PATRICK LEAHY
BURLINGTON
INTERNATIONAL AIRPORT

btv.aero

December 23, 2024

Ms. Cheryl Quaine
Environmental Program Manager
Federal Aviation Administration
New England Regional Offices
1200 District Avenue
Burlington MA 01803

RE: Burlington International Airport (BTV)
14 CFR Part 150 Update 2024 and 2029 Noise Exposure Maps

Dear Ms. Quaine,

On behalf of the City of Burlington and the Patrick Leahy Burlington International Airport, I am pleased to transmit the Burlington International Airport 14 CFR Part 150 Update 2024 and 2029 Noise Exposure Maps.

This document meets all federal requirements for the submission under Federal Aviation Regulations Part 150, Subpart B, and Section 150.21 and is true and complete. All interested parties have been given adequate opportunity to view this document in its draft form.

Should you have any questions, please feel free to contact me. Thank you for your assistance and participation in the development of these maps.

Sincerely,

Nic Longo, Director of Aviation

C: Larry Lackey, Director of Planning, Engineering and Sustainability
Marie Friedman, Director of Finance
David Carman, Deputy Director of Aviation operations
Jeff Bartley, Director of Innovation and Marketing
Diane Carter, JPG

A: 1200 Airport Drive, #1 South Burlington, VT 05403
P: 802.863.2874

Noise Exposure Map Update

Pursuant to Title 14 of the Code of Federal Regulations Part 150

Patrick Leahy Burlington International Airport

HMMH Report No. 03-14010

FINAL DRAFT

December 2024

Prepared for:

City of Burlington, Vermont
1200 Airport Drive, #1
Burlington, VT 05403

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Noise Exposure Map Update

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Patrick Leahy Burlington International Airport

HMMH Report No. 03-14010

FINAL DRAFT

December 2024

Prepared for:

City of Burlington, Vermont
1200 Airport Drive, #1
Burlington, VT 05403

Prepared by:

Kate Larson, Paul Krusell, Gene Reindel, David Crandall, Avery Pecci (HMMH)
Diane Carter, Brianna Whiteman (Jones Payne Group)

HMMH
700 District Avenue, Suite 800
Burlington, MA 01803

and

The Jones Payne Group
123 North Washington Street
Boston, MA 02114

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Executive Summary

The City of Burlington, Vermont (the City) is committed to being a good neighbor and a responsible operator of Patrick Leahy Burlington International Airport (BTV or "the Airport"). The City is updating the Noise Exposure Map for BTV in accordance with the Federal Aviation Administration's (FAA's) process codified under Title 14 of the Code of Federal Regulations Part 150 (14 CFR Part 150 or Part 150).

The Part 150 process provides a structured approach for airport sponsors, airlines, pilots, neighboring communities, federal, state, local agencies, and other stakeholders to collaborate on efforts to prevent incompatible development and mitigate aviation noise impacts. An airport owner/operator's participation in the Part 150 process is voluntary, not required. A Part 150 Study includes the following two principal elements:

- The **Noise Exposure Map** (NEM) element describes the airport layout and operation, aircraft-related noise exposure, land uses in the airport environs, and the resulting noise/land use compatibility. Part 150 requires that the documentation address aircraft operations during two time periods: the year of submission and a forecast year at least five years following the year of submission.
- The **Noise Compatibility Program** (NCP) element describes the actions the airport proprietor recommends to address existing and future land use incompatibilities with aircraft operations.

A Part 150 Study is similarly divided into two phases:

- **Phase 1** - Develop and submit NEM to the FAA for acceptance as being completed in accordance with 14 CFR Part 150.
- **Phase 2** - Develop and submit a Noise Compatibility Program (NCP) to mitigate noise and prevent or reduce incompatible land uses. The FAA reviews and documents its determinations for the recommended measures in a Record of Approval (ROA).

The City of Burlington completed its first Part 150 Study for BTV in 1989. This document represents the fifth update to the NEM. The City completed the previous NEM update for the Airport in 2018 with FAA acceptance in September 2019. In 2020, the FAA approved BTV's most recent NCP update.

This document includes all Phase 1 NEM documentation required for acceptance by the FAA, including quantifying noise exposure from aircraft operations, assessing compatibility of land uses near the Airport, and reviewing the status of the existing NCP measures. The existing condition represents 2024, and the five-year forecast condition represents 2029. The Part 150 study area includes BTV and parts of the adjacent communities of South Burlington, Burlington, Winooski, Colchester, Essex, and Williston, all within Chittenden County.

Noise Exposure Maps

The 2024 and 2029 noise exposure contours are presented in **Figure ES-1** and **Figure ES-2** and in **Chapter 5** of this document.[1] The resulting land use compatibility analysis is summarized in **Table ES-1** and **Table ES-2**, including the population and housing units within the 65 decibel (dB) contour and noise sensitive parcels. The land use analysis shows that 2,440 residential units and 11 noise sensitive parcels are potentially incompatible with noise from BTV aircraft operations in the 2029 Forecast Condition. The FAA considers all land uses compatible with aircraft noise less than 65 dB in terms of the Day-Night Average Sound Level (DNL) metric. Details of the land use analysis are provided in **Section 5.2**.

Table ES-1. Existing (2024) and Forecast (2029) Residential Land Use Compatibility
Source: HMMH and JPG, 2024

Contour Interval DNL (dB)	Population Census 2020				Housing Units			
	Total		Compatible		Total		Compatible	
	2024	2029	2024	2029	2024	2029	2024	2029
65-70	4456	4628	7	7	1913	1985	3	3
70-75	1057	1057	25	25	454	454	11	11
>75	2	2	0	2	1	1	0	0
Total	**5515**	**5687**	**32**	**34**	**2368**	**2440**	**14**	**14**

Table ES-2. Existing (2024) and Forecast (2029) Inventory of Noise Sensitive Sites
Source: HMMH and JPG, 2024

Contour Interval DNL (dB)	Schools		Places of Worship		Public Gathering	
	2024	2029	2024	2029	2024	2029
65-70	5	5	5	5	1	1
70-75	0	0	0	0	0	0
>75	0	0	0	0	0	0
Total	**5**	**5**	**5**	**5**	**1**	**1**

The 2024 and 2029 noise exposure contours cover less area than the Forecast Conditions (2023) DNL contours accepted by FAA on September 26, 2019. This is primarily because the local Vermont Air National Guard unit has been operating fewer F-35A operations than the volume that was previously forecasted and modeled. **Section 5.3** provides a comparison of the updated NEM contours to the 2023 DNL contours.

[1] Large-scale versions of these figures showing the official Noise Exposure Maps can be found in the back pocket of this document in print.

PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure ES-1
2024 Noise Exposure Map

2024 DNL Contour (Existing Conditions)

- Town Boundary
- Airport Property Boundary
- Historic Districts
- Historic Sites
- Local Roads
- Major Roads
- Highways
- Education
- Place of Worship
- Public Gathering
- Noise Monitor
- Rivers & Streams
- Sound Insulated

2024 Land Use

- Single Family Residential (1)
- Multi Family Residential (1)
- Other Residential (1)
- Mixed Use (1)
- Public Use (1)
- Airport
- Commercial (2)
- Manufacturing & Production (2)
- Recreational (2)
- Open Space

(1) Potentially non-compatible within 65 dB DNL contour as discussed in Section 2.1.
(2) Potentially non-compatible within 70 dB DNL contour as discussed in Section 2.1.

Data Source:
Vermont Center for Geographic Information Inc. (VCGI), United States Census Bureau, National Register of Historic Places, Burlington Internationa Airport, Harris Miller Miller & Hanson Inc.

December 13, 2024

The Jones Payne Group, Inc.

