions, much more research is needed. It is important for research to focus on improving emissions estimates of BC from airports and improved modeling studies. In addition to the U.S.EPA and other performing BC-related studies, the FAA also conducts BC research through the ASCENT program.

J.9.6 Ultrafine Particles (UFPs)

Within the field of air quality, airborne particles are collectively categorized as PMs and subdivided into size categories based on their diameters. These divisions are total suspended particles (TSP) with diameters ranging from 2.5 to 40 micrometers (μm), coarse particles PM_{10} with diameters ranging from 2.5 to 10 μm, fine particles $PM_{2.5}$ with diameters less than 2.5 μm, and UFPs with diameters less than 0.1 μm. Most of these particles originate from the exhaust gases generated by fossil fuel-powered engines and other high-temperature combustion sources including aircraft.

Under the CAA, U.S.EPA has established NAAQS for six criteria air pollutants including PM_{10} and $PM_{2.5}$. Outdoor concentrations within U.S.EPA standards are considered safe for the public. Presently, UFPs (by themselves) are not regulated ambient air pollutants. UFPs cannot be considered part of $PM_{2.5}$ because $PM_{2.5}$ regulates by a mass per volume concentration, and UFPs have a comparatively negligible mass. Any eventual UFP regulation would likely be regulated by particle count (or particle number concentrations).

On December 18, 2020, the U.S.EPA published a final action in the Federal Register detailing the agency's review of the NAAQS for PM_{10}/$PM_{2.5}$. UFP is addressed in the supplemental information of the notice. In their review of the PM_{10}/$PM_{2.5}$ NAAQS, the agency determined that due to significant uncertainties and limitations, as well as the limited availability of air monitoring data, that the $PM_{2.5}$ NAAQS would be retained as the indicator for UFP.[39]

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36 Dodson R. E.; Houseman E. A.; Morin B.; Levy J. I. 2009. *An analysis of continuous black carbon concentrations in proximity to an airport and major roadways.* Atmos. Environ, 43243764–3773.

37 Arunachalam S.; Valencia A.; Yang D.; Davis N, Baek B.H.; Dodson R.E.; Houseman A.E.; Levy J.I. 2011. *Comparing Monitoring-Based and Modeling-Based Approaches for Evaluating Black Carbon Contributions from a US Airport.* Air Pol. Mod, 619-623.

38 J.Rovira; J.A.Paredes-Ahumada; J.M.Barceló-Ordinas; J.García-Vidal; C.Reche; Y.Sola; P.L.Fung; T.Petäjä; T.Hussein; M.Viana; September 2022. *Non-linear Models for Black Carbon Exposure Modelling Using Air Pollution Datasets*. Environmental Research Volume 212, Part B.

39 Federal Register, Volume 85, No. 244, Page 82684.

Studies conducted at Zurich Airport in Switzerland and London Heathrow Airport in England have demonstrated that UFP dispersion is highly dependent on wind speed and direction with UFP particle counts being on the order of 10 times higher when measured downwind of the airports.[40,41] A study conducted at Brussels Airport in Belgium demonstrated the UFP emissions from the airport can significantly impact concentrations up to 7 kilometers (4.3 miles) away from the source.[42] These studies have begun to explain the dispersion characteristics of UFPs from airports, but specific health studies to assess impacts of UFPs from airport sources have yet to be conducted.

A study performed by the University of Southern California demonstrated adverse health effects following exposure to airport-related and roadway traffic-related UFPs near Los Angeles International Airport. To understand the distinct health impacts associated with each source, a source apportionment analysis was conducted.[43] The University of Washington conducted a *Mobile ObserVations of Ultrafine Particles (MOV-UP) study* of air traffic-related air quality impacts for communities located below and near the flight paths of Seattle-Tacoma International Airport. The findings show key differences exist in the particle size distribution and the black carbon (BC) concentration for roadway and aircraft features. These differences are important because they help distinguish between the spatial impact of roadway traffic and aircraft UFP emissions using a combination of mobile monitoring and standard statistical methods.[44]

In 2021, as part of the Center for Air Climate and Energy Solutions (CACES), a team from the University of Washington and Virginia Tech developed the first national model estimate for airborne UFP concentrations. The model will ultimately lead to a better understanding of UFP effects on health and could one day impact air pollution policy.[45]

Massport is supportive of cooperative research efforts that are being funded by the FAA and co-led by Washington State University and the Massachusetts Institute of Technology (MIT), which are known as the FAA Center of Excellence for Alternative Jet Fuels and Environment, Aviation Sustainability Center (ASCENT).[46] The primary purpose of the research is the measurement of aviation emissions and their contribution to ambient levels of air pollution. As part of the studies, ACSCENT is measuring UFPs in the vicinity of Logan Airport to determine spatial and short-term temporal variations in the contribution of aviation emissions to ground level air pollutant concentrations. They are also constructing regression

40 Fleuti, E., Maraini, S., Bieri, L., 2017. *Ultrafine Particle Measurements at Zurich Airport.* Flughafen Zurich AG.

41 Masiol, M., Harrison, R. M., Vu, T. V., and Beddows, D. C. S. *Sources of Submicrometre Particles Near a Major International Airport,* Atmos. Chem. Phys. Discuss., doi.org/10.5194/acp-2017-150, in review, 2017.

42 Peters, J., Berghmans, P., and Frijns, E. 2016. *Ultrafine Particles and Black Carbon monitoring in the surroundings of Brussels Airport.* Brussels Environmental Agency.

43 Habre, Rima et al. "Short-term effects of airport-associated ultrafine particle exposure on lung function and inflammation in adults with asthma." *Environment international,"* vol. 118 (2018): 48-59, doi:10.1016/j.envint.2018.05.031.

44 University of Washington, Department of Environmental & Occupational Health Sciences, *Mobile ObserVations of Ultrafine Particles: The MOV-UP study report*, December 2019, https://deohs.washington.edu/sites/default/files/Mov-Up%20Report.pdf.

45 Provat K. Saha et al, High-Spatial-Resolution Estimates of Ultrafine Particle Concentrations across the Continental United States, Environmental Science & Technology (2021). DOI: 10.1021/acs.est.1c03237.

46 U.S. DOT, Federal Aviation Administration, Center of Excellence for Alternative Jet Fuels & Environment. https://ascent.aero/.

models using measured data from the years 2017 and 2018 to determine the contributions of aviation sources to UFP and BC.[47]

In 2023 as part of the TRB Annual and Mid-Year Meetings the following presentations on UFP research studies were given:

- Changes in Ultrafine Particle Concentrations near a Major Airport Following Reduced Transportation Activity during the COVID-19 Pandemic by Sean Mueller et al., 2022.
- Air Quality Impacts of Aviation Activities at a Mid-sized Airport in Central Europe by Ivonne Trebs et al., 2023.

The Mueller et al. study shows the effect of pandemic-related mobility changes on UFP counts in a near-airport community in the U.S. and distinguishes aviation-related and ground transportation source contributions. Notably, this study is an ASCENT supported project.

Additionally, the Trebs et al study performed at a European airport concludes that UFP counts at the studied airport decline at daytime despite significant flight activities during that same time period. The study states that this decline is due to efficient turbulent mixing (high wind speeds and solar radiation) during daytime, causing depletion of nucleation mode particle numbers whereas at nighttime there is a presence of stable nocturnal boundary layer, where pollutants are accumulated.

Massport is also cooperating with Boston University, Tufts University, and other researchers in identifying aircraft-specific related UFPs in an urban environment with non-airport related sources. This research is on-going in the East Boston area and Massport continues to contribute by providing Logan Airport operational and other pertinent data.

J.9.7 Climate Change Adaptation and Resiliency

Massport has a comprehensive resiliency initiative to maximize business continuity amid various human and natural threats. Massport's efforts are guided by the following goals:

- Improve resiliency for overall infrastructure and operations.
- Restore operations during and after disruptive events in a safe and economically viable time frame.
- Create robust feedback loops that allow innovative solutions as conditions change.
- Inform operations and policy, and implement design/build decisions, through the application of sound scientific research and principles that consider threats, vulnerabilities, and cost-benefit calculations.
- Become a knowledge-sharing exemplar of a forward-thinking, resilient port authority.

47 ASCENT Project 018 2020 Annual Report. https://s3.wp.wsu.edu/uploads/sites/2479/2021/04/ASCENT-Project-018-2020-Annual-Report.pdf.

- Work with key influencers and decision-makers to strengthen understanding of the human, national, and economic security implications of extreme weather, changing climate, and anthropogenic threats to Massport's facilities and the region.

These initiatives are described in Chapter 2, *Sustainability, Outreach, and Environmental Justice*.

J.9.8 Statewide, National, and International Initiatives

Advancements on the national and international levels to decrease Airport-related air emissions have continued to focus primarily on three initiatives: the advanced quantification of particulate matter and hazardous air pollutants (HAPs) emissions from aircraft engines; the continued phasing-in of AFV; and the implementation of GHG emissions reduction strategies. These initiatives are briefly described below.

- **Particulate Matter and Hazardous Air Pollutant Research** – Conducted by the ICAO, FAA, U.S.EPA, and others, research continues to better characterize PM_{10}/$PM_{2.5}$ and HAPs emissions (including Pb) from aircraft engines. Similarly, air quality monitoring efforts at other airports were also conducted at various locations to advance what is known about ambient levels of these air pollutants in the vicinities of airports. Massport continues to closely track these issues through its involvement in aviation industry organizations such as ACI-NA and AAAE.
- **AFV 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., electric, 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, electric, or lower-emitting fuels. Massport is replacing all commercially-available diesel-powered GSE with all-electric. In 2018, U.S.EPA awarded a $541,817 grant under the Diesel Emission Reduction Act (DERA) to Massport to replace gas- and diesel-powered GSE at Logan Airport in a collaborative effort to reduce diesel emissions and improve air quality. This grant will allow Massport to assist American Airlines with the replacement of 25 pieces of diesel-powered GSE with all-electric versions. This grant will be used in conjunction with an FAA grant Massport received in the fall of 2018 to install eGSE charging stations for the Terminal B Optimization Project. In 2019, Massport was awarded by U.S.EPA under DERA a $990,000 grant to replace 44 diesel-powered GSE with all-electric baggage tractors, belt loaders, and push-back tugs. Massport contributed a $1,210,000 match. Massport is also collaborating with the MassCEC to study opportunities to enable conversion of the ride-for-hire fleet (RideApp, Rental Car Taxi, and limousine vehicles) that serves Logan to transition to electric vehicles. In early 2022, MassCEC provided a grant to initiate this work and support Logan Airport's expansion of EV charging infrastructure. Over 200 EVs are available to rent at the Airport.[48]

48 Mogavero, Matthew. "Massport and MassCEC Celebrate Electric Vehicle Grant - Over 200 Electric Vehicles Currently Available To Rent At Logan Airport." MassCEC, July 27, 2022. https://www.masscec.com/press/massport-and-masscec-celebrate-electric-vehicle-grant-over-200-electric-vehicles-currently.

