2020 Noise Exposure Map

Boston Logan International Airport

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The objective of airport noise compatibility planning is to promote the compatible growth and development of airports with their surrounding communities. Federal Aviation Administration (FAA) Part 150 regulations (FAR Part 150[1]), first implemented in February 1981, define 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 Day-Night Average Sound Level (DNL)[2] 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. The FAA generally considers all land uses below DNL 65 dB as compatible with aircraft noise.

Noise abatement or mitigation measures that an airport operator must consider in a Part 150 study include acquisition of noncompatible 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 many of Logan Airport's program elements, while regularly reviewed and updated, preceded the promulgation of Part 150.

Massport has been conducting a Residential Sound Insulation Program (RSIP) around Logan Airport since 1983. This document is submitted to the FAA in support of the current RSIP objectives.

The purposes for which this Noise Exposure Map (NEM) is prepared are:

- to provide an updated set of Day-Night Average Sound Level (DNL) contours for the RSIP;
- to protect the long-term economic viability of Logan Airport by ensuring compatible land uses in the vicinity of the airport to the extent that lands in the airport area are not already devoted to noncompatible uses;
- to promote the safety and well-being of the public by encouraging local agencies responsible for land use controls to adopt land use regulations which minimize exposure of persons to potential hazards associated with the operation of the Airport; and
- to provide documentation of Massport's efforts to reduce noncompatible land use.

1.1 Geographic Coverage

The geographic area encompassed by the NEM is termed the Airport Land Use Planning Area (Planning Area). Consistent with Part 150 requirements, the Planning Area is defined as being within at least 30,000 feet from each runway end, or about five miles from the airport. **Figure 1-1** displays the land

1 14 CFR Part 150, "Airport Noise Compatibility Planning."

2 The DNL is a measure of the cumulative noise exposure over a 24-hour day. It is the 24-hour, logarithmic (or energy) average. DNL treats nighttime noise differently than daytime noise; for the A-weighted sound pressure levels occurring at night (between 10:00 PM and 7:00 AM), a 10-dB weighting is applied to the nighttime event to reflect the greater sensitivity to nighttime sound. DNL is the FAA-defined metric for evaluating noise and land use compatibility.

use map for the area surrounding Logan Airport based on 2016 data[3]. The circular region indicated by the dashed line is the Planning Area.

The FAA has published land-use compatibility guidelines, as set forth in Part 150, Appendix A, Table 1, which is reproduced as **Table 1-1** of this document. As the table indicates, the FAA considers all land uses to be compatible with aircraft-related DNL levels below 65 dB, including residential, hotels, retirement homes, intermediate care facilities, hospitals, nursing homes, schools, preschools, and libraries.

Land use compatibility and noise impacts were evaluated based on the land use information surrounding Logan Airport. This chapter provides an overview of municipal jurisdictions with authority to regulate land use in the vicinity of Logan Airport, a description of recommended land uses that are deemed generally compatible under Part 150, Appendix A, and an overview of existing land uses in the vicinity of the airport.

The Planning Area includes all of Winthrop, Revere, Chelsea, Everett, Malden, and most of the Cities of Boston, Cambridge, and Somerville. The area also includes portions of Nahant, Lynn, Saugus, Medford, Melrose, Brookline, Quincy and Hull. As shown in **Figure 1-1**, Logan Airport is located between the City of Boston and Winthrop, and is closely surrounded by residential, commercial and industrial land uses. The majority of the land use on the east side of Logan Airport in Winthrop is residential. Much of the area just north of the airport in East Boston and Revere is residential and the area of East Boston just west of the airport is primarily residential. Just south of the airport is South Boston which consists of commercial and industrial land uses in the closest vicinity to the airport with a large area of residential land use immediately south of the commercial and industrial area.

3 2016 is the latest land use data available for the planning area.

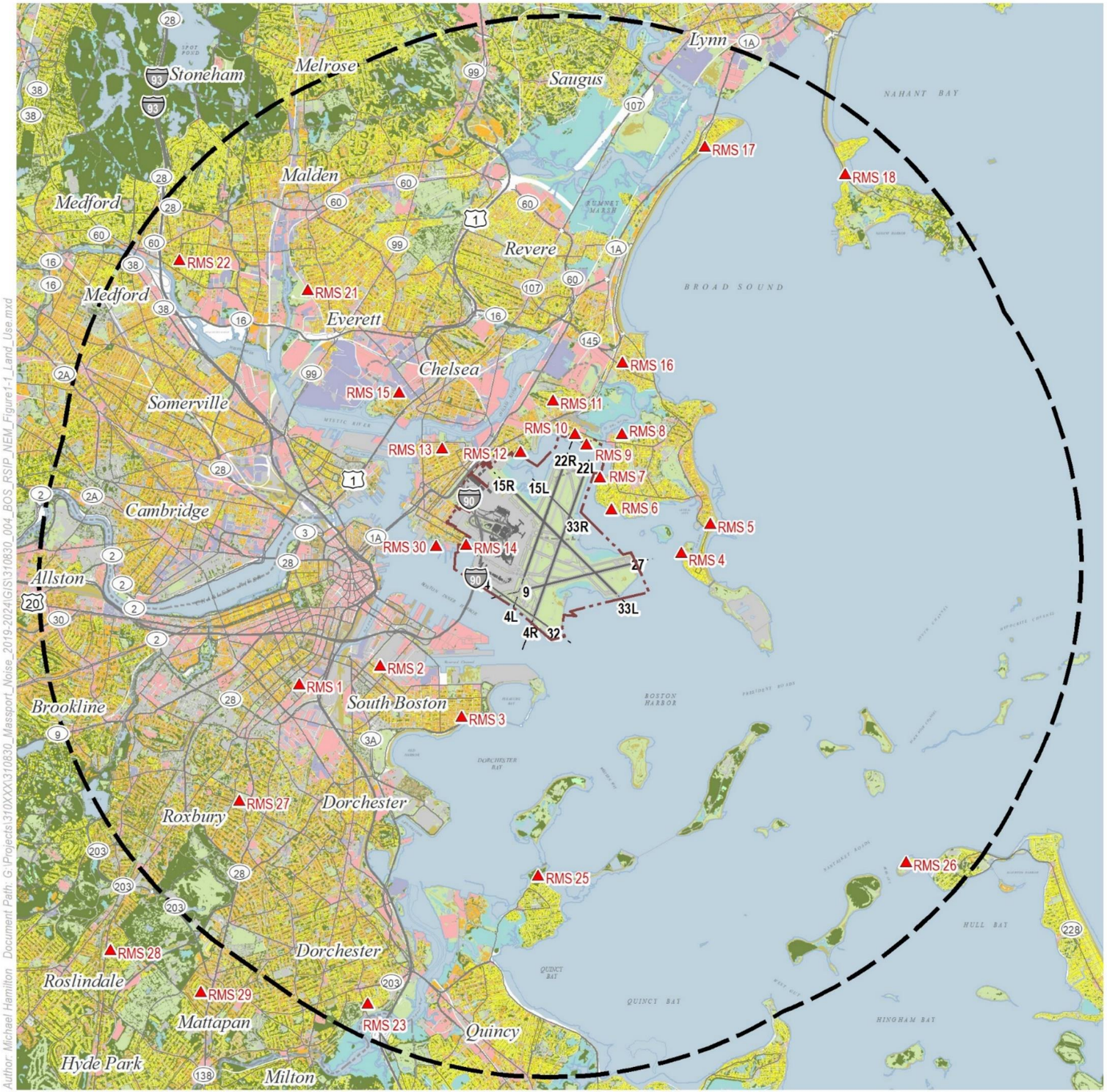

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Figure **1-1**

Land Use within Planning Area (Based on 2016 Data)

- Area within 30,000' BOS Runways
- BOS Airport Boundary
- Runways
- Permanent Noise Monitor

Residential - Single Family	Right-of-way
Residential - Multi-Family	Agriculture
Residential - Other	Open Space
Commercial	Forest
Industrial	Bare Land
Mixed Use	Wetland
Other Impervious	Water

North

0 5,000 10,000 Ft

Source: Harris Miller Miller & Hanson Inc. 2018, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP), 2018; MassGIS

Author: Michael Hamilton Document Path: G:\Projects\310XXX\310830_Massport_Noise_2019-2024\GIS\310830_004_BOS_RSIP_NEM_Figure1-1_Land_Use.mxd

Table 1-1 Part 150 Airport Noise / Land Use Compatibility Guidelines

Land Use	Yearly Day-Night Average Sound Level, DNL, in Decibels (Key and notes on following page)					
	<65	65-70	70-75	75-80	80-85	>85
Residential Use						
Residential other than mobile homes and transient	Y	N(1)	N(1)	N	N	N
Mobile home park	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail--building materials, hardware and	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade--general	Y	Y	Y(2)	Y(3)	Y(4)	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Source: Part 150, Appendix A, Table 1
Numbers in parentheses refer to the notes on the next page.