North
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PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure ES-2
2029 Noise Exposure Map

2029 DNL Contour (Forecast Conditions)

- Town Boundary
- Airport Property Boundary
- Historic Districts
- Historic Sites
- Local Roads
- Major Roads
- Highways
- Education
- Place of Worship
- Public Gathering
- Noise Monitor
- Rivers & Streams
- Sound Insulated

2024 Land Use

- Single Family Residential (1)
- Multi Family Residential (1)
- Other Residential (1)
- Mixed Use (1)
- Public Use (1)
- Airport
- Commercial (2)
- Manufacturing & Production (2)
- Recreational (2)
- Open Space

(1) Potentially non-compatible within 65 dB DNL contour as discussed in Section 2.1.
(2) Potentially non-compatible within 70 dB DNL contour as discussed in Section 2.1.

Data Source:
Vermont Center for Geographic Information Inc. (VCGI), United States Census Bureau, National Register of Historic Places, Burlington Internationa Airport, Harris Miller Miller & Hanson Inc.

December 13, 2024

The Jones Payne Group, Inc.

North
0 1,000 2,000 3,000 4,000 ft

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Sponsor's Certification

The City of Burlington has completed a comprehensive update of the Title 14 Code of Federal Regulations (CFR) Part 150 Noise Exposure Map for Burlington International Airport.

(1) The revised Noise Exposure Maps and associated documentation for the Patrick Leahy Burlington International Airport submitted in this volume to the Federal Aviation Administration under Federal Aviation Regulations Part 150, Subpart B, Section 150.21, are true and complete.

(2) Pursuant to Part 150, Subpart B, Section 150.21(b), all interested parties have been afforded adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure map, and of the descriptions of forecast aircraft operations.

(3) The "Existing Conditions (2024) Noise Exposure Map" (Figure 5-1 on page 5-3) accurately represents conditions for calendar year 2024.

(4) The "Five-Year Forecast Conditions (2029) Noise Exposure Map" (Figure 5-2 on page 5-5) accurately represents forecast conditions for calendar year 2029, which is the fifth calendar year after the date of this submission.

By: Nicolas Longo

Title: Director of Aviation

Date: DECEMBER 23, 2024

Airport Name:	Patrick Leahy Burlington International Airport
Airport Owner/Operator:	The City of Burlington, Vermont
Address:	1200 Airport Drive, #1, Burlington, VT 05403

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FAA Checklist

The FAA produced Advisory Circular 150/5020, "Airport Noise and Land Use Compatibility Planning," that includes a checklist for FAA's use in reviewing NEM submissions. The FAA prefers that the Part 150 documentation includes a copy of the checklist with appropriate page numbers or other references and pertinent notes and comments to assist in the document's review, as presented in the table below.

Part 150 Noise Exposure Map Checklist

Source: FAA/APP, Washington, DC, March 1989; revised June 2005; reviewed for currency 12/2007

PROGRAM REQUIREMENT	YES	NO	SUPPORTING PAGES/REVIEW COMMENTS
I. Submitting and Identifying The NEM:			
A. Submission is properly identified:			
1. 14 C.F.R. Part 150 NEM?	X		NEM Update
2. NEM and NCP together?		X	This document is an NEM Update only.
3. Revision to NEMs FAA previously determined to be in compliance with Part 150	X		Section 1.2.1
B. Airport and Airport Operator's name are identified?	X		Sponsor Certification page xi and Section 1
C. NCP is transmitted by airport operator's dated cover letter, describing it as a Part 150 submittal and requesting appropriate FAA determination?		X	Cover letter is included as part of the official FAA Submittal after public review of this draft.
II. Consultation: [150.21(b), A150.105(a)]			
A. Is there a narrative description of the consultation accomplished, including opportunities for public review and comment during map development?	X		Section 1.3 and Section 6 discuss roles and responsibilities and stakeholder engagement, respectively.
B. Identification of consulted parties:			
1. Are the consulted parties identified?	X		Sections 1.3 and Section 6
2. Do they include all those required by 150.21(b) and A150.105(a)?	X		Sections 1.3 and Section 6
3. Agencies in 2, above, correspond to those indicated on the NEM?	X		Agencies identified on the NEM participated as part of the Technical Advisory Committee (TAC) Sections 1.3 and Section 6
C. Does the documentation include the airport operator's certification, and evidence to support it, that interested persons have been afforded adequate opportunity to submit their views, data, and comments during map development and in accordance with 150.21(b)?	X		Sponsor Certification page xi, Section 6, and Appendix E
D. Does the document indicate whether written comments were received during consultation and, if there were comments, that they are on file with the FAA regional airports division manager?	X		Section 6.3 discusses how comments were collected during the public consultation process. All written comments are included in Appendix F.
III. General Requirements: [150.21]			
A. Are there two maps, each clearly labeled on the face with year (existing condition year and one that is at least 5 years into the future)?	X		Figure 5-1 and Figure 5-2 present maps with the 2024 Existing Conditions and the 2029 (future 5-year) Forecast Conditions, respectively.

PROGRAM REQUIREMENT	YES	NO	SUPPORTING PAGES/REVIEW COMMENTS
B. Map currency:			
1. Does the year on the face of the existing condition map graphic match the year on the airport operator's NEM submittal letter?	X		The Existing Conditions map (Figure 5-1) represents 2024, which is the year of submission of this document.
2. Is the forecast year map based on reasonable forecasts and other planning assumptions and is it for at least the fifth calendar year after the year of submission?	X		The Forecast year is 5 years after the year of submission (Figure 5-2). Section 4.2 describes the forecast methodology.
3. If the answer to 1 and 2 above is no, the airport operator must verify in writing that data in the documentation are representative of existing condition and at least 5 years' forecast conditions as of the date of submission?	N/A		Not Applicable – The Existing Conditions map year matches the year of submittal and the Forecast Conditions map is at least the fifth calendar year.
C. If the NEM and NCP are submitted together:	N/A		Not Applicable – NCP not submitted with this NEM
1. Has the airport operator indicated whether the forecast year map is based on either forecast conditions without the program or forecast conditions if the program is implemented?	N/A		Not Applicable – This is only an NEM Update.
2. If the forecast year map is based on program implementation:	N/A		Not Applicable – This is only an NEM Update.
a. Are the specific program measures that are reflected on the map identified?	N/A		Not Applicable – This is only an NEM Update.
b. Does the documentation specifically describe how these measures affect land use compatibilities depicted on the map?	N/A		Not Applicable – This is only an NEM Update.
3. If the forecast year NEM does not model program implementation, the airport operator must either submit a revised forecast NEM showing program implementation conditions [B150.3(b), 150.35(f)] or the sponsor must demonstrate the adopted forecast year NEM with approved NCP measures would not change by plus/minus 1.5 DNL? (150.21(d))	N/A		Not Applicable – This is only an NEM Update.
IV. Map Scale, Graphics, And Data Requirements: [A150.101, A150.103, A150.105, 150.21(a)]			
A. Are the maps of sufficient scale to be clear and readable (they must not be less than 1" to 2,000'), and is the scale indicated on the maps? (*Note (1) if the submittal uses separate graphics to depict flight tracks and/or noise monitoring sites, these must be of the same scale, because they are part of the documentation required for NEMs.*) (*Note (2) supplemental graphics that are not required by the regulation do not need to be at the 1" to 2,000' scale*)	X		Figure 5-1 and Figure 5-2 present maps with 2024 and 2029 conditions, respectively, at a scale of 1" = 2,000'. Noise monitoring locations are depicted on Figure 5-1 and Figure 5-2. The required supplemental flight track figures are included in Appendix D; in print form they measure 44" x 34" at 1" = 2,000' scale.
B. Is the quality of the graphics such that required information is clear and readable? (Refer to C. through G., below, for specific graphic depictions that must be clear and readable)	X		Figure 5-1 and Figure 5-2 and the supplemental flight track figures in Appendix D include the required elements and are clear and readable.
C. Depiction of the airport and its environs:			
1. Is the following graphically depicted to scale on both the existing condition and forecast year maps?			
a. Airport boundaries	X		Figure 5-1 and Figure 5-2 include airport boundaries.