- **Sustainable Aviation Fuel (SAF)** – International Air Transport Association (IATA) approved a resolution for the governments to continue implementing the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). To achieve carbon-neutral growth, this initiative sets a cap on net CO_2 emissions generated from international aviation at 2020 levels. Airlines are also encouraged to use biofuels, or other SAFs, as a fuel efficiency measure.[49] SAFs are a renewable/cleaner substitute for fossil jet fuels that reduce carbon emissions and improve the air quality. In May 2019, United Airlines agreed to purchase up to 10 million gallons of cost-competitive, commercial-scale, sustainable aviation biofuel over the next two years. Currently, every United Airlines flight out of Los Angeles International Airport are powered by biofuel. United Airlines has renewed its contract with Boston's World Energy, a biofuel producer, to help achieve its commitment to reducing its GHG emissions by 50 percent by 2050.[50] In September 2021, jetBlue announced plans to speed up its transition to SAF with an offtake agreement with SG Preston, a leading bioenergy developer. With the addition of this SG Preston agreement to its previous SAF commitments, jetBlue is well ahead of the pace on its target to convert 10 percent of its total fuel usage to SAF on a blended basis by 2030. The airline will reach nearly 18 percent SAF usage by the end of 2023 when delivery of SAF under this agreement is expected. jetBlue is doubling its previous SAF commitment with SG Preston, which was first announced in 2016 as one of the largest SAF purchase agreements in aviation history.[51] As part of the Net Zero plan, Massport will also try to focus on GHG emissions that it does not directly but can possibly influence. One such example of an area of potential influence would be to enable the use of SAF at Logan. It is estimated that more than 99 percent of airline emissions and approximately 50 percent of airport emissions worldwide are related to the combustion of jet fuel. This past fall, President Biden announced a goal for U.S. companies to produce at least 3 billion gallons of SAF per year by 2030 and, by 2050, sufficient SAF to meet 100 percent of aviation fuel demand, which is currently projected to be around 35 billion gallons per year. Massport will work to enable use of SAF at their three airports and encourage the airline partners to transition to this alternative fuel while longer-term strategies are evaluated, approved, and adopted.
- **Climate Change Technology Standards**[52] – In October 2010, the 37th Assembly (Resolution A37-19) requested the development of an ICAO CO_2 emissions standard. Following six years of development, ICAO's Committee on Aviation Environmental Protection (CAEP) at its tenth meeting recommended an airplane CO_2 emissions certification standard. This new standard is part of the ICAO "Basket of measures" to reduce GHG emissions from the air transport system, and it is the first global technology standard for CO_2 emissions for any sector with the aim of encouraging more fuel-efficient

49 Biofuels international, IATA resolution urges airlines to switch to sustainable aviation fuels. June 3, 2019, https://biofuels-news.com/display_news/14744/iata_resolution_urges_airlines_to_switch_to_sustainable_aviation_fuels/.

50 Good News Network, As Only US Airline to Use Biofuel on Regular Basis, All United Flights from LA Are Now Powered by Biofuel. June 10, 2019. https://www.goodnewsnetwork.org/united-airlines-flights-from-la-powered-by-biofuel/.

51 jetBlue Accelerates Transition to Sustainable Aviation Fuel (SAF) With Plans for the Largest-Ever Supply of SAF in New York Airports for a Commercial Airline, Sep 29, 2021, http://mediaroom.jetblue.com/investor-relations/press-releases/2021/09-29-2021-132310033.

52 International Civil Aviation Organization, Environmental Protection, "Climate Change Technology Standards," 2020. https://www.icao.int/environmental-protection/Pages/ClimateChange_TechnologyStandards.aspx.

technologies in airplane designs. After adoption by the ICAO Council, the new airplane CO_2 emissions certification standard was published as an official CO_2 standard in 2017. The CO_2 standard applies to subsonic jet and turboprop airplanes that are "new type" designs from 2020. It also applies to "in-production" airplanes from 2023 that are modified and meet a specific change criterion. This is subsequently followed up by a production cut-off in 2028, which means that in-production airplanes that do not meet the standard can no longer be produced beyond 2028 unless the designs are modified to comply with the standard.

- **Massachusetts Clean Energy and Climate Plan (CECP) for 2050** – The 2050 CECP is the Commonwealth of Massachusetts' comprehensive and aggressive plan to achieve Net Zero GHG emissions in 2050. The Plan is aimed at reducing statewide gross GHG emissions by at least 85% below the 1990 baseline level. The 2050 CECP charts out the way Massachusetts will achieve the emissions limit and sub-limits in 2050 by building a future in which the heat in homes, power in vehicles, and the electric grid can all operate with minimum reliance on fossil fuels. Information on the Plan and its policies can be found at: https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-plan-for-2050#2050-emissions-limit-and-sublimits-.

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K. Water Quality Supporting Documentation

This appendix provides detailed information in support of Chapter 9, *Water Quality*:

K.1 Stormwater Outfall Reporting

Table K-1 Logan Airport National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007)

Monitoring Event	North Outfall 001		West Outfall 002		Maverick Outfall 003	
	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 Tolyltriazole	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolyltriazole	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

Table K-1 Logan Airport National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007)

Monitoring Event	North Outfall 001		West Outfall 002		Maverick Outfall 003	
	Field Measurement	Laboratory Analysis	Field Measurement	Laboratory Analysis	Field Measurement	Laboratory Analysis
Treatment System Sampling (Internal Outfalls)[7]	pH Quantity, Gallons	Oil and Grease TSS[1] Benzene[2]	Not Required	Not Required	Not Required	Not Required
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

Table K-1 Logan Airport National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007)

Monitoring Event	North Outfall 001		West Outfall 002		Maverick Outfall 003	
	Field Measurement	Laboratory Analysis	Field Measurement	Laboratory Analysis	Field Measurement	Laboratory Analysis
Treatment System Sampling (Internal Outfalls)[7]	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required

Source: Massport

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 BOD - 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 K-2 Fire Training Facility NPDES Permit (No. MA0032751) Stormwater Outfall Monitoring Requirements (2014)

Monitoring Event	Outfall Serial Number 001	
	Field Measurement	Laboratory Analysis
Each Discharge Event[1]	Flow Rate[2] pH	TSS[3] Oil and Grease[4] Total BTEX[5] - Toluene - Benzene - Ethylbenzene - Xylene PAHs[5,6]
Whole Effluent Toxicity (once per permit terms during discharge event)	Not Required	Acute Toxicity[7]

Source: Massport

Notes: Requirements are from NPDES Permit MA0032751, issued August 15, 2014.

All samples, except for wet testing, shall be collected after treatment and prior to discharge from above ground holding tank.

1 Flows from more than one training session may be held in treatment train for several weeks. Treatment and subsequent discharge through Outfall 001 is usually triggered by tank levels. Sampling will be conducted during each discharge event with the sampling point after the GAC unit and prior to discharge from the above ground holding tank. Each sample shall be a composite of three equally weighted (same volume) grab samples taken at the bottom, middle, and top of the above ground tank.

2 Total flow volume shall be reported monthly in gallons and the maximum flow rate in gallons per minute shall be reported for each month.

3 TSS - Total Suspended Solids

4 Oil and grease is measured using EPA Method 1664.

5 BTEX and PAH compounds shall be analyzed using EPA approved methods. Testing method used and method detection level for each parameter will be included in each DMR submittal.

6 PAH - Polycyclic Aromatic Hydrocarbons

7 The permittee shall conduct one acute toxicity test per year. The test results shall be submitted by the last day of the full month following completion of the test in accordance with protocols defined in the permit.

Table K-3 Fire Training Facility NPDES Permit (No. MA0032751) Stormwater Outfall Monitoring Requirements (2021)

Monitoring Event	Outfall Serial Number 001		
	Field Measurement	Laboratory Analysis	
Each Discharge Event[1]	Flow Rate[2] pH	TSS[3] Fecal Coliform Bacteria *Enterococcus Bacteria* Oil and Grease[4] Total BTEX[5] - Toluene - Benzene - Ethylbenzene - Xylene PAHs,Total,Group I[5,6] - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene - Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene	PAHs, Total, Group II[5,6] - Acenaphthylene - Anthracene - Benzo(g,h,i)perylene - Fluoranthene - Fluorene - Naphthalene - Phenanthrene - Pyrene Perfluorohexanesulfonic acid (PFHxS)[7] Perfluoroheptanoic acid (PFHpA) Perfluoranonanoic acid (PFNA) Perfluorooctanesulfonic acid (PFOS) Perfluorooctanoic acid (PFOA) Perfluorodecanoic acid (PFDA)
Whole Effluent Toxicity (once per permit terms during discharge event)	Not Required	Acute Toxicity[8]	

Source: Massport

Notes: Requirements are from NPDES Permit MA0032751, issued January 27, 2021.

All samples, except for wet testing, shall be collected after treatment and prior to discharge from above ground holding tank.

1 Flows from more than one training session may be held in treatment train for several weeks. Treatment and subsequent discharge through Outfall 001 is usually triggered by tank levels. Except for WET samples, sampling will be conducted during each discharge event with the sampling point after the GAC unit and prior to discharge from the above ground holding tank. Each sample shall be a grab sample collected from the above ground tank. WET sampling shall occur from the outfall discharge.