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

Key to Table 1-1

SLUCM: Standard Land Use Coding Manual.

Y(Yes): Land use and related structures compatible without restrictions.

N(No): Land use and related structures are not compatible and should be prohibited.

NLR: Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35: Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dBA must be incorporated into design and construction of structure.

Notes for Table 1-1

1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dBA and 30 dBA should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dBA, thus, the reduction requirements are often started as 5, 10, or 15 dBA over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
2) Measures to achieve NLR of 25 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
3) Measures to achieve NLR of 30 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
4) Measures to achieve NLR of 35 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
5) Land use compatible provided special sound reinforcement systems are installed.
6) Residential buildings require an NLR of 25.
7) Residential buildings require an NLR of 30
8) Residential buildings not permitted

1.2 Day-Night Average Sound Level Contours for 2020

This section describes the results of noise modeling using the FAA Aviation Environmental Design Tool (AEDT) for the 2020 DNL contours. Chapter 2 details the AEDT inputs and assumptions. The DNL contours are presented graphically, the dwelling units and population living within contour intervals are tabulated, and other noise-sensitive land uses within the contours are identified. DNL 65 dB is the focus of much of the noise analysis, as it is the threshold for noise incompatibility with residential land use,[4,5] for both FAA and the U.S. Department of Housing and Urban Development.

The 2020 DNL contours were prepared using the most recent version of FAA's AEDT model at the time of the start of the modeling process, version 3d. **Figure 1-2** shows the DNL 65 to 75 dB contours, in 5-decibel increments, overlaid on the land use base map.

The only residential land uses within the 2020 DNL 65 dB contour are in Winthrop (Point Shirley), Revere and East Boston (Orient Heights). All of the residential areas within the 2020 DNL 65 dB contour have been previously eligible as part of the Massport RSIP. Historically, Massport has reached out to property owners that are still eligible but have not participated in the program.

1.3 Airport Compatible Land Use

Airport compatible land uses can be defined as "those uses that can co-exist with an airport without constraining the safe and efficient operation of the airport or exposing people living or working nearby to unacceptable levels of noise or hazards." This definition is intentionally broad since there are many variables that must be considered when deciding whether a given land use is compatible with in an airport operational environment. For example, variables that can influence the compatibility of a given land use include how the land is managed; the location of the land relative to the airport and its runways; the attributes of the land use; and the potential ancillary impacts associated with the land uses. Consequently, it is reasonable to infer that airport land use compatibility is highly fluid and very dependent on the individual circumstances present in any given environment. However, two general questions guide the identification and assessment of the degree of compatibility between the airport and the surrounding land uses:

- What conditions are required for the airport to operate safely and efficiently? (Conversely, what land use characteristics can adversely affect airport operations?)
- What airport attributes could potentially compromise the safety and well-being of people living or working in neighborhoods surrounding the airport?

These two questions form the foundation of any evaluation of land use compatibility near airports. At the local level, answers to these questions should guide the development and implementation of compatible land use planning tools and techniques to promote both the safety of aircraft operations and the well-being of persons on the ground near an airport.

At the federal level, the FAA encourages and promotes compatible land use planning through direct guidance and multiple support programs. However, the FAA by itself cannot specifically mandate appropriate land use around airports as land use designations and controls are determined at the local level. Several of the most important airport-related regulations and design requirements produced by the FAA and other federal agencies that affect airport land use compatibility include the following:

4 14 Code of Federal Regulations Part 150, Appendix A to Part 150 Noise Exposure Maps, Sec. A150.101(d)).

5 24 Code of Federal Regulations Part 51, Subpart B Noise Abatement and Control, Sec. 51.103(c)).

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Figure **1-2**

2020 RSIP DNL Contours

2020 DNL 65 Contour
2020 DNL 70 Contour
2020 DNL 75 Contour

BOS Airport Boundary
Runways
Permanent Noise Monitor

Residential - Single Family
Residential - Multi-Family
Residential - Other
Commercial
Industrial
Mixed Use
Other Impervious
Right-of-way
Agriculture
Open Space
Forest
Bare Land
Wetland
Water

North

0 5,000 10,000 Ft

Source: Harris Miller Miller & Hanson Inc. 2018, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP), 2018; MassGIS

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- The FAA Advisory Circular 150-5300-13A, Airport Design, defines setback requirements and Runway Protection Zones (RPZ).
- The FAA Advisory Circular 150-5070-6, Airport Master Plans, defines guidelines in preparing an airport master plan, including land use planning.
- The Aviation Safety and Noise Abatement Act (ASNA) of 1979 requires establishment of a single noise metric system to measure cumulative aircraft noise exposure and identification of compatible land uses.
- The Federal Aviation Regulation Part 150 Noise Compatibility Program is the primary federal regulation regarding noise related land use compatibility on and around airports.
- The Airport and Airway Improvement Act of 1982 is the funding mechanism utilized by the FAA for improvement projects and which requires grant recipients to meet grant assurances.
- The Airport Noise and Capacity Act (ANCA) of 1990 established the national aviation- related noise policy.
- The National Environmental Policy Act (NEPA) of 1969 has a variety of environmental implications related to airport land use and noise compatibility.

The preservation of airports from the encroachment of noncompatible land uses must be a priority for airports and surrounding communities. In order to ensure the success of land use compatibility planning, it is critical that airports and local communities take active roles to develop, implement, and maintain land use compatibility programs at their airports. More than ever, it is imperative that a cooperative approach to airport land use compatibility planning be embraced. For that reason, the FAA actively encourages airport owners, state aviation officials, and local jurisdictions to work together to develop compatible land uses around airports to protect these important transportation and economic assets.

1.4 Land Use within 2020 Day-Night Average Noise Contours

The 2020 DNL 65 dB contour encompasses much of the airport property and an additional 1.2 square miles of area, over 87 percent of which is water, shore, or wetlands. **Table 1-2** lists the off-airport area within the contours by land use classification, broken down by contour intervals.

Table 1-2: Land Use Area Contained within the 2020 DNL 65 dB Contour

Land Use (Off Airport Property)	65-70 dB DNL Area (SqMi)	70-75 dB DNL Area (SqMi)	>75 dB DNL Area (SqMi)
Residential - Multi-Family	0.010	-	-
Residential - Single Family	0.006	-	-
Mixed Use - Primarily Residential	0.000	-	-
Commercial/Industrial	0.003	-	-
Transportation	0.065	0.005	-
Water/Wetlands	1.008	0.060	0.004
Undeveloped/Open Space	0.060	-	-
TOTAL	**1.152**	**0.065**	**0.004**

Source: HMMH, 2021

In the annual EDR/ESPR documentation, Massport reports population counts within selected 5 dB increments of airport noise exposure each year. The newly released 2020 U.S. Census data[6] forms the basis of the population counts for the 2020 DNL contours.

In recent years, the method of calculating population impact has been adapted to GIS software. The DNL contours and U.S. Census block centroids and population data are imported into GIS. Then, for each census block, the process determines the fraction of the area of the block that is residential land use and that is within the contour. That fraction is then applied to the census block population and dwelling units counts. **Table 1-3** shows the total number of dwelling units and people estimated from 2020 U.S. Census data as residing within the 2020 DNL 65 dB contour, listed by community and by 5-decibel increments.

Table 1-3: Noise-Exposed Dwelling Units and Population within the 2020 DNL 65 dB Contour

Dwelling Units	> 75 DNL	70-75 DNL	65[1]-70 DNL	Total (65+)[1] DNL
Boston	0	0	21	**21**
Chelsea	0	0	0	**0**
Everett	0	0	0	**0**
Revere	0	0	252	**252**
Winthrop	0	0	40	**40**
Total (All communities)	**0**	**0**	**313**	**313**
Population	**> 75 DNL**	**70-75 DNL**	**65[1]-70 DNL**	**Total (65+)[1] DNL**
Boston	0	0	60	**60**
Chelsea	0	0	0	**0**
Everett	0	0	0	**0**
Revere	0	0	641	**641**
Winthrop	0	0	103	**103**
Total (All communities)	**0**	**0**	**804**	**804**

Source: HMMH, 2021.

Notes: Population counts use the 2020 U.S. Census block data, merged with 2016 Residential Land Use.
2020 noise analysis uses AEDT version 3d.

1 Day-Night Average Sound Level (DNL) 65 decibel (dB) is the federally-defined noise criterion used as a guideline to identify where residential land use is considered noncompatible with aircraft noise.

Where the computer-generated noise contours cut through residential land use areas, Massport applies a "humanization" process[7] in the implementation of its soundproofing program, drawing the eligibility line beyond the contour extents slightly where the contour passes through property boundaries. The goal is to encompass, where practicable, connected neighborhood blocks, rather than dividing a block. **Figure 1-3** shows the 2020 DNL 65 dB contour with the humanization adjustments. **Figure 1-4** presents enlargements of the individual areas where the contour intersects residential land use.