PROGRAM REQUIREMENT	YES	NO	SUPPORTING PAGES/REVIEW COMMENTS
b. Runway configurations with runway end numbers	X		Figure 5-1 and Figure 5-2 include runways to scale with runway end numbering.
2. Does the depiction of the off-airport data include?			
a. A land use base map depicting streets and other identifiable geographic features	X		Figure 5-1 and Figure 5-2 include streets and geographic features.
b. The area within the DNL 65 dB (or beyond, at local discretion)	X		Figure 5-1 and Figure 5-2 include all land uses and area within the DNL 65 dB contour.
c. Clear delineation of geographic boundaries and the names of all jurisdictions with planning and land use control authority within the DNL 65 dB (or beyond, at local discretion)	X		Figure 5-1 and Figure 5-2 include jurisdictional boundaries and names.
D. 1. Continuous contours for at least the DNL 65, 70, and 75 dB?	X		Figure 5-1 and Figure 5-2 include the DNL 65-, 70- and 75-dB contours.
2. Has the local land use jurisdiction(s) adopted a lower local standard and if so, has the sponsor depicted this on the NEMs?		X	Local jurisdictions have not adopted a lower standard.
3. Based on current airport and operational data for the existing condition year NEM, and forecast data representative of the selected year for the forecast NEM?	X		The operational forecast is discussed in Section 4.2 and Appendix C.
E. Flight tracks for the existing condition and forecast year timeframes (these may be on supplemental graphics which must use the same land use base map and scale as the existing condition and forecast year NEM), which are numbered to correspond to accompanying narrative?	X		The required supplemental flight track figures are included in Appendix D; in print form they measure 44" x 34" at 1" = 2,000' scale. Additional flight track graphics are included in Section 4.5 with narrative discussing the contour development.
F. Locations of any noise monitoring sites (these may be on supplemental graphics which must use the same land use base map and scale as the official NEMs)	X		Figure 5-1 and Figure 5-2 include the locations of the three noise monitoring sites.
G. Non-compatible land use identification:			
1. Are non-compatible land uses within at least the DNL 65 dB noise contour depicted on the map graphics?	X		Figure 5-1 and Figure 5-2 include land use color coding.
2. Are noise sensitive public buildings and historic properties identified? (Note: If none are within the depicted NEM noise contours, this should be stated in the accompanying narrative text.)	X		Figure 5-1 and Figure 5-2 identify noise sensitive sites within the DNL 65 dB contours.
3. Are the non-compatible uses and noise sensitive public buildings readily identifiable and explained on the map legend?	X		Figure 5-1 and Figure 5-2 identify noise sensitive sites on the map legend.
4. Are compatible land uses, which would normally be considered non-compatible, explained in the accompanying narrative?	X		Figure 5-1 and Figure 5-2 identify compatible land uses (sound-insulated residential units) which would normally be considered non-compatible; these are counted as compatible in Table 5-3.
V. Narrative Support Of Map Data: [150.21(a), A150.1, A150.101, A150.103]			
A. 1. Are the technical data and data sources on which the NEMs are based adequately described in the narrative?	X		See Section 4 Development of Noise Exposure Contours

PROGRAM REQUIREMENT	YES	NO	SUPPORTING PAGES/REVIEW COMMENTS
2. Are the underlying technical data and planning assumptions reasonable?	X		The City of Burlington carefully vetted all assumptions. The modeling inputs in Section 4 were discussed at TAC meeting #3. Section 4.2 provides aircraft operations information. Appendix C contains correspondence with the FAA.
B. Calculation of Noise Contours:			
1. Is the methodology indicated?	X		See Section 4 for details on the modeling methodology.
a. Is it FAA approved?	X		Appendix C contains correspondence with the FAA on the modeling approach.
b. Was the same model used for both maps? (Note: The same model also must be used for NCP submittals associated with NEM determinations already issued by FAA where the NCP is submitted later, unless the airport sponsor submits a combined NEM/NCP submittal as a replacement, in which case the model used must be the most recent version at the time the update was started.)	X		Both maps were produced using the same methodology, using the latest version of FAA's Aviation Environmental Design Tool (AEDT) available at the time the NEMs were prepared, i.e., version 3e, for civil operations and using NOISEMAP version 7.3 for military operations.
c. Has AEE approval been obtained for use of a model other than those that have previous blanket FAA approval?	X		Use of the NOISEMAP model for military aircraft is documented in the nonstandard modeling memo to FAA, included in Appendix C, together with FAA's written approval of the modeling approach.
2. Correct use of noise models:			
a. Does the documentation indicate, or is there evidence, the airport operator (or its consultant) has adjusted or calibrated FAA-approved noise models or substituted one aircraft type for another that was not included on the FAA's pre-approved list of aircraft substitutions?	X		Aircraft substitutions are identified in Section 4.3.1 and in the nonstandard modeling memo to FAA, included in Appendix C. Other nonstandard data (flight profiles, taxi profiles) used in the model is discussed in Section 4.3 and included in nonstandard memos in Appendix C.
b. If so, does this have written approval from AEE, and is that written approval included in the submitted document?	X		FAA's written approval is included in Appendix C.
3. If noise monitoring was used, does the narrative indicate that Part 150 guidelines were followed?		X	Noise monitoring was not conducted for this study; however, annual average DNL values from the BTV noise monitoring system were computed and are reported in Section 5.1.
4. For noise contours below DNL 65 dB, does the supporting documentation include an explanation of local reasons? (Note: A narrative explanation, including evidence the local jurisdiction(s) have adopted a noise level less than DNL 65 dB as sensitive for the local community(ies), and including a table or other depiction of the differences from the Federal table, is highly desirable but not specifically required by the rule. However, if the airport sponsor submits NCP measures within the locally significant noise contour, an explanation must be included if it wants the FAA to consider the measure(s) for approval for purposes of eligibility for Federal aid.)	N/A		Not Applicable – No noise contours below DNL 65 dB are depicted on the maps.
C. Non-compatible Land Use Information:			
1. Does the narrative (or map graphics) give estimates of the number of people residing in each of the contours	X		See Section 5.2.2

PROGRAM REQUIREMENT	YES	NO	SUPPORTING PAGES/REVIEW COMMENTS
(DNL 65, 70 and 75, at a minimum) for both the existing condition and forecast year maps?			
2. Does the documentation indicate whether the airport operator used Table 1 of Part 150?	X		See Section 2.1
a. If a local variation to table 1 was used:			
(1) Does the narrative clearly indicate which adjustments were made and the local reasons for doing so?	N/A		Not Applicable – No adjustments were made.
(2) Does the narrative include the airport operator's complete substitution for table 1?	N/A		Not Applicable – No adjustments were made.
3. Does the narrative include information on self- generated or ambient noise where compatible or non-compatible land use identifications consider non-airport and non-aircraft noise sources?	N/A		Not Applicable – Non-airport / non-aircraft noise sources were not considered.
4. Where normally non-compatible land uses are not depicted as such on the NEMs, does the narrative satisfactorily explain why, with reference to the specific geographic areas?	X		Sections 3.2.2 and 5.2.2 discuss changes to land use compatibility as a result of sound insulation.
5. Does the narrative describe how forecast aircraft operations, forecast airport layout changes, and forecast land use changes will affect land use compatibility in the future?	X		Section 5.2 discusses changes to land use compatibility from the existing to the forecast conditions.
VI. Map Certifications: [150.21(b), 150.21(e)][2]			
A. Has the operator certified in writing that interested persons have been afforded adequate opportunity to submit views, data, and comments concerning the correctness and adequacy of the draft maps and forecasts?	X		Sponsor Certification, page xi
B. Has the operator certified in writing that each map and description of consultation and opportunity for public comment are true and complete under penalty of 18 U.S.C. § 1001?	X		Sponsor Certification, page xi

[2] Sponsor Certification occurs after the Public Comment Period and upon submittal of the Final NEM to the FAA.