2 Total flow volume shall be reported monthly in average gallons per day and the maximum flow rate in gallons per day shall be reported for each month.

3 TSS - Total Suspended Solids

4 Oil and grease is measured using EPA Method 1664.

5 BTEX and PAH compounds shall be analyzed using EPA approved methods. Testing method used and method detection level for each parameter will be included in each DMR submittal.

6 PAH - Polycyclic Aromatic Hydrocarbons

7 The reporting requirements for the listed PAH parameters takes effect six months after EPA's multi-lab validated method for wastewater is made available to the public on EPA's CWA methods program website.

8 The permittee shall conduct one acute toxicity test per year. The test results shall be submitted by the last day of the full month following completion of the test in accordance with protocols defined in the permit.

Table K-4 Logan Airport 2022 Monthly Monitoring Results for First Quarter — North, West, and Maverick Street Stormwater Outfalls

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)	Klebsiella (cfu/100mL)
001A - North Outfall	1/7/2022	Wet Weather	2.461	0.366	6.34	<4.0	15	<1.0	0.110	130	10	NA
002A - West Outfall	1/7/2022	Wet Weather	8.551	0.804	7.16	<4.0	15	<1.0	0.050	180	50	NA
004A - Maverick Street Outfall	1/7/2022	Wet Weather	0.518	0.014	7.03	<4.0	20	<1.0	0.050	400	110	NA
001C- North Outfall	1/13/2022	Dry Weather	--	--	--	<4.0	<5.0	<1.0	0.060	<10	<10	NA
002C - West Outfall	1/13/2022	Dry Weather	--	--	--	<4.0	12	<1.0	0.080	<10	<10	NA
004C - Maverick Street Outfall	1/13/2022	Dry Weather	--	--	--	<4.0	24	<1.0	0.070	810	340	NA
001C- North Outfall	2/11/2022	Dry Weather	--	--	--	<4.0	9.1	<1.0	0.080	<10	150	NA
002C - West Outfall	2/11/2022	Dry Weather	--	--	--	<3.6	9.0	<1.0	0.090	130	160	NA
004C - Maverick Street Outfall	2/11/2022	Dry Weather	--	--	--	<4.0	15	<1.0	0.060	160	100	NA
001A - North Outfall	2/18/2022	Wet Weather	3.960	1.259	7.57	<4.0	9.8	<1.0	0.160	180	60	NA
002A - West Outfall	2/18/2022	Wet Weather	15.765	1.947	7.38	<4.0	43	<1.0	0.200	150	260	NA
004A - Maverick Street Outfall	2/18/2022	Wet Weather	0.798	0.083	6.94	<4.0	56	<1.0	0.110	180	460	NA
001C- North Outfall	3/7/2022	Dry Weather	--	--	--	<4.0	17.0	<1.0	0.060	30	20	NA
002C - West Outfall	3/7/2022	Dry Weather	--	--	--	<4.0	16.0	<1.0	0.070	4,400	1,800	NA
004C - Maverick Street Outfall	3/7/2022	Dry Weather	--	--	--	<4.0	13	<1.0	0.060	<10	80	NA

Table K-4 Logan Airport 2022 Monthly Monitoring Results for First Quarter — North, West, and Maverick Street Stormwater Outfalls

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)	Klebsiella (cfu/100mL)
001A - North Outfall	3/24/2022	Wet Weather	1.990	0.532	7.14	<4.0	11.0	<1.0	0.110	330	90	NA
002A - West Outfall	3/24/2022	Wet Weather	5.852	0.990	7.45	<4.0	120	<1.0	0.150	1,900	3,400	NA
004A - Maverick Street Outfall	3/24/2022	Wet Weather	0.471	0.039	7.05	<3.6	16	<1.0	0.150	470	200	NA
Discharge Limitations*	Maximum Daily		Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	---
	Average Monthly		Report	Report	6.0 to 8.5	----	Report	Report	Report	Report	Report	---

Notes:
*Discharge limitations for Porter Street Outfall are Report only.
Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
For averaging calculations, the reporting limit was employed for those results measured below the laboratory detection limit.
For geometric mean calculations (fecal coliform and enterococcus), the reporting limit was employed for those results measured below the laboratory detection limit.
The North Outfall, West Outfall, and Maverick Street Outfall samples were analyzed for klebsiella on a case-by-case basis if high fecal coliform concentrations were observed.
Refer to respective monthly DMR for specifics on those events.
Bold values exceed maximum daily discharge limitation.
Dry: Sampling location dry. No sample collected.
NA: Not Analyzed
NM Not Measured
G: Equipment failure
NS: Not Sampled.
TSS: Total Suspended Solids

Table K-5 Logan Airport 2022 Monthly Monitoring Results for First Quarter — Porter Street Stormwater Outfall

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003- Porter Street Outfall 1	1/7/2022	Wet Weather	---	---	6.77	<4.0	72	<1.0	0.220	260	230
003- Porter Street Outfall 2	1/7/2022	Wet Weather	---	---	5.88	<4.0	5.6	<1.0	0.140	10	10
003- Porter Street Outfall 3	1/7/2022	Wet Weather	---	---	7.36	<4.0	5	<1.0	0.060	10	<10
003- Porter Street Outfall Average		Wet Weather	1.715	0.148	6.67	4.0	28	1.0	0.140	30	28
003- Porter Street Outfall 1	1/13/2022	Dry Weather	---	---	---	<4.0	24	<1.0	0.110	50	10
003- Porter Street Outfall 2	1/13/2022	Dry Weather	---	---	---	<4.0	22	<1.0	0.080	<10	<10
003- Porter Street Outfall 3	1/13/2022	Dry Weather	---	---	---	<3.6	17	<1.0	0.080	<10	<10
003- Porter Street Outfall Average		Dry Weather	---	---	---	3.9	15.5	1.0	0.090	17	10
003- Porter Street Outfall 1	2/18/2022	Wet Weather	---	---	7.29	<4.0	110	<1.0	0.280	600	1,600
003- Porter Street Outfall 2	2/18/2022	Wet Weather	---	---	7.63	23	10	<2.0	0.090	<10	20
003- Porter Street Outfall 3	2/18/2022	Wet Weather	---	---	8.08	<4.0	6	<1.0	0.110	10	45
003- Porter Street Outfall Average		Wet Weather	1.851	0.283	7.67	10.3	42	1.3	0.160	39	113
003- Porter Street Outfall 1	2/11/2022	Dry Weather	---	---	---	<3.6	16	<1.0	0.090	<10	110
003- Porter Street Outfall 2	2/11/2022	Dry Weather	---	---	---	<4.0	13	<1.0	0.240	<10	<10
003- Porter Street Outfall 3	2/11/2022	Dry Weather	---	---	---	<4.0	5.2	<1.0	0.060	40	10
003- Porter Street Outfall Average		Dry Weather	---	---	---	3.9	11.4	1.0	0.130	16	22

Table K-5 Logan Airport 2022 Monthly Monitoring Results for First Quarter — Porter Street Stormwater Outfall

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzen e (µg/L)	Surfactant s (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003- Porter Street Outfall 1	3/24/2022	Wet Weather	---	---	7.15	<4.0	40	<1.0	0.160	3,600	2,100
003- Porter Street Outfall 2	3/24/2022	Wet Weather	---	---	7.07	<4.0	<5.0	<1.0	0.100	10	30
003- Porter Street Outfall 3	3/24/2022	Wet Weather	---	---	7.22	<3.6	26	<1.0	<0.050	20	170
003- Porter Street Outfall Average		Wet Weather	1.425	0.191	7.15	3.9	24	1.0	0.103	90	220
003- Porter Street Outfall 1	3/7/2022	Dry Weather	---	---	---	<3.6	18	<1.0	0.080	200	430
003- Porter Street Outfall 2	3/7/2022	Dry Weather	---	---	---	4.3	7.4	<1.0	0.190	10	150
003- Porter Street Outfall 3	3/7/2022	Dry Weather	---	---	---	<3.6	5	<1.0	0.100	<10	<10
003- Porter Street Outfall Average		Dry Weather	---	---	---	3.8	10.1	1.0	0.123	27	86
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 Monthly		Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes:

Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.

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 January 2020 wet weather bacteria samples were collected on 1/25/2020.

TSS Total Suspended Solids

NA Not Analyzed

NS Not Sampled

Table K-6 Logan Airport 2022 Monthly Monitoring Results for Second Quarter — North, West, and Maverick Street Stormwater Outfalls

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)	Klebsiella1 (cfu/100mL)
001A - North Outfall	4/1/2022	Wet Weather	1.813	0.272	7.23	<4.0	16	< 1.0	0.140	250	230	NA
002A - West Outfall	4/1/2022	Wet Weather	6.016	0.846	6.31	6.6	100	< 1.0	0.170	450	1300	NA
004A - Maverick Street Outfall	4/1/2022	Wet Weather	0.450	0.042	6.48	<4.0	22	< 1.0	0.170	600	1700	NA
001C- North Outfall	4/22/2022	Dry Weather	--	--	--	<4.0	8.9	< 1.0	0.080	20	30	NA
002C - West Outfall	4/22/2022	Dry Weather	--	--	--	<4.0	23	< 1.0	0.080	20	10	NA
004C - Maverick Street Outfall	4/22/2022	Dry Weather	--	--	--	<4.0	37	< 1.0	0.050	56,000	1,500	NA
001A - North Outfall	5/2022	Wet Weather	2.019	0.128	NS	NS	NS	NS	NS	NS	NS	NS
002A - West Outfall	5/2022	Wet Weather	5.552	0.406	NS	NS	NS	NS	NS	NS	NS	NS
004A - Maverick Street Outfall	5/2022	Wet Weather	0.417	0.014	NS	NS	NS	NS	NS	NS	NS	NS
001C- North Outfall	5/20/2022	Dry Weather	--	--	--	< 4.0	< 5.0	< 1.0	0.190	2,400	20	NA
002C - West Outfall	5/20/2022	Dry Weather	--	--	--	< 4.0	24	< 1.0	0.130	16,000	1,300	NA
004C - Maverick Street Outfall	5/20/2022	Dry Weather	--	--	--	<4.0	7.3	<1.0	0.070	430	170	NA
001A - North Outfall	6/8/2022	Wet Weather	2.838	0.230	6.82	<4.0	8.0	<1.0	0.220	890	700	NA
002A - West Outfall	6/8/2022	Wet Weather	9.845	0.779	7.31	<3.6	8.2	<1.0	0.230	2,700	3,200	NA
004A - Maverick Street Outfall	6/8/2022	Wet Weather	0.692	0.038	6.95	<4.0	15	<1.0	0.160	430	560	NA

Table K-6 Logan Airport 2022 Monthly Monitoring Results for Second Quarter — North, West, and Maverick Street Stormwater Outfalls

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	Enterococcus (cfu/100mL)	Klebsiella1 (cfu/100mL)
001C- North Outfall	6/7/2022	Dry Weather	--	--	--	<4.0	10	<1.0	0.100	80	10	NA
002C - West Outfall	6/7/2022	Dry Weather	--	--	--	<4.0	15	<1.0	0.120	150	110	NA
004C - Maverick Street Outfall	6/7/2022	Dry Weather	--	--	--	<4.0	8.9	<1.0	0.050	560	340	NA
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 Monthly		Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.