6 accessed 10/6/2021 from https://services.arcgis.com/P3ePLMYs2RVChkJx/arcgis/rest/services/USA_Census_2020_Redistricting_Blocks/FeatureServer

7 Following guidance in FAA Airport Improvement Program Appendix R Section R-9 Block Rounding

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Figure **1-3**

2020 RSIP DNL 65 Humanized Contour

- 2020 RSIP Humanized Contour Line
- 2020 RSIP Forecast Contour Line
- BOS Airport Boundary
- Runways
- Permanent Noise Monitor

Residential - Single Family	Right-of-way
Residential - Multi-Family	Agriculture
Residential - Other	Open Space
Commercial	Forest
Industrial	Bare Land
Mixed Use	Wetland
Other Impervious	Water

North

0 5,000 10,000 Ft

Source: Harris Miller Miller & Hanson Inc. 2018, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP), 2018; MassGIS

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Figure **1-4**

2020 RSIP DNL 65 Humanized Contour Over Residential Areas

- 2020 RSIP Humanized Contour Line
- 2020 RSIP Forecast Contour Line
- BOS Airport Boundary
- Runways
- Permanent Noise Monitor
- Sound Insulation Areas
- Parcel Boundary

North

0 1,000 2,000 Ft

Source: Harris Miller Miller & Hanson Inc. 2018, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP), 2018; MassGIS

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The humanization process adds approximately 456 more people in 179 more dwelling units[8] to the region enclosed by the 65 DNL contour. **Table 1-4** lists the dwelling unit and population counts by community, noting the difference made by expanding the eligibility line. The majority of those homes have already been soundproofed. Massport will use RSIP records to produce an estimate of the properties currently eligible for participation in the program. Field verification of the individual neighborhoods is required in order to determine an accurate count of the number of dwelling units within the 65 DNL line that have not been sound-insulated.

Table 1-4: Noise-Exposed Dwelling Units and Population within the Humanized 2020 DNL 65 dB Contour

Dwelling Units	70-75 DNL	65[1]-70 DNL	Total (65+)[1] DNL	Estimated Additional due to Humanization Process
Boston	0	41	41	20
Chelsea	0	0	0	0
Everett	0	0	0	0
Revere	0	394	394	142
Winthrop	0	57	57	17
Total (All communities)	**0**	**492**	**492**	**179**
Population	**70-75 DNL**	**65[1]-70 DNL**	**Total (65+)[1] DNL**	**Estimated Additional due to Humanization Process**
Boston	0	129	129	69
Chelsea	0	0	0	0
Everett	0	0	0	0
Revere	0	987	987	346
Winthrop	0	144	144	41
Total (All communities)	**0**	**1,260**	**1,260**	**456**

Source: Massport and HMMH, 2021.
Notes: Population counts use the 2020 U.S. Census block data, merged with 2016 Residential Land Use.
2020 noise analysis uses AEDT version 3d; Humanization process extends contour line outward to include whole neighborhood blocks.
1 Day-Night Average Sound Level (DNL) 65 decibel (dB) is the federally-defined noise criterion used as a guideline to identify when residential land use is considered noncompatible with aircraft noise.

8 These estimates are calculated with GIS software that determines the fraction of the area of each census block that is residential land use and that is within the contour. That fraction is applied to the census dwelling units and population counts for that block.

2 Noise Model Inputs

This chapter presents the noise model inputs and assumptions used in developing the 2020 DNL contours. Since 2004, Massport has relied primarily on radar data as the main source of input for noise calculations. HMMH uses radar flight data collected by Massport's Noise and Operations Monitoring System (NOMS) for each calendar year as input to the noise model program. The 2020 DNL contours were produced using the most current version of AEDT available (AEDT version 3d).

2.1 Fleet Mix

Table 2-1 presents a summary of the annual flight operations for the 2020 contours. The 206,702 total operations represent a decrease of over 50 percent in comparison to the typical annual operations counts from recent years, due to the COVID-19 pandemic. Operations by aircraft type are summarized into several key categories: commercial (passenger and cargo) or GA operations; large jet, regional jet, and turboprop or propeller (non-jet) aircraft. Additionally, aircraft operations are split into daytime and nighttime periods, where nighttime hours are defined as 10:00 PM to 7:00 AM. Operations occurring during nighttime hours incur a 10-dB weighting when included in the DNL modeling calculation.

For 2020, the aircraft types identified by the radar data were matched to the AEDT 3d database, which contains individual noise and performance profiles for 172 different fixed-wing civilian aircraft types, as well as over 80 military aircraft types and 26 helicopters.[9] For those aircraft recorded in radar data that are not in the AEDT database, the radar type is paired with the best available alternative using an aircraft substitution list included in the AEDT model. The complete list of aircraft operations, used as input to AEDT, is presented in detail in **Table 2-2**.

Table 2-1: 2020 Annual Operations by Category

		Day	Night
Commercial	Large Jet	116,449	24,968
	Regional Jet	20,962	1,385
	Non-Jet	28,957	124
GA	All GA Aircraft	12,719	1,139
Total		**179,086**	**27,616**
Grand Total		**206,702**	

Source data: Massport's Noise Monitoring System, Revenue Office and HMMH, 2021
Large Jets are those with 90 seats or more
Nighttime is defined as 10:00 PM to 7:00 AM
Commercial operations are defined as scheduled passenger, cargo, and charter operations

The portion of flight operations occurring at night (defined in the definition of DNL as 10:00 pm to 7:00 am) is 13.4 percent overall, and 17.7 percent for the Commercial Jets category.

9 Some of the 172 civilian fixed wing types are older Stage 1 and 2 airplanes that no longer operate in the U.S., or aircraft that do not operate at Logan Airport. There are ordinarily no military aircraft operations at Logan Airport.

Table 2-2: 2020 Annual Operations by Specific Aircraft Type

ANP Type	Runway Use Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
Commercial Jet Operations						
7478	HJA	1	0	1	0	2
747400	HJA	154	0	152	2	308
A340-211	HJA	76	0	47	29	152
A340-642	HJA	69	0	66	3	138
A380-861	HJA	31	0	0	31	62
767300	HJB	67	17	8	76	168
7673ER	HJB	1,502	760	1,307	955	4,524
767400	HJB	106	4	105	5	220
777200	HJB	200	49	224	25	498
767CF6	HJB	73	39	25	87	224
767JT9	HJB	76	16	5	87	185
7773ER	HJB	298	6	34	270	608
7878R	HJB	801	18	787	32	1,638
A300-622R	HJB	455	648	600	503	2,207
A330-301	HJB	539	3	487	55	1,085
A330-343	HJB	387	143	340	190	1,059
A350-941	HJB	246	0	133	113	491
DC1010	HJB	11	4	5	10	30
DC1030	HJB	9	8	7	10	34
MD11GE	HJB	35	6	28	13	83
MD11PW	HJB	17	4	15	6	42
717200	LJA	293	50	302	41	687
737800	LJB	9,203	3,611	10,518	2,296	25,628
737400	LJB	3	0	2	1	6
737700	LJB	2,623	458	2,648	434	6,163
757300	LJB	18	16	28	6	68
757PW	LJB	748	398	1,012	134	2,291
757RR	LJB	669	234	740	162	1,805
A319-131	LJB	4,920	565	4,806	678	10,969
A320-211	LJB	1,739	468	2,071	136	4,414
A320-232	LJB	10,428	2,051	10,998	1,481	24,958
A320-271N	LJB	530	86	567	49	1,232
A321-232	LJB	10,544	3,454	12,254	1,744	27,997
EMB190	LJB	9,758	961	9,496	1,223	21,438
MD83	LJB	1	0	1	0	2
CL600	RJ	114	1	101	13	229
CRJ9-ER	RJ	968	71	1,006	34	2,079
CRJ9-LR	RJ	242	19	209	52	522