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Acronyms

Acronym	Definition
AC	Air Carrier
AEDT	Aviation Environmental Design Tool
AEE	Office of Environment and Energy
AIP	Airport Improvement Program
ANP	Aircraft Noise and Performance
AT	Air Taxi
ATCT	Airport Traffic Control Tower
BTV	Burlington International Airport
CFR	Code of Federal Regulations
dB	Decibel (A-weighted unless otherwise stated)
DNL	Day-Night Average Sound Level
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
FBO	Fixed-base Operator
GA	General Aviation
HMMH	Harris Miller Miller & Hanson Inc.
ML	Military
MSL	Mean Sea Level
NCP	Noise Compatibility Program
NEM	Noise Exposure Map
NEPA	National Environmental Policy Act of 1969
NLR	Noise Level Reduction
Part 150	Title 14 of the Code of Federal Regulations Part 150 “Airport Noise Compatibility Planning”
ROA	Record of Approval
SEL	Sound Exposure Level
SLUCM	Standard Land Use Coding Manual
TAC	Technical Advisory Committee
TAF	Terminal Area Forecast
USAF	United States Air Force
USGS	United States Geological Survey
VTANG	Vermont Air National Guard
VTARNG	Vermont Army National Guard

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Contents

Appendices

Figures

Tables

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1 Introduction to Noise Compatibility Planning

As the airport operator, the City of Burlington, Vermont (the City), is undertaking a Noise Compatibility Planning Study for Patrick Leahy Burlington International Airport (BTV or "the Airport") in accordance with Title 14 of the Code of Federal Regulation Part 150 (14 CFR Part 150, or Part 150; herein referred to as "Part 150 Study"). The purpose of this Part 150 Study is to:

- Develop an accurate, and updated Noise Exposure Map (NEM) that reflects current and future airport operations, including the Vermont Air National Guard (VTANG) operation of F-35A Lightning II aircraft.
- Communicate noise exposure levels and land use compatibility associated with BTV aircraft operations to the surrounding communities.

One of the principal reasons for preparation of this update is the City's interest in continuing implementation of federally supported noise mitigation at BTV. The NEM prepared under this Part 150 Study is subject to Federal Aviation Administration (FAA) acceptance.

1.1 Part 150 Process

The Part 150 process provides a structured approach for airport sponsors, airlines, pilots, neighboring communities, federal, state, local agencies, and other stakeholders to collaborate on efforts to reduce impacts to people who live in significantly noise impacted areas. The regulations, 14 CFR Part 150, established technical requirements and standards for preparing Noise Exposure Maps (NEM) and airport Noise Compatibility Programs (NCP) along with requirements for public involvement. During this process airport sponsors:

- Make the noise condition publicly available by publishing NEMs.
- Consider noise conditions based on NEMs and identify, assess, and recommend measures to mitigate aviation noise and prevent or reduce incompatible development. This information is documented in the NCP.
- Invite consultation by local land use authorities with property in the day-night average sound level (DNL) 65, 70 and 75 decibel (dB) noise contours, federal agencies, aircraft user groups at the airport, and the public to review and comment on the NEMs and the measures studied and identified in the NCP.

Airport sponsors typically undertake the Part 150 process in two steps:

1. Develop and submit NEM which the FAA reviews/accepts and
2. Develop and submit NCP which the FAA reviews and issues Record of Approval.

The average time to complete the two-step Part 150 process ranges from two to five years. Once planning is complete, the implementation of recommended measures outlined in the airport's NCPs

occurs in phases, over multiple years. For airports with extensive incompatible land uses, this occurs over decades.

The Aviation Safety and Noise Abatement Act authorizes the FAA to provide financial assistance to airport sponsors for noise compatibility planning. FAA's Airport Improvement Program (AIP) includes a funding allocation specifically to provide airport sponsor financial assistance via grants to undertake noise compatibility planning and implement measures to mitigate aviation noise and reduce or prevent incompatible land uses.

Acceptance of an NEM by the FAA is a prerequisite to their subsequent review and approval of measures recommended in an NCP**. Figure 1-1** provides an overview of the efforts airport sponsors take during the Part 150 process. Note that stakeholder engagement occurs throughout the process. Soliciting input is an important and required aspect of developing a successful airport noise compatibility program. Stakeholder engagement includes opportunities to comment on the NEMs and NCP during informal meetings, public workshops, and public hearings, and directly to FAA (Federal Register Notice) before a final decision on the airport's NCP is made.

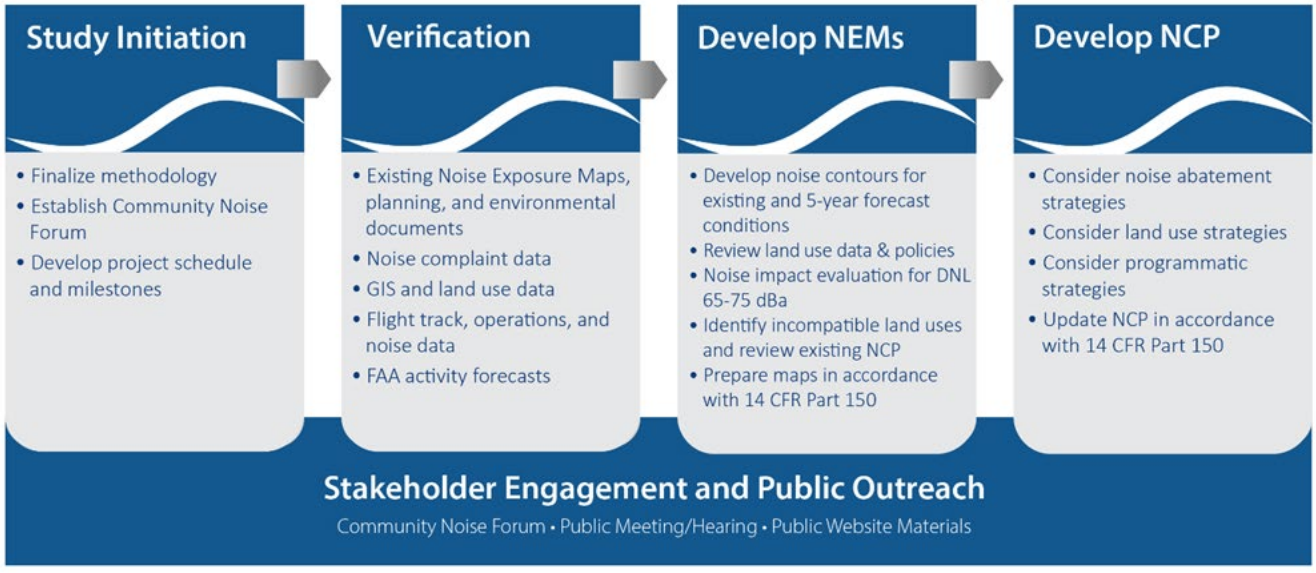

Figure 1-1. Overview of the FAA Part 150 Process
Source: HMMH

1.1.1 Noise Exposure Map

The NEM document describes the airport layout and operation, aircraft-related noise exposure, land uses in the airport environs, and the resulting noise/land use compatibility. The NEM documentation must address two timeframes:

1. The year of submission (the "Existing Condition") and
2. A forecast year that is at least five years following the year of submission (the "Forecast Condition").

This NEM update contains an Existing Condition map for calendar year 2024, and a five-year Forecast Condition map for calendar year 2029, presented in **Chapter 5.** The FAA uses a checklist (see page xiii) to review NEMs submitted by airport sponsors to ensure that the NEMs address the information required per 14 CFR Part 150, including tabulated data, analysis results, and clear descriptions of the data collection and analysis undertaken in the development of the NEM.

1.1.2 Noise Compatibility Program

An NCP is a program that airport sponsors develop in accordance with 14 CFR Part 150. The NCP document explains actions the airport sponsor or other responsible agency has done or will do to reduce incompatible land uses and to prevent the introduction of new incompatible land uses within the area covered by the NEMs prepared by the airport sponsor and accepted by the FAA.