1 Klebsiella is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.

TSS Total Suspended Solids

NA Not Analyzed

NS Not Sampled

Table K-7 Logan Airport 2022 Monthly Monitoring Results for Second Quarter — Porter Street Stormwater Outfall

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003- Porter Street Outfall 1	4/1/2022	Wet Weather			6.96	< 4.0	29	< 1.0	0.080	1,100	1,500
003- Porter Street Outfall 2	4/1/2022	Wet Weather			7.02	5.7	22	< 1.0	0.170	20	160
003- Porter Street Outfall 3	4/1/2022	Wet Weather			6.98	< 4.0	< 5.0	< 1.0	0.070	50	60
003- Porter Street Outfall Average		Wet Weather	1.086	0.168	6.99	4.7	19	1.0	0.100	103	243
003- Porter Street Outfall 1	5/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 2	5/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 3	5/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall Average		Wet Weather	0.895	0.087	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 1	6/8/2022	Wet Weather			6.80	<4.0	8.0	<1.0	0.150	3,200	4,300
003- Porter Street Outfall 2	6/8/2022	Wet Weather			7.27	<4.0	<5.0	<1.0	0.130	4,000	2,200
003- Porter Street Outfall 3	6/8/2022	Wet Weather			6.16	<4.0	<5.0	<1.0	0.090	170	490
003- Porter Street Outfall Average		Wet Weather	2.120	0.166	6.74	4.0	6.0	1.0	0.120	1,296	1,667
003- Porter Street Outfall 1	04/22/2022	Dry Weather	---	---	---	< 4.0	13	< 1.0	0.100	< 10	< 10
003- Porter Street Outfall 2	04/22/2022	Dry Weather	---	---	---	< 4.0	7.3	< 1.0	0.100	< 10	170
003- Porter Street Outfall 3	04/22/2022	Dry Weather	---	---	---	< 3.6	< 5.5	< 1.0	0.140	< 10	< 10
003- Porter Street Outfall Average		Dry Weather				3.9	8.6	1.0	0.113	10	26

Table K-7 Logan Airport 2022 Monthly Monitoring Results for Second Quarter — Porter Street Stormwater Outfall

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003- Porter Street Outfall 1	5/20/2022	Dry Weather	---	---	---	< 4.0	28	< 1.0	0.140	< 10	30
003- Porter Street Outfall 2	5/20/2022	Dry Weather	---	---	---	23.0	25	< 1.0	0.760	30	490
003- Porter Street Outfall 3	5/20/2022	Dry Weather	---	---	---	< 4.0	5.5	< 1.0	0.130	50	50
003- Porter Street Outfall Average		Dry Weather				10.3	19.5	1.0	0.343	25	90
003- Porter Street Outfall 1	6/7/2022	Dry Weather	---	---	---	<4.0	28	<1.0	0.080	<10	45
003- Porter Street Outfall 2	6/7/2022	Dry Weather	---	---	---	<3.6	5.3	<1.0	0.120	30	<10
003- Porter Street Outfall 3	6/7/2022	Dry Weather	---	---	---	<4.0	9.7	<1.0	0.110	<10	<10
003- Porter Street Outfall Average		Dry Weather				3.9	14.3	1.0	0.100	14	17
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 Monthly		Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003, and 0034 by using the SWMM model developed for Logan Airport.

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

NS Not Sampled

Table K-8 Logan Airport 2022 Monthly Monitoring Results for Third Quarter — North, West, and Maverick Street Stormwater Outfalls

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A - North Outfall	7/2022	Wet Weather	0.343	0.049	NS	NS	NS	NS	NS	NS	NS	NA
002A - West Outfall	7/2022	Wet Weather	1.012	0.155	NS	NS	NS	NS	NS	NS	NS	NA
004A - Maverick Street Outfall	7/2022	Wet Weather	0.088	0.012	NS	NS	NS	NS	NS	NS	NS	NA
001C- North Outfall	7/13/2022	Dry Weather	--	--	--	<4.0	9.2	<1.0	0.100	200	10	NA
002C - West Outfall	7/13/2022	Dry Weather	--	--	--	<4.0	19	<1.0	0.080	110	40	NA
004C - Maverick Street Outfall	7/13/2022	Dry Weather	--	--	--	<4.0	14	<1.0	0.060	600	140	NA
001A - North Outfall	8/22/2022	Wet Weather	1.136	0.126	7.82	4.3	26	<1.0	0.080	14,000	3,500	NA
002A - West Outfall	8/22/2022	Wet Weather	3.063	0.438	6.42	<3.6	36	<1.0	0.250	11,000	3,400	NA
004A - Maverick Street Outfall	8/22/2022	Wet Weather	0.263	0.031	6.84	<4.0	59	<1.0	0.270	27,000	3,300	NA
001C- North Outfall	8/5/2022	Dry Weather	--	--	--	<4.0	<5.0	<1.0	0.090	540	<10	NA
002C - West Outfall	8/5/2022	Dry Weather	--	--	--	<4.0	9.5	<1.0	0.090	110	20	NA
004C - Maverick Street Outfall	8/5/2022	Dry Weather	--	--	--	<4.0	14	<1.0	0.060	380	30	NA
001A - North Outfall	9/2022	Wet Weather	2.263	0.245	NS	NS	NS	NS	NS	NS	NS	NA

Table K-8 Logan Airport 2022 Monthly Monitoring Results for Third Quarter — North, West, and Maverick Street Stormwater Outfalls

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
002A - West Outfall	9/2022	Wet Weather	6.801	0.867	NS	NS	NS	NS	NS	NS	NS	NA
004A - Maverick Street Outfall	9/2022	Wet Weather	0.566	0.059	NS	NS	NS	NS	NS	NS	NS	NA
001C- North Outfall	9/19/2022	Dry Weather	--	--	--	<4.0	15.0	<1.0	<0.250	220	<10	NA
002C - West Outfall	9/19/2022	Dry Weather	--	--	--	<4.0	9.4	<1.0	<0.250	1,900	120	NA
004C - Maverick Street Outfall	9/19/2022	Dry Weather	--	--	--	<3.6	12	<1.0	<0.050	8.0	3.0	NA
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 Monthly		Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 Klebsiella is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled

Table K-9 Logan Airport 2022 Monthly Monitoring Results for Third Quarter — Porter Street Stormwater Outfall

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003- Porter Street Outfall 1	7/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 2	7/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 3	7/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall Average		Wet Weather	0.305	0.053	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 1	7/13/2022	Dry Weather	---	---	---	<4.0	6.1	<1.0	0.120	110	<10
003- Porter Street Outfall 2	7/13/2022	Dry Weather	---	---	---	<4.0	6.9	<1.0	0.160	100	<10
003- Porter Street Outfall 3	7/13/2022	Dry Weather	---	---	---	<3.6	<5.6	<1.0	0.190	10	110
003- Porter Street Outfall Average		Dry Weather	---	---	---	3.9	6.2	1.0	0.157	48	22
003- Porter Street Outfall 1	8/22/2022	Wet Weather	---	---	7.25	<4.0	35	<1.0	0.220	15,000	43,000
003- Porter Street Outfall 2	8/22/2022	Wet Weather	---	---	7.76	7.9	25	<1.0	0.140	14,000	5,500
003- Porter Street Outfall 33	8/22/2022	Wet Weather	---	---	7.53	<4.0	<5.0	<1.0	<0.050	1000	27,00
003- Porter Street Outfall Average		Wet Weather	0.961	0.059	7.51	5.3	22	1.0	0.137	5,944	8,611
003- Porter Street Outfall 1	8/5/2022	Dry Weather	---	---	---	<4.0	82	<1.0	0.320	27,000	180
003- Porter Street Outfall 2	8/5/2022	Dry Weather	---	---	---	<4.0	<5.0	<1.0	0.360	10	50
003- Porter Street Outfall 3	8/5/2022	Dry Weather	---	---	---	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall Average		Dry Weather	---	---	---	4.0	43.5	1.0	0.340	520	520

Table K-9 Logan Airport 2022 Monthly Monitoring Results for Third Quarter — Porter Street Stormwater Outfall

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003- Porter Street Outfall 1	9/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 2	9/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 3	9/2022	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall Average		Wet Weather	1.349	0.201	NS	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall 1	9/19/2022	Dry Weather	---	---	---	<4.0	7.0	<1.0	<0.250	480	<10
003- Porter Street Outfall 2	9/19/2022	Dry Weather	---	---	---	<4.0	5.8	<1.0	0.070	150	320
003- Porter Street Outfall 3	9/19/2022	Dry Weather	---	---	---	NS	NS	NS	NS	NS	NS
003- Porter Street Outfall Average		Dry Weather	---	---	---	6.4	4.0	1.0	0.160	268	57
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 Monthly		Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfall 003 by using the SWMM model developed for Logan Airport.
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