ANP Type	Runway Use Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
EMB145	RJ	3	0	3	0	6
EMB14L	RJ	460	28	483	5	977
EMB170	RJ	1,644	34	1,579	99	3,356
EMB175	RJ	7,185	403	6,964	625	15,177
Subtotal		**67,247**	**14,634**	**70,164**	**11,718**	**163,764**
Commercial Non-Jet Operations						
BEC58P	NJ	12,452	54	12,496	10	25,013
CNA208	NJ	1,224	13	1,218	19	2,474
DHC830	NJ	608	16	613	11	1,247
SF340	NJ	173	0	173	0	346
Subtotal		**14,457**	**83**	**14,500**	**40**	**29,080**
Commercial Aircraft Total		**81,704**	**14,718**	**84,663**	**11,759**	**192,844**
General Aviation Operations						
747400	HJA	0	1	1	0	2
A330-301	HJB	1	0	1	0	2
737800	LJB	3	0	2	1	6
737400	LJB	1	0	1	0	2
737700	LJB	4	0	4	0	8
757RR	LJB	0	1	1	0	2
A319-131	LJB	2	0	1	1	4
A321-232	LJB	3	0	3	0	6
EMB190	LJB	1	0	0	1	2
BD-700-1A10	RJ	200	8	191	16	415
BD-700-1A11	RJ	57	5	59	3	123
CIT3	RJ	7	0	7	0	14
CL600	RJ	658	42	660	40	1,401
CL601	RJ	210	16	213	13	452
CNA500	RJ	23	0	23	0	47
CNA510	RJ	87	4	85	6	182
CNA525C	RJ	171	39	183	28	421
CNA55B	RJ	485	60	493	52	1,090
CNA560U	RJ	18	1	17	2	37
CNA560XL	RJ	394	21	392	23	830
CNA680	RJ	635	35	629	41	1,341
CNA750	RJ	301	31	310	22	663
ECLIPSE500	RJ	6	0	6	0	12
EMB145	RJ	25	3	27	1	57
FAL20	RJ	1	0	1	0	2
FAL900EX	RJ	99	5	99	5	207
G650ER	RJ	80	7	80	7	174

ANP Type	Runway Use Group	Arrivals		Departures		Total
		Day	Night	Day	Night	
GIIB	RJ	2	0	1	1	4
GIV	RJ	269	25	266	27	587
GV	RJ	181	26	192	14	413
IA1125	RJ	28	10	30	8	76
LEAR25	RJ	1	0	1	0	2
LEAR35	RJ	467	95	459	102	1,123
MU3001	RJ	185	8	184	9	386
BEC58P	Non-jet	211	11	211	11	444
C130	Non-jet	1	0	1	0	2
CNA172	Non-jet	24	0	23	2	49
CNA182	Non-jet	23	0	22	1	45
CNA206	Non-jet	8	0	8	0	16
CNA208	Non-jet	590	39	588	41	1,258
CNA441	Non-jet	7	5	7	5	23
COMSEP	Non-jet	146	7	148	5	305
DHC6	Non-jet	319	26	310	35	691
GASEPF	Non-jet	7	0	7	0	14
GASEPV	Non-jet	171	3	169	5	348
PA28	Non-jet	15	0	15	0	29
PA30	Non-jet	7	1	7	1	16
B206L	Helo	50	0	50	0	100
B407	Helo	4	0	3	1	8
B429	Helo	10	4	13	1	27
B430	Helo	1	0	1	0	2
EC130	Helo	27	14	30	11	82
H500D	Helo	2	0	2	0	4
R44	Helo	10	0	10	0	20
S76	Helo	39	4	37	6	86
SA330J	Helo	51	7	53	5	115
SA350D	Helo	10	8	9	9	35
SA355F	Helo	10	0	10	0	20
SA365N	Helo	1	0	1	0	2
General Aviation Total		**6,347**	**570**	**6,353**	**564**	**13,835**
Total Annual Operations		**88,051**	**15,288**	**91,017**	**12,323**	**206,679**

Source: Massport 2020 NOMS data, HMMH Analysis 2021

2.2 2020 Runway Use

Table 2-3 presents the 2020 annual BOS runway usage, listed separately for jets and non-jets.

Table 2-3: Overall BOS Runway Use in 2020

Runway	DEPARTURES				ARRIVALS			
	Jets		Non-Jets		Jets		Non-Jets	
	Day	Night	Day	Night	Day	Night	Day	Night
04L	-	-	10.5%	5.0%	1.0%	<0.1%	4.3%	1.4%
04R	5.3%	4.8%	9.8%	2.7%	24.5%	17.9%	20.4%	11.2%
9	20.2%	12.4%	10.4%	3.3%	-	-	-	-
14	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	0.8%	0.5%
15R	5.5%	14.8%	8.1%	41.1%	4.1%	2.4%	6.1%	19.1%
22L	2.3%	2.7%	2.0%	2.2%	35.5%	35.9%	34.6%	21.9%
22R	33.5%	27.1%	34.3%	14.8%	<0.1%	<0.1%	3.6%	3.2%
27	12.2%	15.8%	4.3%	3.8%	16.4%	12.0%	4.9%	5.6%
32	-	-	-	-	1.7%	-	4.7%	-
33L	21.1%	22.4%	20.8%	27.1%	16.8%	31.8%	18.2%	34.8%
33R	-	-	-	-	-	-	2.4%	2.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Percentages may not appear to add exactly to 100% due to rounding

Source: 2020 NOMS data analysis, HMMH 2021

To understand the annual runway usage and to discover any changes that might indicate changes in the year-to-year DNL contours, Massport compares annual runway usage separately for the various aircraft categories as identified in **Table 2-2**. **Table 2-4** is Heavy Jet operations, **Table 2-5** is Lighter Jet operations, and **Table 2-6** is Regional Jet and Non-Jet operations.

Table 2-4: 2020 Heavy Jet Runway Use

Runway	Heavy Jets, group A (HJA)				Heavy Jets, group B (HJB)			
	Departures		Arrivals		Departures		Arrivals	
	Day (%)	Night (%)	Day (%)	Night (%)	Day (%)	Night (%)	Day (%)	Night (%)
04L	--	--	--	--	--	--	0.0%	0.1%
04R	9.0%	4.6%	26.4%	--	8.1%	6.5%	23.7%	17.6%
9	7.2%	--	--	--	12.7%	9.1%	--	--
14	--	--	--	--	--	--	--	--
15L	--	--	--	--	--	--	--	--
15R	13.5%	43.1%	0.9%	--	10.8%	19.9%	4.8%	2.7%
22L	5.3%	4.6%	30.1%	100.0%	6.0%	3.7%	36.8%	29.6%
22R	24.1%	13.8%	--	--	28.3%	28.5%	--	--
27	1.1%	--	8.8%	--	9.3%	2.8%	13.1%	3.3%
32	--	--	--	--	--	--	--	--
33L	39.9%	33.9%	33.7%	--	24.7%	29.5%	21.6%	46.8%
33R	--	--	--	--	--	--	--	--
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Percentages may not appear to add exactly to 100% due to rounding

Source: 2020 NOMS data analysis, HMMH 2021

Table 2-5: 2020 Lighter Jet Runway Use

Runway	Lighter Jets, group A (LJA)				Lighter Jets, group B (LJB)			
	Departures		Arrivals		Departures		Arrivals	
	Day (%)	Night (%)	Day (%)	Night (%)	Day (%)	Night (%)	Day (%)	Night (%)
04L	--	--	0.3%	--	--	--	0.8%	0.0%
04R	0.7%	--	30.8%	29.4%	5.6%	4.6%	24.5%	17.8%
9	31.1%	28.6%	--	--	19.8%	12.7%	--	--
14	--	--	--	--	--	--	--	--
15L	--	--	--	--	--	--	--	--
15R	--	2.3%	0.3%	3.9%	5.4%	13.4%	4.3%	2.5%
22L	--	--	32.9%	19.6%	2.3%	2.5%	36.1%	36.9%
22R	29.1%	23.8%	--	--	33.8%	26.8%	0.0%	--
27	21.9%	42.9%	17.8%	11.8%	12.2%	19.1%	17.3%	12.4%
32	--	--	--	--	--	--	1.0%	--
33L	17.2%	2.4%	17.8%	35.3%	20.9%	21.0%	16.0%	30.4%
33R	--	--	--	--	--	--	--	--
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Percentages may not appear to add exactly to 100% due to rounding

Source: 2020 NOMS data analysis, HMMH 2021

Table 2-6: 2020 Regional Jet and Non-Jet Runway Use

Runway	Regional Jets (RJ)				Non-Jets (NJ)			
	Departures		Arrivals		Departures		Arrivals	
	Day (%)	Night (%)	Day (%)	Night (%)	Day (%)	Night (%)	Day (%)	Night (%)
04L	--	--	2.1%	0.2%	10.5%	5.0%	4.3%	1.4%
04R	3.6%	3.0%	24.4%	19.1%	9.8%	2.7%	20.4%	11.2%
9	23.5%	17.1%	--	--	10.4%	3.3%	--	--
14	--	--	--	--	--	--	--	--
15L	--	--	--	--	--	--	0.8%	0.5%
15R	4.1%	13.2%	3.6%	1.6%	8.1%	41.1%	6.1%	19.1%
22L	1.1%	2.2%	33.4%	35.2%	2.0%	2.2%	34.6%	21.9%
22R	34.1%	27.1%	0.0%	0.1%	34.3%	14.8%	3.6%	3.2%
27	12.8%	19.1%	14.4%	21.1%	4.3%	3.8%	4.9%	5.6%
32	--	--	4.8%	--	--	--	4.7%	--
33L	20.8%	18.4%	17.4%	22.7%	20.8%	27.1%	18.2%	34.8%
33R	--	--	--	--	--	--	2.4%	2.4%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Percentages may not appear to add exactly to 100% due to rounding