The FAA reviews and approves specific measures based on information contained in the NCP. Airports may apply for grant funding for implementation of FAA-approved measures. An airport-recommended and FAA-approved measure does not require implementation of the measure but merely demonstrates that the measure is in compliance with Part 150. Additionally, if a measure requires subsequent FAA action, its implementation may require environmental study under the National Environmental Policy Act of 1969 (NEPA), as amended[3].

Chapter 3 presents a summary of the current BTV NCP, approved in 2020.

1.2 Burlington International Airport Part 150 Program Participation

The City began this Part 150 Update in late 2023 and expects to submit the final NEM document to FAA by December 2024 for their acceptance that the document is in accordance with 14 CFR Part 150 requirements. Public workshops were held in October 2024 to present the updated NEM document to the community and to answer questions from the public. **Chapter 5** provides the official NEMs for the Existing Conditions (2024) and the five-year Forecast Conditions (2029). The predominant change in the noise model inputs from the Existing to the Forecast Conditions is an overall 3.6 percent growth in civilian operations. The City held a 30-day public comment period in fall 2024 to invite comments and questions related to the NEM document.

The City is not updating the BTV NCP at this time; the NCP measures currently in place will continue. The land use measures, which are based on the DNL contours, will adopt the updated NEMs in their ongoing implementation.

1.2.1 History of Noise Compatibility Planning at BTV

For over 35 years, the City of Burlington has been committed to participating in Part 150 process. The City completed its first Part 150 Study for BTV in 1989. The NEM was accepted by the FAA and NCP measures were approved by the FAA in 1990. The NEM was updated in 1997, 2006, 2015, and 2018, and

[3] https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/Req-NEPA.pdf

the NCP was updated in 2008 and 2020. **Figure 1-2** provides a timeline for BTV's Part 150 program participation over the years.

The City completed the most recent NEM and NCP updates in 2019 and 2020, respectively. The FAA found the NEMs in compliance with Part 150 requirements on September 26, 2019, with NEM contours for 2018 existing and 2023 forecast conditions. The contour maps are referred to as the "2018 NEM" and "2023 NEM", respectively, in this document.[4] The FAA provided a Record of Approval (ROA) for the NCP on October 16, 2020 (see **Appendix B**).[5] A review of the current NCP is provided in **Chapter 3** of this document, along with implementation status of each recommended measure.

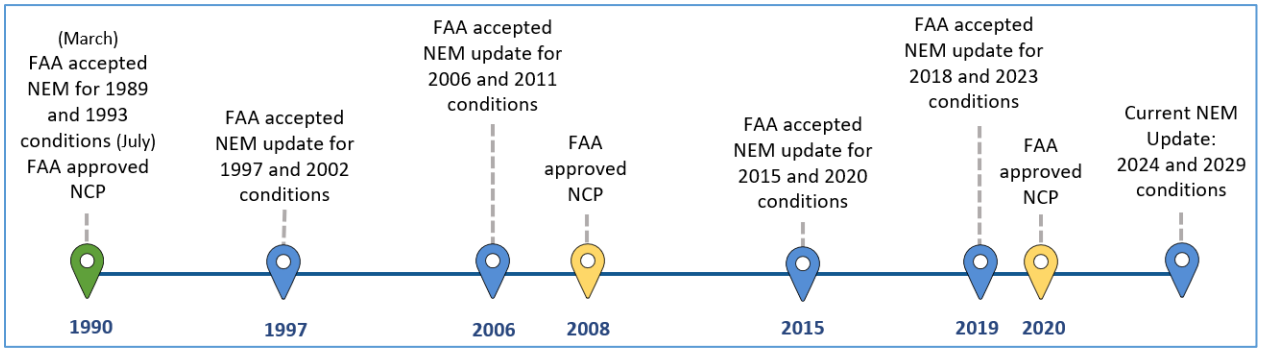

Figure 1-2. Timeline of BTV participation in Part 150 Program
Source: HMMH

1.2.2 BTV Airport Facilities

BTV serves Vermont's most populous city, Burlington, and its metropolitan area. BTV is a civil airport with two military tenants, the Vermont Air National Guard (VTANG) and the Vermont Army National Guard (VTARNG). The airport is located mainly in South Burlington, approximately three miles east of Burlington's central business district. With roots dating back to the 1920s, BTV is by far the busiest airport in Vermont. Current commercial passenger service is provided by five airlines. Airside facilities at BTV currently include two runways, a taxiway system, and ramp areas that support general aviation (GA), air carrier, military, and air cargo services.

The Airport makes a significant contribution to the local economy. In addition to commercial airline services, BTV hosts BETA Technologies research and development facility and the Vermont Flight Academy (VFA), a non-profit flight school offering pilot certifications and ratings. The airport also services Healthnet helicopter ambulance, operated in collaboration between Dartmouth-Hitchcock Hospital and the University of Vermont (UVM).

[4] FAA provided notice of its acceptance in the Federal Register on October 10, 2019 https://www.federalregister.gov/documents/2019/10/10/2019-22221/noise-exposure-map-notice-burlington-international-airport-south-burlington-vermont
[5] https://www.btvsound.com/wp-content/uploads/sites/4/2020/10/Burlington-Vermont-NCP-Record-of-Approval-REVISED-signed-002.pdf

1.2.3 BTV Military Operations

The VTANG 158th Fighter Wing operated the F-16C Fighting Falcon aircraft for over 30 years and currently flies the F-35A Lightning II. The United States Air Force (USAF) prepared the F-35A Operational Basing Final Environmental Impact Statement (EIS)[6] in 2013 and later issued a Record of Decision.[7] The unit received the F-35A aircraft in 2019, and they were declared operational in early 2022[8]. The previous NEM update, prepared while the VTANG was still operating the F-16C aircraft, included F-35A aircraft in its five-year forecast to represent projected 2023 conditions. This NEM update accounts for actual F-35A operational frequency and procedures rather than the projections made during the EIS and previous NEM noise model preparation.

The VTARNG operates an Army Aviation Support Facility at BTV where the 1st Battalion, 103d Aviation Regiment and the 86th Medical Company (Air Ambulance) is based. At BTV, the VTARNG operates helicopters (H-60M and UH-72) and C-12 turboprop aircraft.

1.3 Part 150 Roles and Responsibilities

Several groups are involved in the preparation of the BTV Part 150 Study and have provided important information that has been incorporated into this NEM document, including:

- The City of Burlington, including its staff and consultants (the Study Team),
- The 158th Fighter Wing of the VTANG,
- The VTARNG,
- The Technical Advisory Committee (TAC),
- The FAA, and
- The public.

1.3.1 The City of Burlington

As the airport operator, the City of Burlington submits the NEM document, recommends NCP measures, pursues implementation of the adopted NCP measures, and manages the Study Team. The City also leads public engagement efforts related to the Part 150 Study.

1.3.2 158th Fighter Wing of the VTANG

The VTANG's 158th Fighter Wing has both a state and federal mission to carry out. The USAF selected the 158th Fighter Wing to host the F-35A mission and the unit received a new fleet of F-35A Lightning II aircraft in 2019. The Study Team consulted with the 158th Fighter Wing to understand their procedures for operation of F-35A aircraft and to obtain flight track and flight profile information for noise

[6] Final United States Air Force F-35A Operational Basing Environmental Impact Statement, September 2013 https://vt.public.ng.mil/Portals/19/Documents/Volume1, https://vt.public.ng.mil/Portals/19/Documents/Volume2
[7] Record of Decision issued October 4, 2013 https://vt.public.ng.mil/Portals/19/Documents/F-35A
[8] https://www.158fw.ang.af.mil/NEWS/Article-Display/Article/3138190/vtang-completes-a-historic-first-for-air-national-guard/

modeling. Personnel from the 158th Fighter Wing reviewed the developed data for military noise model inputs and provided concurrence on data accuracy.