NS Not Sampled

Table K-10 Logan Airport 2022 Monthly Monitoring Results for Fourth Quarter — North, West, and Maverick Street Stormwater Outfalls

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A - North Outfall10/24/2022Wet Weather4.7210.4278.11<4.015<1.00.2904,600430NA002A - West Outfall	10/24/2022	Wet Weather	20.703	1.512	8.05	<4.0	20	<1.0	0.170	370	500	NA
004A - Maverick Street Outfall	10/24/2022	Wet Weather	1.228	0.104	7.69	<4.0	14	<1.0	<0.05	20	<10	NA
001C- North Outfall	10/13/2022	Dry Weather	--	--	--	<4.0	7.1	<1.0	0.090	560	90	NA
002C - West Outfall	10/13/2022	Dry Weather	--	--	--	<4.0	7	<1.0	0.060	30	<10	NA
004C - Maverick Street Outfall	10/13/2022	Dry Weather	--	--	--	<4.0	14	<1.0	<0.050	10	50	NA
001A - North Outfall	11/16/2022	Wet Weather	2.510	0.274	6.95	5.8	15	<1.0	0.100	1,500	12,000	NA
002A - West Outfall	11/16/2022	Wet Weather	8.712	0.953	7.17	<4.0	<5.0	<1.0	0.110	1,500	6,800	NA
004A - Maverick Street Outfall	11/16/2022	Wet Weather	0.624	0.071	6.28	<4.0	<5.0	<1.0	0.100	530	2,800	NA
001C- North Outfall	11/1/2022	Dry Weather	--	--	--	5.1	11	<1.0	0.310	300	120	NA
002C - West Outfall	11/1/2022	Dry Weather	--	--	--	<4.0	32	<1.0	0.110	10	110	NA

Table K-10 Logan Airport 2022 Monthly Monitoring Results for Fourth Quarter — North, West, and Maverick Street Stormwater Outfalls

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
004C - Maverick Street Outfall	11/1/2022	Dry Weather	--	--	--	<4.0	12	<1.0	<0.050	30	30	NA
001A - North Outfall	12/7/2022	Wet Weather	4.119	0.374	7.28	<4.0	12	<1.0	0.060	370	1,500	NA
002A - West Outfall	12/7/2022	Wet Weather	14.197	1.303	6.20	<3.6	7.7	<1.0	0.050	400	2,500	NA
004A - Maverick Street Outfall	12/7/2022	Wet Weather	1.043	0.095	6.35	7.6	13	<1.0	0.060	60	80	NA
001C- North Outfall	12/21/2022	Dry Weather	--	--	--	4.0	52	<5.0	0.090	10	<10	NA
002C - West Outfall	12/21/2022	Dry Weather	--	--	--	<4.0	26	<1.0	0.080	<10	<10	NA
004C - Maverick Street Outfall	12/21/2022	Dry Weather	--	--	--	<4.0	40	<1.0	0.060	45	100	NA
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 Monthly		Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled

Table K-11 Logan Airport 2022 Monthly Monitoring Results for Fourth Quarter — Porter Street Stormwater Outfall

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003- Porter Street Outfall 1 (PSO-CB174)	10/24/2022	Wet Weather			7.90	<3.6	9.1	<1.0	0.180	2,800	800
003- Porter Street Outfall 2 (PSO-DMH102)	10/24/2022	Wet Weather			7.58	6.3	<5.0	<1.0	0.070	1,300	2,200
003- Porter Street Outfall 3	10/24/2022	Wet Weather			8.43	<4.0	<5.0	<1.0	0.070	20	670
003- Porter Street Outfall Average		Wet Weather	4.953	0.333	7.97	4.63	6.4	1.0	0.107	418	1,056
003- Porter Street Outfall 1	10/13/2022	Dry Weather	---	---		<4.0	<5.0	<1.0	0.120	40	30
003- Porter Street Outfall 2	10/13/2022	Dry Weather	---	---		<4.0	6.9	<1.0	0.210	150	300
003- Porter Street Outfall 3	10/13/2022	Dry Weather	---	---		<4.0	<5.0	<1.0	0.080	<10	20
003- Porter Street Outfall Average		Dry Weather				4.0	5.6	1.0	0.137	39	56
003- Porter Street Outfall 1	11/16/2022	Wet Weather			7.14	<4.0	31	<1.0	0.120	8,500	6,600
003- Porter Street Outfall 2	11/16/2022	Wet Weather			7.39	<4.0	5.20	<1.0	0.100	890	3,500
003- Porter Street Outfall 3	11/16/2022	Wet Weather			6.94	<4.0	<5.0	<1.0	0.060	180	1500
003- Porter Street Outfall Average		Wet Weather	1.605	0.199	7.16	4.0	13.7	1.0	0.093	1,108	3,260
003- Porter Street Outfall 1	11/01/2022	Dry Weather	---	---		<4.0	18	<1.0	<0.250	360	820
003- Porter Street Outfall 2	11/01/2022	Dry Weather	---	---		<4.0	5.0	<1.0	0.150	<10	4,500

Table K-11 Logan Airport 2022 Monthly Monitoring Results for Fourth Quarter — Porter Street Stormwater Outfall

Outfall	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003- Porter Street Outfall 3	11/01/2022	Dry Weather	---	---		5.8	9.0	<1.0	0.090	110	1,700
003- Porter Street Outfall Average		Dry Weather				4.6	10.7	1.0	0.163	73	1,844
003- Porter Street Outfall 1	12/7/2022	Wet Weather			7.58	5.3	22	<1.0	0.070	2,300	3,800
003- Porter Street Outfall 2	12/7/2022	Wet Weather			7.82	<4.0	<5.0	<1.0	<0.050	100	180
003- Porter Street Outfall 3	12/7/2022	Wet Weather			8.01	<4.0	5.10	<1.0	<0.050	80	2800
003- Porter Street Outfall Average		Wet Weather	2.562	0.294	7.80	4.4	10.7	1.0	0.057	264	1,242
003- Porter Street Outfall 1	12/21/2022	Dry Weather	---	---		7.4	480	<1.0	0.100	<10	50
003- Porter Street Outfall 2	12/21/2022	Dry Weather	---	---		<4.0	<5.0	<1.0	0.050	<10	40
003- Porter Street Outfall 3	12/21/2022	Dry Weather	---	---		<4.0	100.0	<1.0	0.110	<10	60
003- Porter Street Outfall Average		Dry Weather				5.1	195.0	1.0	0.137	10	49
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 Monthly		Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfall 003 by using the SWMM model developed for Logan Airport.
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

NS Not Sampled

Table K-12 Logan Airport 2022 Quarterly Wet Weather Monitoring Results — North, West, Maverick Street, and Porter Street Stormwater Outfalls

Outfall	Date	pH (S.U.)	Benzo(a)-anthracene (µg/L)	Benzo(a)-pyrene (µg/L)	Benzo(b)-fluoranthene (µg/L)	Benzo(k)-fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h,)-anthracene (µg/L)	Indeno (1,2,3-cd)-pyrene (µg/L)	Naphthalene (µg/L)	Total PAHs (µg/L)
001Q - North Outfall	1/17/2022	8.05	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
002Q - West Outfall	1/17/2022	6.57	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
004Q - Maverick Street Outfall	1/17/2022	6.34	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q- Porter Street Outfall 1	1/17/2022	6.88	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q- Porter Street Outfall 2	1/17/2022	7.16	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q- Porter Street Outfall 3	1/17/2022	7.55	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q- Porter Street Outfall Average		7.20	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
001Q - North Outfall	4/6/2022	6.42	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
002Q - West Outfall	4/6/2022	7.40	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
004Q - Maverick Street Outfall	4/6/2022	7.54	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q- Porter Street Outfall 1	4/6/2022	7.67	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q- Porter Street Outfall 2	4/6/2022	8.12	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q- Porter Street Outfall 3	4/6/2022	8.15	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q- Porter Street Outfall Average		7.98	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Table K-12 Logan Airport 2022 Quarterly Wet Weather Monitoring Results — North, West, Maverick Street, and Porter Street Stormwater Outfalls

Outfall	Date	pH (S.U.)	Benzo(a)-anthracene (µg/L)	Benzo(a) -pyrene (µg/L)	Benzo(b)-fluoranthene (µg/L)	Benzo(k)-fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h,)-anthracene (µg/L)	Indeno (1,2,3-cd)-pyrene (µg/L)	Naphthalene (µg/L)	Total PAHs (µg/L)
001Q - North Outfall	8/22/2022	7.82	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
002Q - West Outfall	8/22/2022	6.42	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
004Q - Maverick Street Outfall	8/22/2022	6.84	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q- Porter Street Outfall 1	8/22/2022	7.25	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q- Porter Street Outfall 2	8/22/2022	7.76	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q- Porter Street Outfall 3	8/22/2022	7.53	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q- Porter Street Outfall Average		7.51	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
001Q - North Outfall	11/16/2022	6.95	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
002Q - West Outfall	11/16/2022	7.17	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
004Q - Maverick Street Outfall	11/16/2022	6.28	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q - Porter Street Outfall 1	11/16/2022	7.14	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q - Porter Street Outfall 2	11/16/2022	7.39	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q - Porter Street Outfall 3	11/16/2022	6.95	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	<2.00
003Q - Porter Street Outfall Average		7.16	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Table K-12 Logan Airport 2022 Quarterly Wet Weather Monitoring Results — North, West, Maverick Street, and Porter Street Stormwater Outfalls

Outfall	Date	pH (S.U.)	Benzo(a)-anthracene (µg/L)	Benzo(a) -pyrene (µg/L)	Benzo(b)-fluoranthene (µg/L)	Benzo(k)-fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h,)-anthracene (µg/L)	Indeno (1,2,3-cd)-pyrene (µg/L)	Naphthalene (µg/L)	Total PAHs (µg/L)
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
	Average Monthly	6.0 to 8.5	Report	Report	Report	Report	Report	Report	Report	Report	Report

Source: Massport

Notes: For averaging calculations, a value of zero was employed for those results measures below the laboratory detection limit.