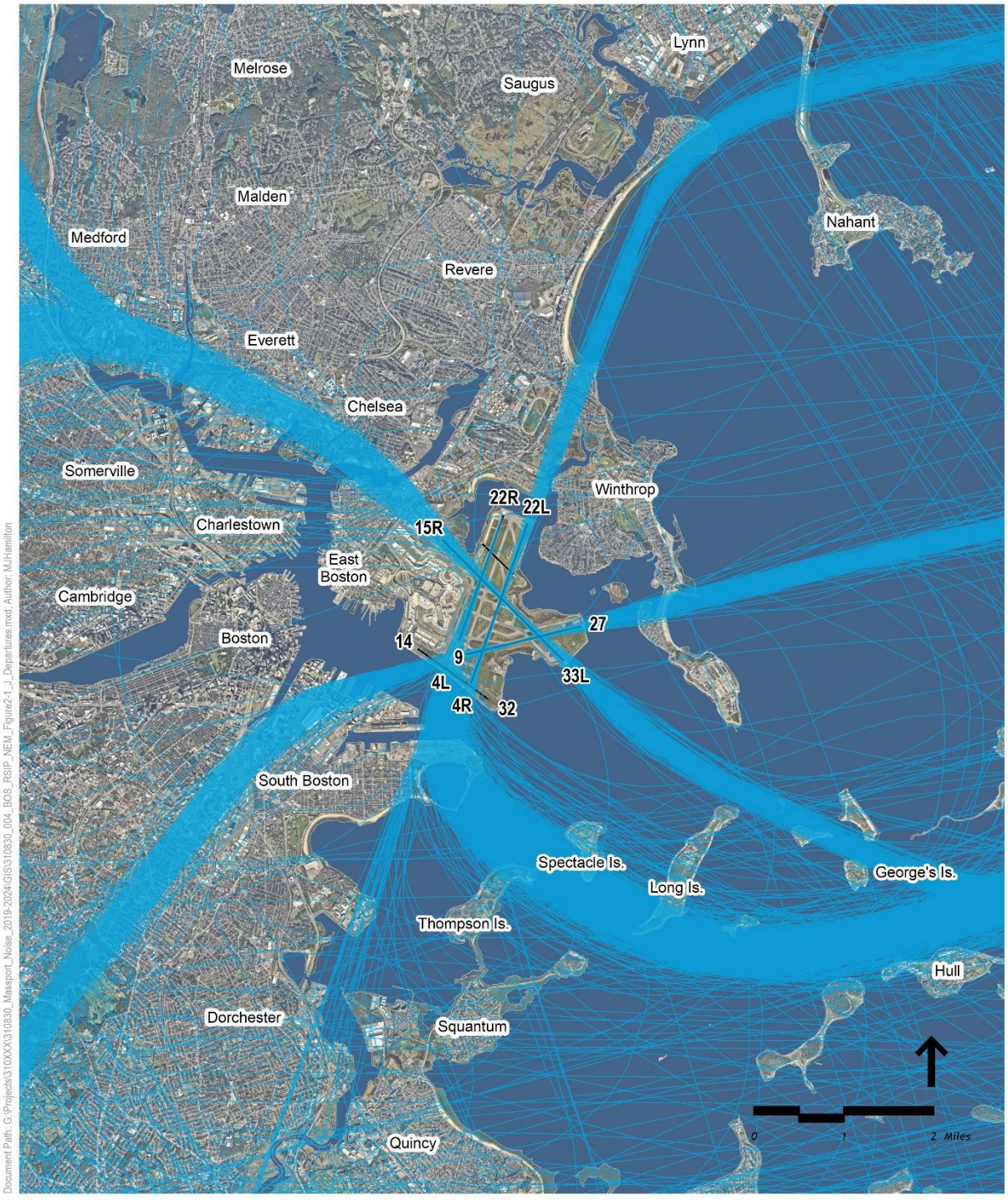
Source: 2020 NOMS data analysis, HMMH 2021

2.3 Modeled Flight Tracks

Massport generates its annual noise contours for Logan Airport by processing every flight that is available in the year's radar data through AEDT. This methodology improves the precision of modeling by:

- Automating the production of noise contours directly from each individual radar trace. For 2020, 206,789 traces were collected and 205,834 (99.5 percent) retained enough information to be converted by HMMH's pre-processor into AEDT flight tracks. Each radar trace was converted to a model track, ensuring that the lateral dispersion of radar tracks was retained in the modeling. The operations on these radar traces were then scaled to account for all the 206,679 operations that occurred in 2020.
- Providing greater detail than standard AEDT analyses through the use of individual flight tracks taken directly from the radar system rather than relying on consolidated, representative flight tracks data.
- Modeling each operation for the actual time of day and on the specific runway that it actually used, rather than applying a generalized distribution to broad ranges of aircraft types.
- Selecting the specific airframe and engine combination to model, on an operation-by-operation basis, based on the aircraft registration or a published composition of the fleets of the specific airlines operating at Logan Airport.
- Using each flight's origin and destination to select the proper stage length.
- Using each aircraft's actual altitude profile to select from the available flight profiles for each aircraft type in the AEDT database.

Figure 2-1 through Figure 2-4 provide a sample of the flight tracks used in calculating the 2020 DNL contours. **Figure 2-1** shows 8,542 of the 86,596 jet departure tracks, **Figure 2-2** shows 8,599 of the 86,548 jet arrival tracks, **Figure 2-3** shows 3,865 of the 16,390 non-jet departure tracks, and **Figure 2-4** shows 3,855 of the 16,300 non-jet arrival tracks.

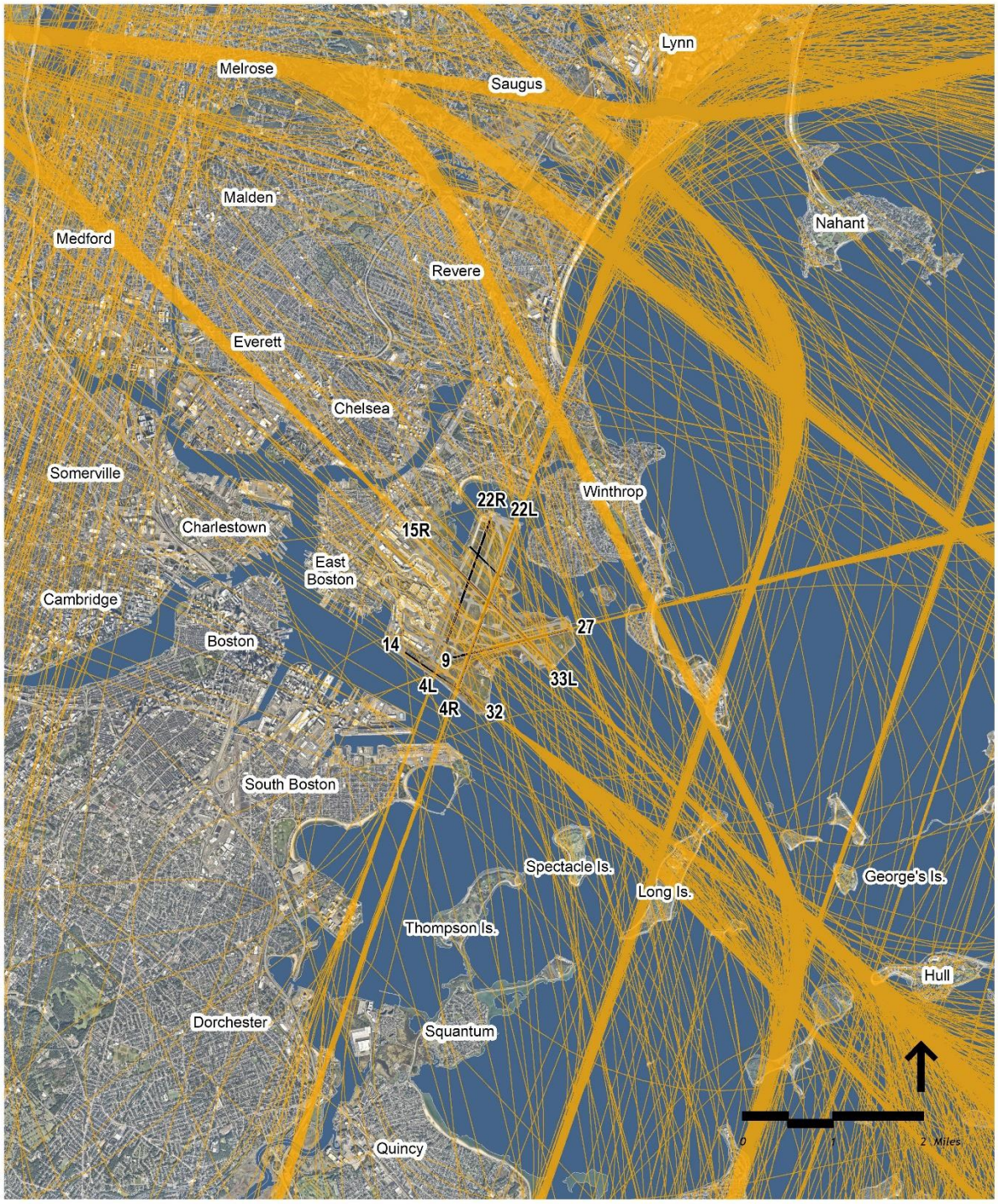


Source: Massport NOMS / ERA Multi-Lat, Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP) 2014