1.3.3 The Vermont Army National Guard (VTARNG)

Administered by the National Guard Bureau (a joint bureau of the departments of the U.S. Army and USAF), the VTARNG has both a federal and state mission. The dual mission, a provision of the U.S. Constitution and the U.S. Code of Laws, results in each soldier holding membership in both the National Guard of their state and in the U.S. Army. The VTARNG mainly operates H-60M and UH-72 helicopters at BTV, as well as infrequent flights by C-12 turboprop aircraft. The Study Team obtained concurrence from the 86th Troop Command for VTARNG military noise model inputs.

1.3.4 The Technical Advisory Committee (TAC)

The TAC is comprised of designated representatives from a broad spectrum of entities, including the Airport Commission, Airport management staff, local jurisdictions, school districts, FAA, fixed-base operator (FBO), VTANG and VTARNG. All TAC meetings are open to the public.

The TAC represents the core advisory group consulted throughout this NEM update process. The members review and provide input on Study content and materials, representing their constituents' interests. The TAC also provides a forum for discussion of complex topics, allowing members to share their differing perspectives on aircraft noise concerns. **Chapter 6** discusses the public participation process, including the TAC's role, during the development of the NEM update for BTV.

1.3.5 Federal Aviation Administration

The Federal Aviation Administration (FAA) provides oversight funding for airport noise compatibility planning pursuant to the Aviation Safety and Noise Abatement Act and Title 14, Code of Federal Regulations (CFR) Part 150. The FAA provides advice, guidance, and technical assistance to the Airport Sponsor throughout Part 150 process and reviews the NEM and NCP for accuracy and compliance with 14 CFR Part 150 and coordinates these reviews within FAA. Except for certain noise abatement measures, the FAA does not develop or implement airport noise compatibility programs on behalf of airports.

FAA involvement includes participation by staff from at least three parts of the agency:

- The Office of Environment and Energy
- The Air Traffic Organization
- The Office of Airports

The **Office of Environment and Energy** (AEE), located in FAA headquarters, reviews complex technical, regulatory, and legal matters of national environmental policy significance. The Office of Environment and Energy Noise Division (AEE-100) reviews and approves (or disapproves) of non-standard data inputs to the FAA's Aviation Environmental Design Tool (AEDT).

The **Air Traffic Organization** includes the Air Traffic Controllers and support staff. BTV's Air Traffic Control Tower (ATCT) personnel provide input on operational data, judgment regarding safety and capacity effects of alternative noise abatement measures, and input on implementation requirements for noise abatement measures.

Two groups in the **Office of Airports** are involved. The New England Regional Office (RO) is the main point of contact for reviews, compliance, and direction as the Part 150 Update study progresses, including the approval of the aviation forecast, and determining if the documentation satisfies all Part 150 requirements. Headquarters ensures consistency with Part 150 regulations and reviews of national importance.

Prior to acceptance of the NEM/NCP documentation and approval of the airport-recommended NCP measures, the FAA conducts a Lines-of-Business review, which includes Air Traffic, Flight Standards, Legal, Special Programs, Planning and Requirements, Flight Procedures, and Regional Review.

1.3.6 Public

Members of the public are given opportunities to follow the Study's progress and provide input. The public could stay abreast of progress by visiting the BTV Sound website[9], participating in the public information meetings, and submitting comments on the draft NEM document. At regularly scheduled monthly Airport Commission meetings, the City provides information on the BTV noise monitors and noise comments as well as updating the status of the residential sound insulation program and the airport's Part 150 program. **Chapter 6** contains more information regarding stakeholder engagement.

1.4 Introduction to Noise Terminology

Information presented in this NEM document relies upon a reader's understanding of the characteristics of noise (unwanted sound), the effects noise has on persons and communities, and the metrics or descriptors commonly used to quantify noise. The properties, measurement, and presentation of noise involve specialized terminology. This section presents a brief overview; **Appendix A** contains more detailed information on noise metrics.

Sound is a physical phenomenon consisting of minute vibrations (waveforms) that travel through a medium such as air or water. **Noise** is sound that is unwelcome.

Noise metrics may be thought of as measures of noise 'dose'. There are two main types, describing (1) single noise events (single-event noise metrics) and (2) total noise experienced over longer time periods (cumulative noise metrics). Single-event metrics indicate the intrusiveness, loudness, or noisiness of individual aircraft events. Cumulative metrics consider the frequency of noise events as well as the time of day in which they occur. Unless otherwise noted, all noise metrics presented in Part 150 documentation are reported in terms of the A-weighted decibel (abbreviated as dBA or simply as dB where the A-weighting is understood).

[9] https://www.btvsound.com/

Noise sensitivity is greater at night because background (ambient) sound levels tend to be lower at night and people tend to be sleeping. DNL represents noise as it occurs over a 24-hour period, treating noise events occurring at night (10 p.m. to 7 a.m.) with a 10 dB weighting.[10] This 10 dB weighting is applied to account for greater sensitivity to nighttime noise and the fact that events at night are often perceived to be more intrusive than daytime. **Figure 1-3** illustrates the weighting concept. An alternative way of describing this adjustment is that each event occurring during the nighttime period is calculated as if it were equivalent to ten daytime events. For purposes of Part 150, DNL is normally calculated through use of aircraft operations data averaged over a longer period, such as a year, to smooth out fluctuations occurring in day-to-day operations. The DNL depicted by an NEM is often referred to as the annual average daily DNL.

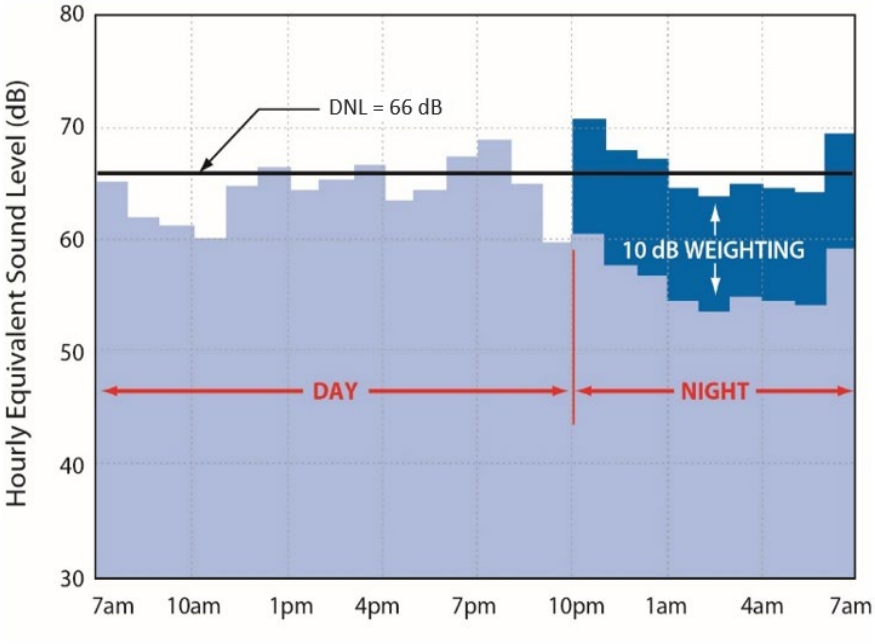

Figure 1-3. Example of a Day-Night Average Sound Level Calculation
Source: HMMH

[10] For the regulatory definition of DNL see 14CFR Part 150 §150.7 Definitions. http://www.ecfr.gov/cgi-bin/text-idx?SID=f8e6df268e3dad2edb848f61b9a0fb51&mc=true&node=pt14.3.150&rgn=div5; Accessed on 12/07/2022.

1.5 Navigating This Document

This document and the Part 150 Study it represents were undertaken in accordance with the requirements of the Part 150 regulation in Title 14 of the Code of Federal Regulations. The FAA-maintained NEM checklist (provided on page xiii) enumerates specific FAA requirements and identifies the associated location of the supporting text in this document and its appendices.