PAHs Polynuclear Aromatic Hydrocarbons

ND Not Detected

NS Not Sampled

Table K-13 Logan Airport 2022 Quarterly Wet Weather Monitoring Results — Northwest and Runway/Perimeter Stormwater Outfalls

Outfall	Date	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (SU)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)
005Q - Northwest Outfall	1/17/2022	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A8)	1/17/2022	0.164	0.019	7.87	<4.0	5.2	<1.0
006Q- Runway/ Perimeter Outfall (A15)	1/17/2022	0.065	0.007	7.62	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A20)	1/17/2022	0.097	0.009	8.17	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A25)	1/17/2022	0.151	0.013	7.22	<4.0	83	<1.0
006Q- Runway/ Perimeter Outfall (A28)	1/17/2022	0.072	0.014	6.95	<4.0	13	<1.0
006Q- Runway/ Perimeter Outfall (A34)	1/17/2022	0.408	0.071	8.07	<4.0	11	<1.0
006Q- Runway/ Perimeter Outfall (A38)	1/17/2022	0.154	0.020	7.73	<4.0	14	<1.0
006Q- Runway/Perimeter Outfall Average		0.159	0.022	7.66	4.0	19.5	1.0
005Q - Northwest Outfall	04/06/2022	0.033	0.236	7.09	<4.0	21	< 1.0
006Q- Runway/ Perimeter Outfall (A8)	04/06/2022	0.025	0.120	7.07	<4.0	5.2	< 1.0
006Q- Runway/ Perimeter Outfall (A15)	04/06/2022	0.010	0.048	7.09	<4.0	33	< 1.0
006Q- Runway/ Perimeter Outfall (A19)	04/06/2022	0.003	0.020	6.93	<4.0	52	< 1.0
006Q- Runway/ Perimeter Outfall (A21)	04/06/2022	0.204	0.880	6.91	<4.0	5.8	< 1.0
006Q- Runway/ Perimeter Outfall (A23)	04/06/2022	0.023	0.116	7.19	<4.0	440	< 1.0
006Q- Runway/ Perimeter Outfall (A34)	04/06/2022	0.087	0.285	7.10	<4.0	14	< 1.0
006Q- Runway/ Perimeter Outfall (A38)	04/06/2022	0.025	0.105	7.20	<4.0	< 5.0	< 1.0
006Q- Runway/Perimeter Outfall Average		0.054	0.225	7.07	4.0	79.3	1.0
005Q - Northwest Outfall	NS	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A8)	NS	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A15)	NS	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A19)	NS	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A21)	NS	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A23)	NS	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A34)	NS	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A38)	NS	NS	NS	NS	NS	NS	NS
006Q- Runway/Perimeter Outfall Average		NS	NS	NS	NS	NS	NS

Table K-13 Logan Airport 2022 Quarterly Wet Weather Monitoring Results — Northwest and Runway/Perimeter Stormwater Outfalls

Outfall	Date	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (SU)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)
005Q - Northwest Outfall	11/16/2022	0.037	0.331	6.64	<4.0	9.4	<1.0
006Q- Runway/ Perimeter Outfall (A9)	11/16/2022	0.021	0.164	6.95	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A15)	11/16/2022	0.007	0.057	6.82	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A19)	11/16/2022	0.003	0.026	6.97	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A21)	11/16/2022	0.109	1.147	7.19	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A23)	11/16/2022	0.017	0.140	7.47	4.5	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A33)	11/16/2022	0.014	0.117	7.96	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A38)	11/16/2022	0.013	0.131	7.18	<4.0	<5.0	<1.0
006Q- Runway/Perimeter Outfall Average		0.026	0.255	7.22	4.1	5.0	1.0
Discharge Limitations		Report	Report	Report	Report	Report	Report

Source: Massport

Notes: For averaging calculations, a value of zero was employed for those results measures below the laboratory detection limit.

Requirements are from NPDES Permit MA 0000787, issued July 31, 2007.

TSS Total Suspended Solids

NS Not Sampled

Table K-14 Logan Airport February 2022 Wet Weather Deicing Monitoring Results — North, West, Porter Street, and Runway/Perimeter Stormwater Outfalls

Outfall	Date	Ethylene Glycol, Total (mg/L)	Propylene Glycol, Total (mg/L)	BOD5 (mg/L)	COD (mg/L)	Ammonia Nitrogen (mg/L)	Nonylphenol (µg/L)	4-Methyl-1-H-benzotriazole (µg/L)	5-Methyl-1-H-benzotriazole (µg/L)	Tolytriazole (µg/L)
001B - North Outfall	1/7/2022	<2.00	4.43	200	240	1.04	<51	NA	NA	NA[6]
002B - West Outfall	1/7/2022	<2.00	245	210	700	0.845	<5.0	NA	NA	<50,000
003B - Porter Street Outfall 1	1/7/2022	<2.00	33.4	150	2,100	1.62	<48	NA	NA	<50,000
003B - Porter Street Outfall 2	1/7/2022	<2.00	4.39	9.8	47	0.097	<5.0	NA	NA	<50,000
003B - Porter Street Outfall 3	1/7/2022	<2.00	<2.00	4.1	27	0.275	<5.0	NA	NA	<50,000
003B - Porter Street Outfall Average		2.00	13	55	725	0.664	19	NA	NA	50,000
006B - Runway/Perimeter (A9)	1/7/2022	NS	NS	NS	NS	NS	NS	NS	NS	NS
006B - Runway/Perimeter (A17)	1/7/2022	NS	NS	NS	NS	NS	NS	NS	NS	NS
006B - Runway/Perimeter (A20)	1/7/2022	NS	NS	NS	NS	NS	NS	NS	NS	NS
006B - Runway/Perimeter (A21)	1/7/2022	NS	NS	NS	NS	NS	NS	NS	NS	NS
006B - Runway/Perimeter (A24)	1/7/2022	NS	NS	NS	NS	NS	NS	NS	NS	NS
006B - Runway/Perimeter (A33)	1/7/2022	NS	NS	NS	NS	NS	NS	NS	NS	NS
006B - Runway/Perimeter (A40)	1/7/2022	NS	NS	NS	NS	NS	NS	NS	NS	NS
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.										
Discharge Limitations	Average Monthly	Report	Report	Report	Report	Report	Report	Report	Report	Report
	Maximum Daily	Report	Report	Report	Report	Report	Report	Report	Report	Report

Source: Massport

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.
Tolytriazole concentrations calculated as sum of 4-Methyly-1-H-benzotriazole and 5-Methyl-1-H-benzotriazole.

BOD5 Five-day Biochemical Oxygen Demand
COD Chemical Oxygen Demand
NA Not Analyzed

Table K-15 Logan Airport Stormwater Outfall NPDES Water Quality Monitoring Results — 1993 to 2022

Year	Oil and Grease (mg/L)			Settable Solids[2] (mg/L)		TSS (mg/L)			pH			
	North Outfall	West Outfall	Maverick Street Outfall	North Outfall	West Outfall	North Outfall	West Outfall	Maverick Street Outfall	North Outfall	West Outfall	Porter Street Outfall	Maverick Street Outfall
# / # = Number of samples at or below NPDES limits / Total number of samples taken[1]												
1993	30/31	29/30	29/29	19/19	19/19	-	-	-	34/35	34/34	35/35	35/35
1994	35/36	36/36	36/36	34/35	32/36	-	-	-	33/36	28/36	30/36	35/36
1995	33/35	34/34	35/35	34/35	34/34	-	-	-	35/35	33/34	34/34	35/35
1996	29/35	36/36	36/36	32/35	35/36	-	-	-	35/35	35/36	36/36	36/36
1997	30/35	34/35	35/35	31/34	34/34	-	-	-	35/35	35/35	35/35	34/35
1998	35/36	36/36	35/36	34/36	35/36	-	-	-	36/36	36/36	36/36	36/36
1999	29/30	30/30	30/30	30/30	29/30	-	-	-	30/30	30/30	30/30	30/30
2000	34/36	35/35	34/34	34/36	36/36	-	-	-	36/36	36/36	36/36	35/35
2001	28/28	27/28	26/28	29/29	27/28	-	-	-	29/29	29/29	28/28	28/28
2002	36/36	36/36	35/36	32/36	36/36	-	-	-	36/36	36/36	36/36	36/36
2003	30/32	31/32	32/32	32/32	31/32	-	-	-	32/32	32/32	32/32	32/32
2004	32/34	33/34	34/34	34/34	34/34	-	-	-	34/34	34/34	34/34	34/34
2005	33/35	35/35	35/35	33/35	32/35	-	-	-	35/35	35/35	35/35	35/35
2006	33/33	32/33	32/33	32/34	33/33	-	-	-	34/34	33/33	33/33	33/33
2007	29/29	28/28	29/29	22/22	22/22	6/6	5/6	4/6	26/26	26/26	22/22	26/26
2008	23/23	22/23	22/23	N/A	N/A	24/24	24/24	22/24	12/12	12/12	21/21	10/10
2009	24/24	24/24	20/21	N/A	N/A	24/24	24/24	20/21	16/16	16/16	48/48	16/16
2010	24/24	24/24	19/19	N/A	N/A	22/23	23/23	18/19	11/11	11/11	24/24	10/10
2011	24/24	22/24	23/23	N/A	N/A	24/24	22/24	20/23	12/12	12/12	23/23	11/11
2012	21/21	21/21	15/15	N/A	N/A	21/21	20/22	14/15	9/9	9/9	26/27	6/6
2013	20/20	21/21	4/4	N/A	N/A	20/21	21/21	4/4	8/8	9/9	24/27	2/2
2014	21/21	21/21	20/20	N/A	N/A	21/21	20/21	19/20	8/8	8/8	24/24	7/7

Table K-15 Logan Airport Stormwater Outfall NPDES Water Quality Monitoring Results — 1993 to 2022

Year	Oil and Grease (mg/L)			Settable Solids[2] (mg/L)		TSS (mg/L)			pH			
	North Outfall	West Outfall	Maverick Street Outfall	North Outfall	West Outfall	North Outfall	West Outfall	Maverick Street Outfall	North Outfall	West Outfall	Porter Street Outfall	Maverick Street Outfall
2015	19/20	19/19	18/18	N/A	N/A	20/20	18/19	18/18	8/8	8/8	19/23	7/7
2016	23/23	23/23	23/23	N/A	N/A	23/23	23/23	22/23	10/11	11/11	33/33	10/11
2017	23/23	22/22	23/23	N/A	N/A	23/23	22/22	23/23	8/8	7/7	33/33	8/8
2018	21/21	20/21	21/21	N/A	N/A	19/21	21/21	19/21	9/9	10/10	27/27	10/10
2019	21/21	19/20	21/21	N/A	N/A	21/21	20/21	21/21	9/9	10/10	28/28	10/10
2020	12/12	12/12	12/12	N/A	N/A	12/12	12/12	12/12	4/4	4/4	12/12	4/4
2021	23/23	23/23	23/23	N/A	N/A	22/23	22/23	22/23	11/11	11/11	31/31	11/11
2022	21/21	21/21	21/21	N/A	N/A	21/21	20/21	21/21	9/9	9/9	26/27	9/9

Source: Massport

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.