2020 Air Carrier Jet Departures (8,542 Tracks)

Sample Jet Departures Flight Tracks

Figure 2-1

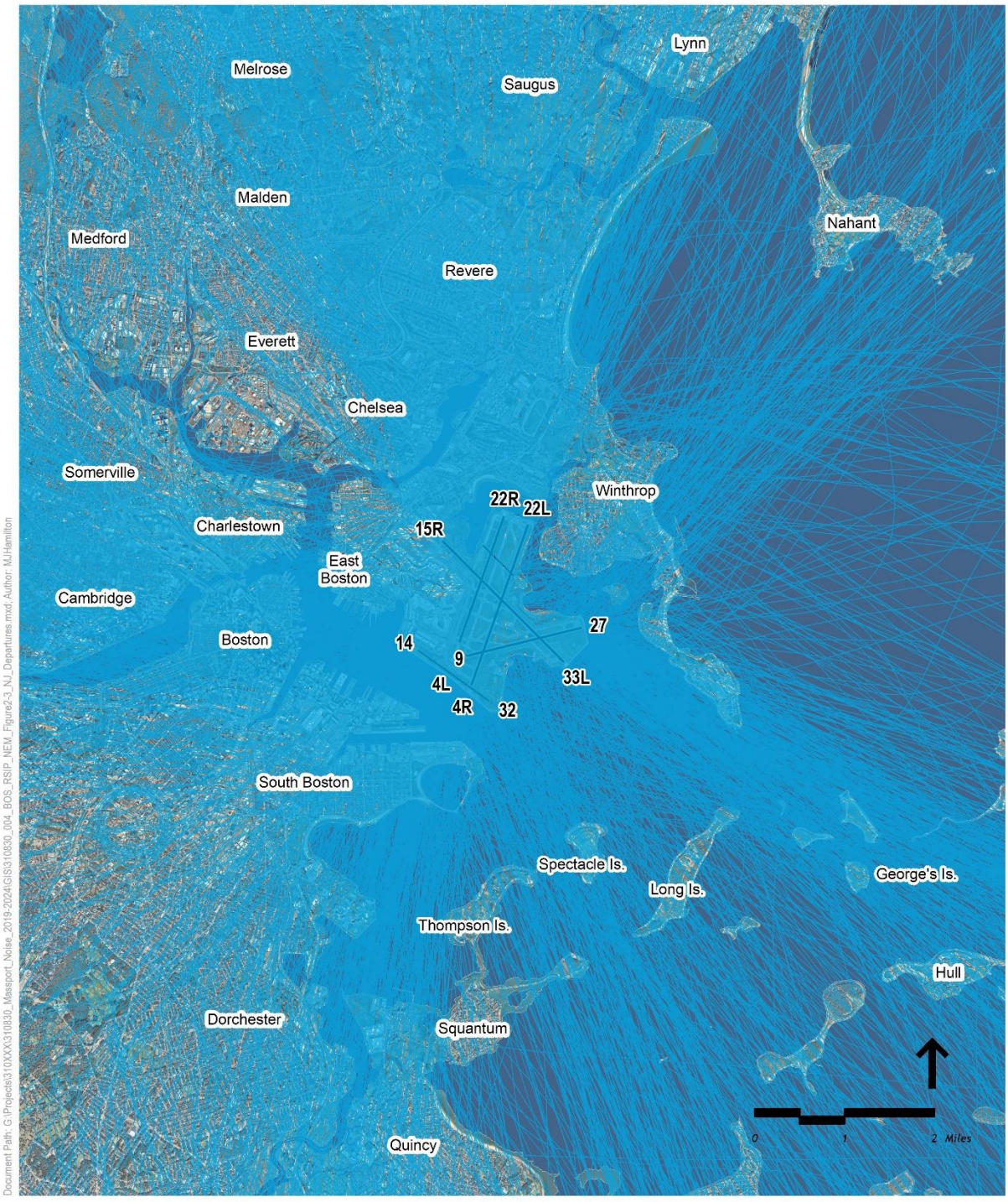


Source: Massport NOMS / ERA Multi-Lat, Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP) 2014

2020 Air Carrier Jet Arrivals (8,599 Tracks)

Sample Jet Arrivals Flight Tracks

Figure 2-2

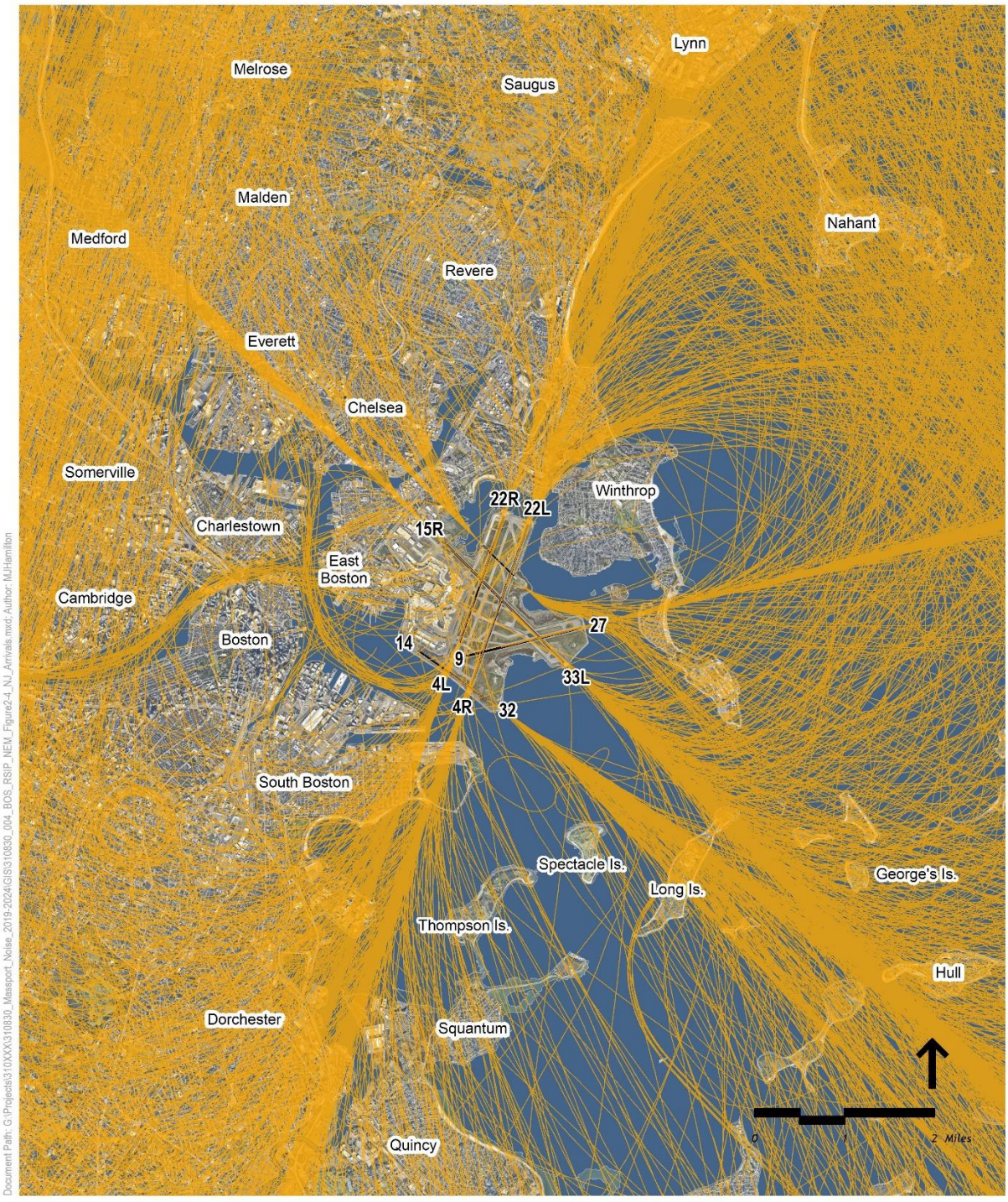


Source: Massport NOMS / ERA Multi-Lat, Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP) 2014

2020 Non-Jet Departures (3,865 Tracks)

Sample Non-Jet Departures Flight Tracks

Figure 2-3



Source: Massport NOMS / ERA Multi-Lat, Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP) 2014

2020 Non-Jet Arrivals (3,855 Tracks)

Sample Non-Jet Arrivals Flight Tracks

Figure 2-4

3 Noise Abatement

This chapter provides background information on Massport's noise abatement efforts within the context of federal regulations. This information is reviewed and updated annually in Massport's environmental documentation and is provided here for reference.