This document is organized as follows:

- The Airport Sponsor's certification and the FAA NEM checklist are provided in the front of the document, immediately following the Executive Summary
- **Chapter 1** introduces Part 150, includes the history of noise compatibility planning at BTV, and describes the roles and responsibilities of groups involved in the Study.
- **Chapter 2** presents FAA's land use compatibility guidelines and discusses land use in the BTV Part 150 Study area.
- **Chapter 3** describes the existing BTV Noise Compatibility Program and reports the implementation status for each measure.
- **Chapter 4** discusses the development of the aircraft noise exposure contours, including the noise modeling methodology and inputs.
- **Chapter 5** presents the official 2024 and 2029 Noise Exposure Maps and resulting land use compatibility data.
- **Chapter 6** reports on the stakeholder engagement efforts undertaken during the Part 150 process to date.
- Appendices provide supporting documentation as follows:
    - Appendix A: Noise Terminology
    - Appendix B: Existing Noise Compatibility Program Record of Approval
    - Appendix C: Noise Modeling Preparation Correspondence
    - Appendix D: Model Flight Tack Maps (with Same Scale and Base Map as NEMs)
    - Appendix E: Stakeholder Consultation
    - Appendix F: Public Comments
    - Appendix G: Noise Exposure Map Figures, Detailed View

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2 Land Use

Part 150 requires the review of land uses located in the airport vicinity to understand the relationship between those land uses and the noise exposure associated with aircraft operations. This includes delineation of land uses within the DNL 65 dB and higher aircraft noise exposure contours and identification of noise sensitive uses.

This chapter provides an overview of the municipal jurisdictions with authority to regulate land use in the vicinity of BTV, a description of recommended land uses that are deemed generally compatible under Appendix A of Part 150, the land use data collection and verification process, and an overview of existing land uses classifications in the vicinity of the Airport.

2.1 Land Use Compatibility Guidelines

The objective of airport noise compatibility planning is to promote compatible land use in communities surrounding airports. Part 150 requires the review of existing land uses surrounding an airport to determine land use compatibility associated with aircraft activity at the Airport.

The FAA has published land use compatibility designations, as set forth in Part 150, Appendix A, Table 1 (reproduced here as **Table 2-1**). As **Table 2-1** indicates, the FAA generally considers all land uses to be compatible with aircraft-related noise exposure in terms of DNL below 65 dB, including residential parcels, hotels, retirement homes, intermediate care facilities, hospitals, nursing homes, schools, preschools, and libraries. These categories are referenced throughout the Part 150 process.

Table 2-1. Part 150 Airport Noise / Land Use Compatibility Guidelines

Source: Part 150, Appendix A, Table 1, 2007

Land Use	Yearly Day-Night Average Sound Level [DNL] in Decibels					
	<65	65-70	70-75	75-80	80-85	>85
Residential Use						
Residential other than mobile homes and transient lodgings	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 farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	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

Key and notes to this table are on the following page.

Key to Table 2-1

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 A-weighted decibels (dB) must be incorporated into design and construction of structure.

Notes for Table 2-1

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.

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 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often started as 5, 10, or 15 dB 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 dB 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 dB 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 dB 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.

2.2 Local Land Use

Local municipalities have primary authority over land use decisions in the vicinity of the Airport. BTV is located in South Burlington, Vermont, approximately three miles east of Burlington's central business district. The Part 150 study area is centered on the airport and includes parts of the adjacent communities of South Burlington, Burlington, Winooski, Colchester, Essex, and Williston, all contained within Chittenden County. **Figure 2-1** displays the study area, defined to meet the regulatory requirements[11] of Part 150.

Chittenden County has a regional planning council which includes planning department personnel from each of the cities and towns in the county. Representatives from each jurisdiction are invited to serve on the Part 150 Study's TAC and to provide the Study Team with feedback on the land use data used in the NEM.

[11] Extending to at least 30,000 feet (approximately 5 nautical miles) from each runway end.

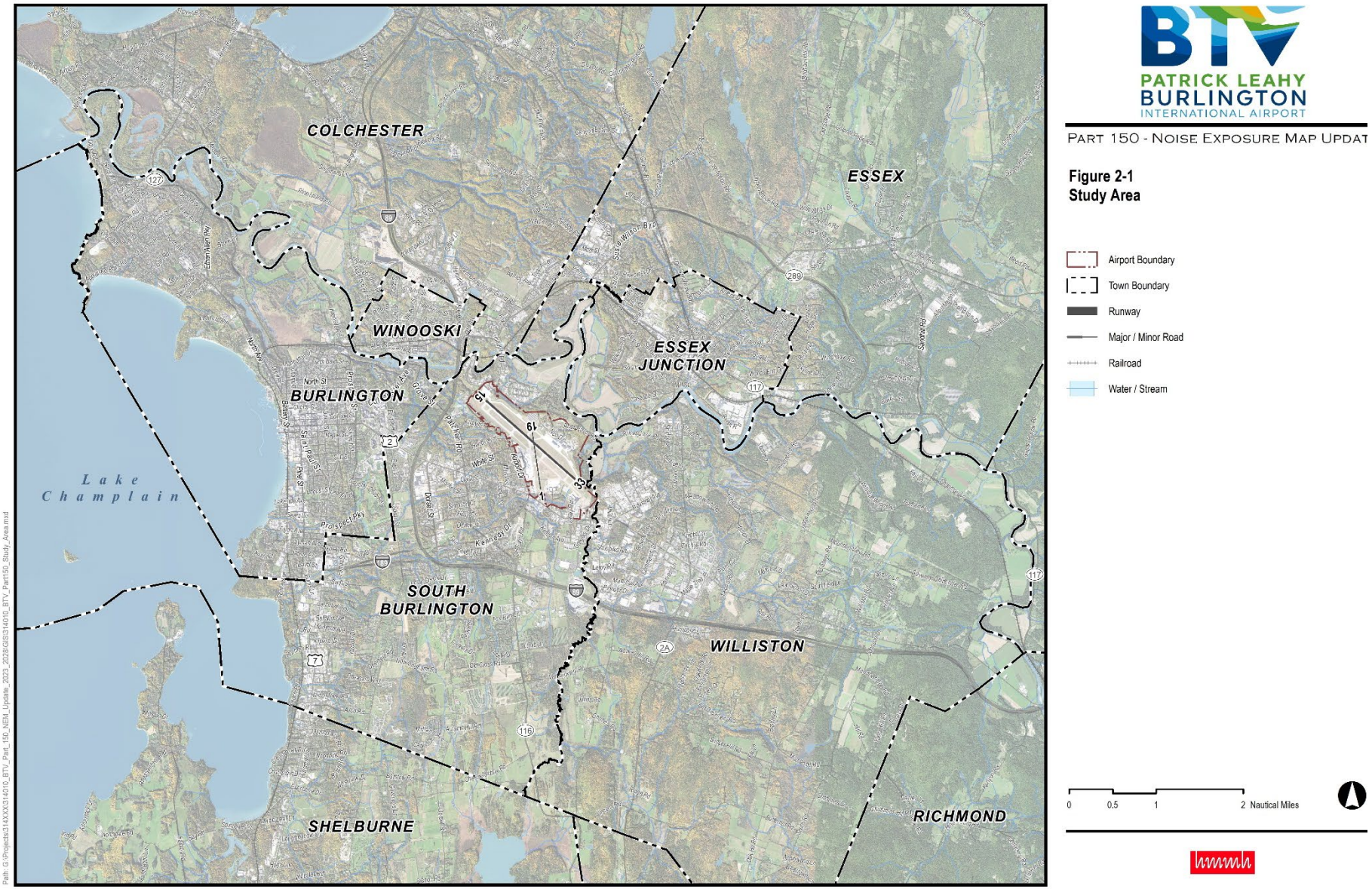

Figure 2-1. Study Area

2.3 Land Use Data Collection and Verification

The Study Team collected detailed land use information from municipalities throughout the study area. Land use data collection and verification focused on the area expected to be within the DNL 65 dB contour, based on prior NEM contours. The jurisdictions determined to potentially have land within the DNL 65 dB or higher aircraft noise exposure areas were consulted to verify existing land uses, and to discuss local land use controls and/or policies. The collected land use and zoning information were summarized according to Part 150 land use categories. Noise sensitive land use parcels, categorized by type (residential, school, etc.) were identified and the Study Team conducted a "windshield survey" to verify land uses within the study area. **Figure 2-2** presents the existing land use data.