N/A Not Analyzed

1 The total number of samples at each outfall varies year to year. In some years, fewer samples are taken due to factors such as construction, weather, and/or tidal conditions.

2 Settleable solids analyses were replaced with TSS in 2008.

Table K-16 Logan Airport Oil and Hazardous Material Spills1 and Jet Fuel Handling — 1990 to 2022

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	N/A	N/A	438,100,000	3,745
1991	186	N/A	N/A	N/A	2,471
1992	195	N/A	N/A	N/A	4,355
1993	188	N/A	N/A	451,900,000	3,131
1994	217	N/A	N/A	476,700,000	4,046
1995	161	N/A	N/A	309,200,000	21,4122
1996	159	N/A	N/A	346,700,000	1,321
1997	147	N/A	N/A	377,488,161	2,0293
1998	191	N/A	N/A	387,224,004	10,0474
1999	196	43	7,151	425,937,051	7,0125
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	10,1886
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

Table K-16 Logan Airport Oil and Hazardous Material Spills1 and Jet Fuel Handling — 1990 to 2022

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)
2011	108	12	572	340,421,373	337
2012	132	5	593	343,731,127	439
2013	94	6	452	349,397,940	351
2014	129	17	2,785	370,222,342	785
2015	196	16	1,278	374,985,216	885
2016	231	14	1,158	456,003,328	558
2017	176	8	2,3107	472,229,047	315
2018	189	8	7,660	521,056,895	7,383
2019	152	22	799	542,314,657	514
2020	67	4	352	220,004,260	179
2021	152	4	787	302,650,342	514
2022	119	3	303	443,381,606	200

Source: Massport Fire-Rescue Department.

Notes:

N/A 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 2018 fuel spilled includes 7,000 gallons of jet fuel released during a construction related incident involving a fuel hydrant installation project.

6 In 2003, one fuel spill comprised 9,460 gallons or 94 percent of the total volume of the MassDEP/MCP reportable spills that year. The fuel spill was contained and did not enter the drainage system.

7 2017 total volume spilled includes 1,750 gallons of deicing fluid

K.2 Oil and Hazardous Materials Spills

Table K-17 Type and Quantity of Oil and Hazardous Material Spills at Logan Airport — 1999 to 2022

Year	Jet Fuel			Hydraulic Oil			Diesel Fuel			Gasoline			Other		
	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	18	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
2011	69	337	10	21	149	1	7	55	1	4	16	0	7	15	0
2012	80	439	4	25	79	1	17	38	0	2	12	0	8	25	0
2013	56	351	5	15	51	0	13	32	0	2	<2	0	7	10	0
2014	81	785	13	24	98	1	17	1,810	2	4	9	0	3	83	1
2015	110	885	10	43	149	3	16	151	2	7	46	1	20	47	0
2016	94	558	8	73	224	4	30	300	2	6	12	0	28	64	0
2017	103	315	5	36	101	1	13	59	2	4	14	0	20	1,821[7]	0
2018	111	7,383[8]	6	39	93	0	14	127	2	2	5	0	23	52	0
2019	77	514	17	41	156	3	13	57	1	9	41	1	12	31	0

Table K-17 Type and Quantity of Oil and Hazardous Material Spills at Logan Airport — 1999 to 2022

Year	Jet Fuel			Hydraulic Oil			Diesel Fuel			Gasoline			Other		
	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
2020	35	179	3	13	66	1	9	34	0	4	25	0	6	48[9]	0
2021	77	514	3	18	35	1	13	48	0	9	41	0	35	149	0
2022	57	200	3	23	39	0	6	19	0	20	22	0	13	12	0

Source: Massport

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).

7 Includes 1,750 gallons of deicing fluid (vehicle accident).

8 7,000 gallons of jet fuel were released during a construction related incident involving a fuel hydrant installation project.

9 Includes one spill of AvGas (2 gallons); two spills of motor oil (2 gallons); one spill not otherwise specified (two gallons); one spill of deicing fluid (40 gallons); one spill of transmission fluid (3 gallons).

K.3 Massachusetts Contingency Plan Active Sites

Table K-18 Status of Massachusetts Contingency Plan (MCP) Active Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
1. Fuel Distribution System (FDS) RTN: 3-1287 - OPEN	
2011	A Periodic Review of the Temporary Solution for the FDS was submitted in April 2011. Three Post-Class C Response Action Outcome (RAO) Status Reports were submitted for the FDS in February, June, and December 2011, summarizing the routine inspection and monitoring activities.
2012	Post-Class C RAO Status Reports were submitted in May and November 2012, summarizing the routine inspection and monitoring activities.
2013	Post-Class C RAO Status Reports were submitted in May and November 2013, summarizing the routine inspection and monitoring activities.
2014	Post-Class C RAO Status Reports were submitted in May and November 2014, summarizing the routine inspection and monitoring activities. In addition, a Release Abatement Measure (RAM) Plan was submitted in April 2014 to address construction in the area of the FDS followed by a RAM Completion Report submitted in August 2014.
2015	Post-Temporary Solution Status Reports were submitted in May and November 2015, summarizing the routine inspection and monitoring activities.
2016	RAO-C 5-year periodic review submitted in July 2016. Two Post-Temporary Solution Status Reports were submitted in 2016 summarizing the routine inspection, monitoring, and product recovery activities.
2017	Tier II Extension transmitted in August 2017 for response actions conducted at Terminal B subsequent to filing a Temporary Solution. A Final Permanent Solution Statement was submitted for Areas 3 and 5 in December 2017.
2018	A Post-temporary Solution Status Report submitted in February, 2018; a RAM Plan submitted for Terminal C in February 2018; RAO-C Inspection Report Submitted March, 2018; a RAM Plan Modification #2 submitted for Terminal B; a RAM Status Report submitted for Terminal C; Final RAM Status Report submitted in July, 2018; Post temporary Solution Status Report submitted in July, 2018; and a RAM Plan Modification #1 for Terminal C submitted in December, 2018.
2019	A Post-temporary Solution Status Report submitted in January, 2019; Terminal B RAM Status Report submitted in January, 2019; a RAM Completion Report submitted for Terminal B Pier B in August, 2019; a Terminal C Pier B RAM Completion Report submitted in September, 2019; and a RAM Plan for the Terminal B-C Connector Project was submitted in November, 2019.
2020	RAM Plan Status Report #1 for the Terminal B-C Connector Project was submitted in March 2020; RAM Plan Status Report #2 for the Terminal B-C Connector Project was submitted in September 2020.
2021	RAM Plan Status Report #3 for the Terminal B-C Connector Project was submitted in March 2021; RAM Plan Status Report #4 for the Terminal B-C Connector Project was submitted in September 2021.

Table K-18 Status of Massachusetts Contingency Plan (MCP) Active Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
2022	RAM Plan Status Report for the B to C Connector was submitted in March 2022 and the RAM Completion Report was submitted in December 2022.
2. Fire Training Facility RTN: 3-28199 – OPEN	
2011	A RAM Completion Statement was submitted on April 25, 2011. A Phase II Scope of Work was prepared and submitted to MassDEP on January 18, 2011. Phase II and Phase III Reports were submitted on December 8, 2011. A RAM Completion Statement was submitted on April 25, 2011.
2012	Phase IV Status Report transmitted in June 2012; the Phase IV Remedy Implementation Plan was submitted in December 2012.
2013	Phase IV Status Report transmitted in June 2013; the Phase IV Completion Report was transmitted in December 2013.
2014	Phase V Remedy Operation Status Reports submitted in June and December 2014.
2015	Phase V Remedy Operation Status Reports submitted in June and December 2015.
2016	Phase V Remedy Operation Status Reports submitted in June and December 2016.
2017	Phase V Remedy Operation Status Reports submitted in June and December 2017.
2018	Phase V Remedy Operation Status Reports submitted in June and December 2018.
2019	Phase V Remedy Operation Status Reports submitted in June and December 2019.
2020	Phase V Remedy Operation Status Reports submitted in June and December 2020.
2021	Phase V Remedy Operation Status Reports submitted in June and December 2021.
2022	Phase V Remedy Operation Status Reports submitted in June and December 2022.
3. Former American Airlines – North Cargo RTN: 3-35030 - OPEN	
2018	Release Notification made on June 29, 2018 due to presence of Non-Aqueous Petroleum Liquid in a monitoring well at a thickness not consistent with the previously submitted Response Action Outcome. Immediate Response Action (IRA) Plan submitted in August 2018; IRA Status Report submitted December 2018.
2019	Phase I and Tier Classification submitted in July 2019 A RAM Plan submitted in August 2019; a RAM Plan Status Report No. 1 was submitted in December 2019. Construction is ongoing with the Terminal E Modernization Project and subsequent reports will be filed.
2020	RAM Plan Status Report No. 2 was submitted in June 2020. RAM Plan Status Report No. 3 was submitted in December 2020.
2021	RAM Plan Status Report No. 4 was submitted in June 2021. RAM Plan Status Report No. 5 was submitted in December 2021.
2022	RAM Status Report No. 6 was submitted in June 2022. Phase II Comprehensive Site Assessment was submitted in July 2022. RAM Status Report No. 7 was submitted in December 2022.