3.1 Regulatory Framework

Logan Airport Noise Abatement Rules and Regulations

Massport's primary mechanism for reducing noise impacts from Logan Airport's operations is founded in its Noise Rules.[10] The Noise Rules, adopted in 1986, 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 certified) aircraft 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); and
- 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.

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[11] 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

10 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).

11 14 CFR Part 36, "Noise Standards: Aircraft Type and Air Worthiness Certification."

of a Stage 2 aircraft in the continental U.S. unless its takeoff weight is 75,000 pounds or less. FAA 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. According to Massport records, the most recent year with operations by re-certificated Stage 3 aircraft[12] was 2012.
- 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, nearly 98 percent of aircraft in the 2019 Logan Airport fleet would also meet or exceed 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 15 percent of aircraft in the 2019 Logan Airport fleet would meet Stage 5 noise limits.

FAR Part 150

First implemented in February 1981, FAR Part 150 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 noncompatible 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 consideration of 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. 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.

3.2 Cumulative Noise Index

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

12 Boston Logan International Airport 2017 Environmental Status and Planning Report, Table H-3, "Percentage of Commercial Jet Operations by Part 36 Stage Category – 1998 to 2017"

DNL so that activity occurring at night is penalized by adding an extra 10 dB to each event. This penalty is mathematically equivalent to multiplying the number of nighttime events by each aircraft by a factor of 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 annual Environmental Data Reports (EDRs) and Environmental Status and Planning Reports (ESPRs), Massport reports partial CNI values of noise at Logan Airport, so that relative contributions by various subsets of the fleet (cargo, night operations, passenger jets, etc.) are identified. The Noise Rules, adopted by Massport following public hearings held in February 1986, established a CNI limit of 156.5 EPNdB. The CNI generally decreased from 1990 to 2010, as airlines modernized their fleets, and has generally increased over the last decade. For the past twenty years, annual CNI values have remained well below the cap, with changes from year to year on the order of a few tenths of a decibel. **Table 3-1** shows the calculated CNI values for a few key years as published in the 2018/2019 EDR. The CNI for 2020 has not yet been calculated.

Table 3-1: Cumulative Noise Index (EPNL) – 1990 to 2019 (limit 156.5)

Year	1990	2000	2010	2017	2018	2019
Full CNI (Entire Commercial Jet	156.4	154.7	151.9	153.1	153.4	153.5

Source: HMMH, 2020.
Note: General aviation (GA) aircraft and non-jet aircraft are not included in the calculations.

3.3 Noise Abatement Efforts

Massport's noise abatement program continues to play a critical role in helping to limit and monitor noise impacts. Massport's emphasis on noise abatement has focused on the benefits of better analysis tools, involvement in noise research projects and improved modeling techniques to identify the causes of noise problems. Massport also continues to coordinate with FAA and the Massport CAC on matters related to runway use and the ongoing area navigarion (RNAV) Pilot project.

Massport's NOMS, installed in 2008, includes extensive analysis and mapping capabilities, the latest FAA NextGen radar data feed, use of multilateration radar (a separate and unique source of operational data), improved noise complaint handling, and direct correlation of noise events with radar flight paths and complaints (a feature that the prior system did not have). This latter capability has improved the ability of the system to differentiate between aircraft and community noise sources. Massport recently evaluated the current system and went out to bid for an upgraded NOMS in 2018.

Other continuing elements of Massport's noise mitigation program are discussed below.

Residential Sound Insulation Program

Massport has one of the most extensive residential and school sound insulation programs in the nation. To date, Massport has installed sound insulation in 5,467 residences, including 11,515 dwelling units, and 36 schools in East Boston, Roxbury, Dorchester, Winthrop, Revere, Chelsea, and South Boston. Historically, the percentage of eligible homeowners who have responded, and whose dwellings are ultimately treated, varies significantly by community, from a high of nearly 90 percent in Revere to a low of about 50 percent in South Boston. Approximately 80 to 85 percent of homeowners in East Boston and Winthrop have historically participated. Approximately 8 percent of applicants also

choose the Room of Preference option that allows the owner to identify a room (usually a bedroom or living room) for extra acoustical treatment.

Eligibility for sound insulation must follow FAA guidelines which state that the residence must be located within the latest DNL 65 dB contour submitted to the FAA and a noncompatible structure must be experiencing existing interior noise levels within habitable rooms that are 45 dB or greater with the windows closed to be considered eligible. Also, structures constructed after October 1, 1998 are typically not eligible and structures that do not meet building codes are not eligible until the building's deficiencies have been addressed. The FAA will allow a residence to be treated under the sound insulation program one time; homes treated previously are not eligible for additional consideration.

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. The Logan Airside Improvements Project update took into account the 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 has also contacted property owners that are still eligible within the RSIP boundaries that had previously declined to participate. Owners were offered a second chance to participate in the program.

Massport will continue to work with the FAA to sound-insulate eligible homes. Massport will apply for FAA funds to treat eligible properties, as needed. As of 2015, the FAA requires airports to use the AEDT model to establish eligibility; therefore, Massport is submitting an AEDT- derived noise exposure map to be kept on file with the FAA through this document. The FAA submitted sound insulation program contour should represent current operational conditions; generally, the contour year should match the date of the document submittal. Massport has produced developed this document, incorporating the 2020 DNL contours, to comply with this requirement. Due to the COVID-19 pandemic, the 2020 DNL contours are likely to represent the historically smallest contours at BOS.

The Massport Noise Abatement Office, established in 1977, maintains the noise section of the Massport website, which provides information on Massport's sound insulation program, the Airport's noise monitoring system, various abatement measures, and other information of interest to the public. A total of 5,467 residential buildings and 11,515 dwelling units have been sound insulated since 1986 when the program was first implemented. Those totals were reached in 2014; no additional sound insulation has been done under that program since then. **Table 3-2** lists the yearly progress of this mitigation effort. **Table 3-3** provides a list of all schools that have been treated under Massport's sound insulation program.

Table 3-2: Residential Sound Insulation Program (RSIP) Status (1986-2018)

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
2012[3]	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
Total	5,467	11,515

Source: Massport, 2020
[1] Includes multiple units.
[2] Individual units.
[3] Federal funding was delayed in 2012.

Table 3-3: Schools Treated Under Massport Sound Insulation Program

Within City of Boston (27 schools)		Other Towns (9 Schools)
13 East Boston Schools	*6 South Boston Schools*	*3 Winthrop Schools*
East Boston High	St. Augustine	Winthrop Jr. High School
St. Mary's Star of the Sea	Cardinal Cushing	E. B. Newton
St. Dominic Savio High	Patrick Gavin	A. T. Cummings (Ctr.) School
St. Lazarus	St. Bridgid's	
James Otis	Oliver Hazard Perry	*1 Revere School*
Samuel Adams	Condon School	Beachmont School
Curtis Guild	*8 Roxbury and Dorchester Schools*	
Dante Alighieri	Samuel Mason	*5 Chelsea Schools*
P.J. Kennedy	Dearborn Middle	Shurtleff School
Donald McKay	Ralph Waldo Emerson	Williams School
Hugh Roe O'Donnell	Lewis Middle	St. Rose Elementary
E Boston Central Catholic	Nathan Hale Elem.	St. Stanislaus
Manassah Bradley	Phillis Wheatley Elem.	Chelsea High School
	Davis Ellis Elem.	
	Henry L. Higginson	

Source: Massport, 2020

Other Massport Noise Initiatives

- Massport develops annual noise contours, published on their website and in EDR/ESPR documents.
- Massport's website features an internet flight tracking system known as PublicVue.[13] The PublicVue site allows the user to view flight tracks in near-real time, replay flight tracks, and enter noise complaints.
- The Noise Office uses summary reports of operations by airline, runway, aircraft type, and other parameters to help track potential changes in the noise environment. Tables 6-11 (Partial CNI) and 6-13 (Time Above) in the 2018/2019 EDR are examples of these reports.
- Massport, in an advisory role, participated in the completed FAA Boston Logan Airport Noise study (BLANS) process, which designed RNAV departure procedures off most runways to avoid highly populated areas and the use of an over-water visual approach at night to keep aircraft offshore as much as possible.
- Massport supports, where possible, the Massport Community Advisory Committee (CAC). The Massport CAC is a state-legislated body that works with Massport on a range of Authority-wide topics, including environmental issues. Further information about the Massport CAC can be found at http://massportcac.org/.
- Massport supported FAA RNAV initiatives to develop RNAV arrivals and the Runway 33L departure RNAV procedure. Massport has been working with the Massachusetts Institute of Technology (MIT) and FAA to evaluate performance-based navigation (PBN) procedures and possible changes to these procedures as part of the RNAV Pilot project since 2016.