Table K-18 Status of Massachusetts Contingency Plan (MCP) Active Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
4. Terminal B Gate 5 (formerly Gate 7) RTN: 3-35047 - OPEN	
2018	Release Notification in July 2018 regarding a release of jet fuel from a hydrant line during the Terminal B Optimization construction project; an IRA Plan was submitted in September 2018; and an IRA Status Report was submitted in November 2018;
2019	A final IRA Status Report was submitted in May 2019; a Phase I, Tier Classification and a Conceptual Phase II Scope of Work were submitted in July 2019, and an IRA Completion Report was submitted in November 2019.
2020	Preparation for a Phase II Comprehensive Site Assessment is underway for submission in July 2022.
2022	Phase II Comprehensive Site Assessment submitted in July 2022.
5. Former Building 6 (RTN 3-37749) - OPEN	
2022	In October 2022 a Release Notification Form was filed for this release site due to the discovery of PCBs in soil. The site is being developed for the construction of an additional fuel tank at the fuel farm facility. Excavation and management of PCB-impacted soil along with site investigations under the MCP are ongoing.

Source: Massport.

Notes: RTN = Release Tracking Number. This list includes active Massport MCP sites only. Additional sites are the responsibility of Logan Airport tenants. Refer to Figure 8-2 for location of active MCP sites. Complete information dating back to 1997 on closed sites is included in Appendix J, Environmental Compliance and Management/Water Quality.

Phase I Initial Site Investigation

Phase II Comprehensive Site Assessment

Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Actions

Phase IV Implementation of Selected Remediation Action

Phase V Operation, Maintenance, and/or Monitoring

K.4 Massachusetts Contingency Plan Closed Sites

Table K-19 Massport Contingency Plan (MCP) Closed Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
1. North Outfall (3-4837) – CLOSED 12/27/2012	
Phase II and Phase III Reports filed in March 1997	Indicated petroleum contamination present at the site was likely the result of decades of airport operation; risk assessment reported no significant risk to human health, or to the aquatic and avian community.
RAO submitted in March 1998	Class C RAO using a Temporary Solution (periodic site monitoring and assessment); remediation steps included (not limited to) installation of a new fuel distribution system and decommissioning of certain fuel lines, and natural biodegradation processes; goal is to have petroleum contamination reduced to an area less than 1,000 square feet. Installation of the new fuel distribution system and decommissioning of sections of the old system were completed. Massport initiated site evaluation to document the reduction of petroleum contamination following the decommissioning of the North Fuel Farm and fuel distribution system.
Post Class C RAO evaluation report submitted in December 2002	Massport has eliminated substantial hazards at this site and submitted a Class C RAO statement. In accordance with applicable regulations, Massport will conduct a periodic evaluation at five-year intervals until a Permanent Solution has been achieved. The next periodic evaluation was scheduled for 2007.
2004	Evaluation report indicated that a "Condition of No Significant Risk" has not been achieved at this site. Massport scheduled another assessment in 2007.
2005	No change in status for 2005.
2006	Massport prepared the five-year review of the Class C RAO for this site, which was due in December 2007.
2007	Massport completed its five-year review of the Class C RAO and transmitted it to MassDEP in December 2007. It was determined that a "Condition of No Significant Risk" has not been achieved at this site at this time. The next five-year re-evaluation will be conducted in 2012.
2008	No change in status.
2009	No change in status.
2010	No change in status.
2011	No change in status. Massport provided updated data for the MassDEP website.
2012	Response Action Outcome submitted to MassDEP on December 27, 2012. No further MCP response action is required.
2. Former Robie Park (3-10027) - CLOSED 09/21/2016	
2005	A Phase I was completed in 2005 with a 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.

Table K-19 Massport Contingency Plan (MCP) Closed Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
2009	A Phase V Remedy Operation Status Plan was submitted on March 31, 2010.
2010	Two Remedy Operation Status Reports were submitted on September 29, 2010 and March 28, 2011. The next status report was scheduled for September 30, 2011.
2011	Phase IV Project Status Reports 2 and 3 were submitted in March and September 2011, respectively.
2012	Phase V Status Reports 4 and 5 were submitted in March and September 2012, respectively.
2013	Phase V Status Reports 6 and 7 were submitted in March and September 2013, respectively.
2014	Phase V Status Reports 8 and 9 were submitted in March and September 2014, respectively.
2015	Phase V Reports 10 and 11 were submitted in March and September 2015, respectively.
2016	A Permanent Solution Statement was submitted in 2016.
3. Former Robie Property (3-23493) - CLOSED 01/04/2010	
2005	A Phase I was completed in 2005.
2006	No change in status for 2006.
2007	No change in status for 2007.
2008	A Phase II was submitted to MassDEP on October 21, 2008.
2009	An Activity and Use Limitation (AUL) was recorded with the Suffolk County Registry of Deeds for the site on December 16, 2009.
2010	A Class A-3 RAO was submitted on January 4, 2010, corresponding with the recording of an AUL. On May 21, 2010, a RAM Plan for the Economy Parking Structure was submitted. The first RAM Status Report was submitted on September 21, 2010. An AUL Amendment was recorded on December 9, 2010.
2011	A RAM Completion Statement was submitted on March 15, 2011. Regulatory closure has been achieved. No further response actions are required.
4. Tomahawk Drive (3-27068) - CLOSED 08/20/2008	
2007	Release notification form submitted in August 2007.
2008	A Class B-1 RAO was submitted to MassDEP on January 9, 2009. No further response actions were required.
2009	No further response actions were required.
2011	No further response actions required.

Table K-19 Massport Contingency Plan (MCP) Closed Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
5. Southwest Service Area Overflow Lot/Tomahawk Drive (3-28792) – CLOSED 10/18/2018	
2009	Release notification form was submitted to MassDEP/BWSC on October 8, 2009.
2010	A Class B-1 RAO was submitted to MassDEP on October 18, 2010. No further response actions required.
2011	No further response actions required.
6. Taxiway D (3-29716) – CLOSED 12/21/2011	
2010	Release notification form was submitted on December 22, 2010.
2011	A Class A-1 RAO was submitted on December 23, 2011. No further response actions required.
7. West Outfall Release (3-29792) – CLOSED 02/07/2012	
2011	Release notification form was submitted on April 8, 2011. Two IRA Status Reports were submitted to MassDEP on June 9 and December 5, 2011. A RAO was submitted on February 13, 2012. No further response actions required.
8. Hertz Parking Lot Site (3-30260) – CLOSED 09/05/2012	
2011	Release notification form was submitted on August 29, 2011. A RAM Plan was submitted to MassDEP on September 1, 2011.
2012	A Class A-2 RAO was submitted on September 10, 2012. No Further response actions required.
9. Former Butler Aviation Hangar (3-30654) – CLOSED 11/12/2014	
2012	Verbal notification of a release was provided to MassDEP on February 14, 2012, when Rental Car Center construction encountered an unidentified underground storage, and a Release Notification Form was submitted on April 23, 2012. An IRA Plan was submitted May 21, 2012 and IRA Status Reports were submitted on June 18 and December 26, 2012.
2013	Phase I Report and Tier Classification submitted February 21, 2013 and IRA Completion Report submitted on July 11, 2013.
2014	A Permanent Solution Statement was submitted in October 2014. No further response actions required.
10. Southwest Service Area/Porter Street @ Harborside Drive (3-32022) – CLOSED 11/20/2017	
2014	MassDEP notified of 72-hour Reportable Condition on March 10, 2014
2015	Phase I Report and Tier Classification submitted March 9, 2015.
2016	Permanent Solution Statement scheduled to be submitted in 2017
2017	A Permanent Solution Statement and AUL were submitted November 2017.

Table K-19 Massport Contingency Plan (MCP) Closed Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
11. Former Hangar Building 16 (3-32351) – CLOSED 01/21/2016	
2014	Release Notification Form Submitted August 4, 2014.
2015	A RAM Plan was submitted on January 29, 2015; a Phase I Report and Tier Classification were submitted on August 3, 2015; a RAM Completion Report was submitted November 16, 2015.
2016	A Permanent Solution Statement was submitted on January 21, 2016. No further response actions are required.
12. Terminal B Gate 29 RTN (3-35608) – CLOSED 05/07/2020	
2019	Release Notification in May 2019 due to elevated vapors during removal of an underground storage tank; IRA Plan submitted in July 2019; IRA Status Report submitted in September 2019.
2020	A Permanent Solution Statement was submitted in May 2020 so the site is now closed.

Source: Massport

Notes: RTN = Release Tracking Number. This list includes Massport MCP sites only. Additional sites are the responsibility of Logan Airport tenants. Refer to Figure J-1 in Chapter 9, *Environmental Compliance and Management/Water Quality,* for location of closed MCP sites.

AUL Activity and Use Limitation
FDS Fuel Distribution System
IRA Immediate Response Action
MCP Massachusetts Contingency Plan
Phase I Initial Site Investigation
Phase II Comprehensive Site Assessment
Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Actions
Phase IV Implementation of Selected Remediation Action
Phase V Operation, Maintenance and/or Monitoring
RAM Release Abatement Measure
RAO Response Action Outcome

Figure K-1 Massachusetts Contingency Plan Sites (Closed)

2022 Environmental Status and Planning Report

1. North Outfall (3-4837)
2. Former Robie Park (3-10027)
3. Former Robie Property (3-23493)
4. Tomahawk Drive (3-27068)
5. Southwest Service Area Overflow (3-28792)
6. Taxiway D (3-29716)
7. West Outfall Release (3-29792)
8. Hertz Parking Lot Site (3-30260)
9. Former Butler Aviation Hangar (3-30654)
10. Southwest Service Area/Porter Street at Harborside Drive (3-32022)
11. Former Hangar Building 16 (3-32351)
12. Terminal B Gate 29 (3-35608)

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