13 Massport. *Flight Monitor.* http://www.massport.com/logan-airport/about-logan/noise-abatement/flight-monitor/.

- Massport annually contacts airlines to encourage the use of single engine taxiing whenever possible. Massport also encourages airlines to apply the vortex generator retrofit to their Airbus A319/A320/A321 aircraft.
- Massport strives to participate in research to reduce community noise levels, including research done through the Airport Cooperative Research Program (ACRP) or with FAA, such as the RNAV Pilot project currently underway.
- Massport is a member of the Aviation Sustainability Center (ASCENT) which is a coalition of 16 leading US research universities and over 60 private sector stakeholders (including MASSPORT) committed to reducing the environmental impact of aviation. Massport is actively participating in two research initiatives on aircraft noise.[14]

Noise Complaint Line

In 2019, Massport received 268,929 noise complaints from 2,671 individual complainants in 86 communities. That data represent a 277 percent increase from 2018 in complaints, and a 27 percent increase in individual complainants, from a similar number of communities. The community of Medford generated over 36 percent of the calls in 2019 and has the most unique callers as well as the highest number of complaints.

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[15] which has dramatically increased complaints logged in the system. In 2017, the average number of complaints per individual caller (the ratio of calls to callers) was 13.9. This ratio increased to an average 32.8 complaints per caller throughout 2018 and then to an average 100.7 complaints per caller in 2019.

Appendix H, Noise Abatement in the 2018/2019 EDR, has a full listing of the complaints by community.

FAA and Massport RNAV Pilot Project

Over the last several years, the implementation of new PBN procedures – including RNAV – has resulted in a concentration of flights. On October 7, 2016, FAA signed a Memorandum of Understanding (MOU) with Massport[16] to frame the process for analyzing opportunities to reduce noise through changes or amendments to PBN. Massport has been working with FAA and others to develop test projects that are designed to help address the concentration of noise from PBN. Massport has 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, will study possible strategies to address neighborhood concerns. This is 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 are committing to: (1) analyze the feasibility; (2) measure and

14 https://ascent.aero/participant/massachusetts-port-authority/

15 Airnoise is a subscription service that allows the user to file a 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/

16 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/.

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.

The project has been structured in two phases, or "blocks". Block 1 recommendations are those that would not result in shifting noise from one area to another, and that would not have significant operational/technical implications. Block 2 recommendations could result in noise increases in some areas or face technical barriers that would require further review.

A report on Block 1 recommendations was completed in December 2017, and the Massport CAC voted to approve and recommend implementation of the Block 1 procedures. On December 20, 2017, Massport sent a request for FAA review and implementation of the Block 1 recommendations. A copy of that letter is provided in Appendix H, Noise Abatement of the 2017 ESPR. FAA review of Block 1 recommendations began in 2018 and is ongoing. 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. The FAA continues to evaluate these procedures and two of the procedures are expected to be published in late 2021.

The RNAV technical team, led by MIT, continues to progress with Block 2 options. Block 2 procedures are more complex due to potential operational/technical barriers or equity issues. Procedures being considered as part of Block 2 are RNAV or Required Navigational Performance (RNP)[17] approaches to Runway 22L and Runway 4R, continuous descent RNAV profiles, heading based departures from Runway 22L/22R and dispersed headings from Runway 33L and 27. Both Runway 33L and Runway 22L/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 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 study team is reviewing this information and reviewing other options. Massport and MIT completed the Block 2 analysis and presented their findings to the MCAC in June 2021 and at a public meeting in September 2021. The MCAC and Massport will determine which measures are forwarded to the FAA for final review.

Reduced Engine Taxiing

Single or reduced engine taxiing has the potential to reduce noise at Logan Airport. When used, the largest benefit is achieved by reducing the use of the engines on the side of the aircraft closest to the community. However, this is not always practicable due to airline procedures, taxiway routings, and safety considerations. Massport has reached out to the airlines and encouraged the use of this procedure whenever practicable. The letters from Massport sent to airport users in 2018 and 2019 are published in Appendix L of the 2018/2019 EDR.

Boston Logan Airport Noise Study (BLANS)

FAA's Record of Decision (ROD) approving construction of the unidirectional Runway 14-32 required that FAA, Massport, and the Logan Airport CAC jointly undertake a study, known as the BLANS, to

17 Required Navigational Performance (RNP) procedures provide a precise flight path both laterally and vertically for aircraft on approach.

determine whether changes to existing noise abatement flight track corridors might further reduce noise impacts. In addition, the Massachusetts Environmental Policy Act (MEPA) Certificate for the Boston Logan Airside Improvements Planning Environmental Impact Report (EIR) directed Massport to work with FAA and local communities on a review of the Logan Airport PRAS. FAA has been implementing RNAV procedures at airports across the country and those noise studies were able to influence the design of the RNAV procedures for implementation at Logan Airport. The BLANS consisted of three phases that concluded in 2017. The Logan Airport CAC could not agree on a runway use program from Phase 3 to recommend. Therefore, the study ended without a recommendation, and a final report on the BLANS program was issued in April 2017.

Noise Abatement Management Plan

Massport's noise abatement goals are achieved through the implementation of multiple elements. **Table 3-4** lists these goals, the associated plan elements, progress toward achieving these goals, as reported in the 2018/2019 EDR.

Table 3-4. Noise Abatement Management Plan

Noise Abatement Goal	Plan Elements	2018/2019 Progress Report
Limit total aircraft noise	Limit on Cumulative Noise Index (CNI)	The CNI value for 2018 was 153.4 EPNdB and for 2019 was 153.5 EPNdB, which are well below the cap of 156.5 EPNdB.
	Stage 3 percentage Requirement in Noise Rules	In 2018 and 2019, 100 percent of Logan Airport's total commercial jet traffic satisfied Stage 3 noise criteria or better. The newest Stage 5 category comprised 15 percent of these operations.
Mitigate noise impacts	Residential Sound Insulation Program (RSIP)	No additional dwelling units were sound insulated in 2018 or 2019, leaving the total of treated dwelling units at 11,515 since the start of the program in 1986. See Appendix H of the 2018/2019 EDR for additional details.
	School Sound Insulation Program	Thirty-six eligible schools have been sound insulated since this program began.
	Noise Abatement Arrival and Departure Procedures	Flight track monitoring and data analysis were used to verify adherence to noise abatement flight procedures. See Appendix H of the 2018/2019 EDR for data from recent years.
	Preferential Runway Advisory System (PRAS) Runway End Use Goals	Massport continues to report on effective runway use and compare the results to PRAS goals despite that program no longer being in effect..
	Runway Restrictions	Noise-based use restrictions 24 hours per day on departures from Runway 4L and arrivals on Runway 22R were continued.
	Reduced-Engine Taxiing	Voluntary use of reduced-engine taxiing is encouraged when appropriate and safe. See Appendix L of the 2018/2019 EDR for more information.
Continue to Improve the Noise Monitoring System	Evaluate current system and update system as needed	In 2018, Massport did a thorough review of its current noise monitoring system and went out to bid for an upgraded system. The prior vendor L3Harris was selected and in 2019, L3Harris began upgrading the system and has upgraded six noise monitors.
Minimize nighttime noise	Nighttime Stage 2 Aircraft Prohibition	With the FAA's ban on all Stage 2 operations after December 31, 2015, this prohibition is no longer necessary.
	Nighttime Runway Restrictions	Prohibitions on use of Runway 4L for departures and Runway 22R for arrivals between 11:00 PM and 6:00 AM were continued.

Noise Abatement Goal	Plan Elements	2018/2019 Progress Report
	Maximization of Late-Night Over-Water Operation	Efforts to maximize late-night over-water operations were continued. Use of Runway 15R for departures and Runway 33L for arrivals continued.
Minimize nighttime noise (continued)	Nighttime Engine Run-up and auxiliary power unit (APU) Restrictions	Restriction on nighttime engine run-ups and use of APUs was continued.
Address/respond to noise issues and complaints	Noise Complaint Line	Massport continued operation of its Noise Complaint Line, (617) 561-3333.
	Special Studies	Massport continued to provide technical assistance and analysis using noise monitoring system to support the FAA and others in monitoring jet departure tracks from Runway 27 and Runway 33L. Massport and the FAA are conducting an RNAV evaluation project designed to identify ways to reduce noise from the RNAV procedure (which concentrates flights). Massport is working with ASCENT on two research project concerning aircraft noise and flight procedures.

Source: Massport, 2020