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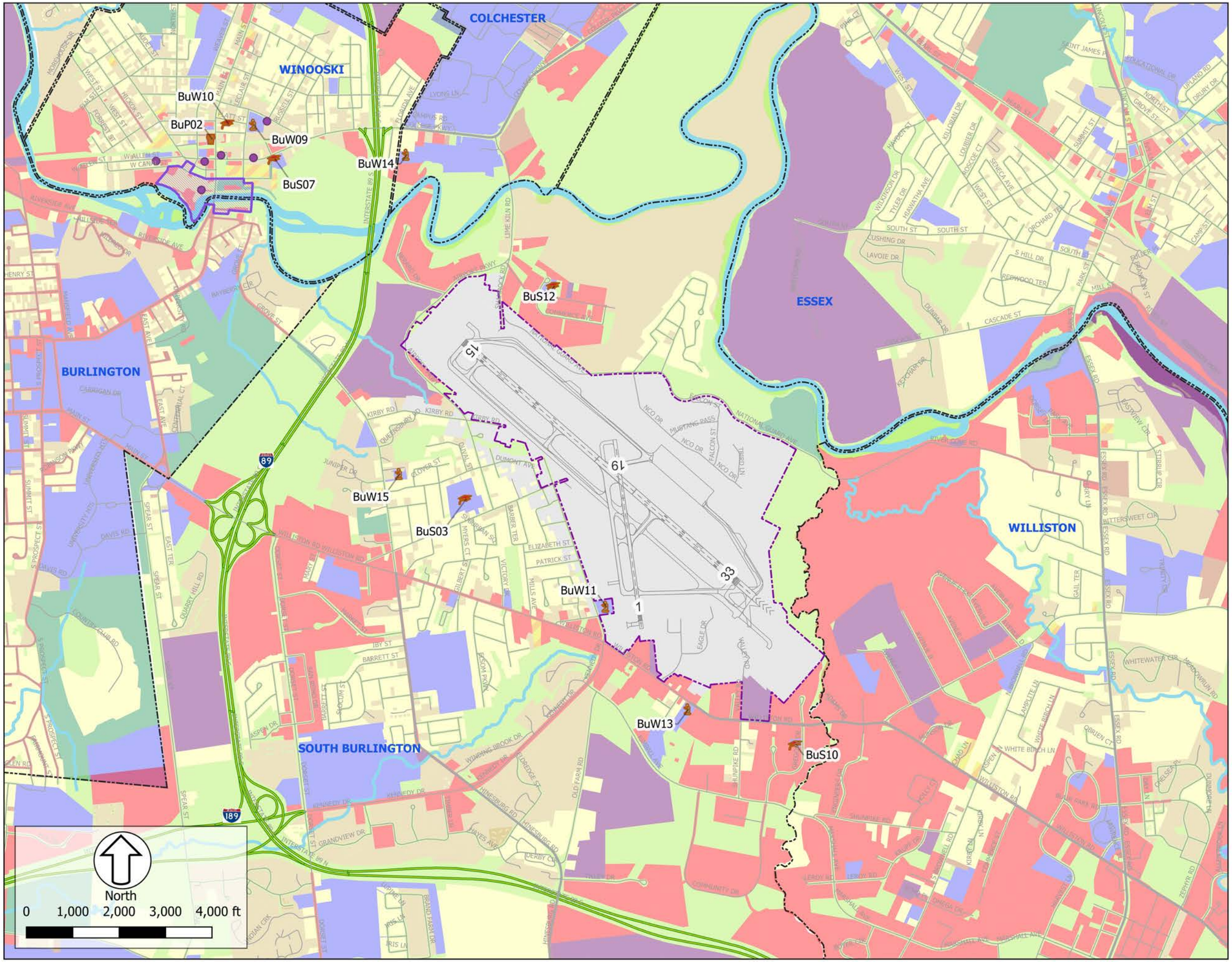
PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 2-2
Existing Land Use



- Town Boundary
- Airport Property Boundary
- Historic Districts
- Historic Sites
- Local Roads
- Major Roads
- Highways
- Education
- Health Care
- Place of Worship
- Public Gathering
- Rivers & Streams

2024 Land Use

- Single Family Residential (1)
- Multi Family Residential (1)
- Other Residential (1)
- Mixed Use (1)
- Public Use (1)
- Airport
- Commercial (2)
- Manufacturing & Production (2)
- Recreational (2)
- Open Space

(1) Potentially non-compatible within 65 dB DNL contour as discussed in Section 2.1.
(2) Potentially non-compatible within 70 dB DNL contour as discussed in Section 2.1.

Data Source:
Vermont Center for Geographic Information Inc. (VCGI), United States Census Bureau, National Register of Historic Places, Burlington Internationa Airport, Harris Miller Miller & Hanson Inc.

December 13, 2024

The Jones Payne Group, Inc.

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3 Existing Noise Compatibility Program

BTV's existing Noise Compatibility Program (NCP) includes 14 FAA-approved measures which are a combination of measures approved in 2008 and 2020. Copies of the 2008 and 2020 FAA ROA documents are included in **Appendix B.** The 2020 NCP focused on updating the land use and programmatic measures to address the increased noise anticipated with the Vermont Air National Guard (VTANG) 158th Fighter Wing conversion of fighter aircraft from the F-16C to the F-35A, as well as addressing the City's and adjoining jurisdictions' preference for the local surrounding residential areas to remain a source of affordable housing.

There are seven operational measures (from the 2008 NCP ROA), five land use measures, and two programmatic measures in the current NCP. When the City decides to update the NCP, a review of all measures will be revisited for applicability. **Table 3-1** summarizes the individual measures, the FAA action and the City's implementation status. Detailed descriptions of each measure are provided in the following sections.

Table 3-1. Noise Compatibility Program Status

Sources: FAA ROA documents, BTV, Jones Payne Group, 2024

Number	Measure Description	Implementation Status
Operational Measures (2008 Record of Approval)		
O-1	Extension of Taxiway G	Completed
O-2	Terminal Power Installation & APU/GPU Restrictions	Implemented
O-3	Nighttime Bi-direction Runway Use	Unable to Implement
O-4	Noise Abatement Flight Paths for Runway 15 & 33 Departures and 15 Arrivals	Implemented
O-5	Voluntary Limits on Military C-5A Training	Implemented
O-6	Voluntary Minimization of F-16 Multiple Aircraft Flights	No Longer Applicable
O-7	Voluntary Army Guard Helicopter Training Controls	Not Implemented
Land Use Measures (2020 Record of Approval)		
L-1	Land Acquisition and Relocation	Implemented
L-2	Sound Insulation of Residential Structures	Implemented
L-3	Sound Insulation of Noise Sensitive Buildings	Implemented
L-4	Purchase Assurance for Single Family Parcels	Available for Implementation
L-5	Sales Assistance for Single Family Parcels	Available for Implementation
Programmatic Measures (2020 Record of Approval)		
P-1	Ongoing Monitoring and Review of Noise Exposure Map (NEM) and Noise Compatibility Program (NCP) Status	Ongoing
P-2	Noise and Flight Track Monitoring	Ongoing

3.1 Operational Measures

Operational measures, sometimes called noise abatement measures, are those that control noise at the source; such measures include airport layout modifications, noise barriers, flight path changes, preferential runway use, and arrival and departure procedures. The intention of operational measures in the NCP is to reduce the number of people and noise sensitive properties exposed to aircraft noise of DNL 65 dB or greater by changing the size or shape of the DNL contours.

The following operational measures were contained in the 2008 NCP ROA but were not addressed by the 2020 ROA. An update on the status of each measure is provided for reference. The City will be revisiting these measures during the next NCP update.

3.1.1 O-1: Extension of Taxiway G

Original statement of recommendation*: Taxiway G would be extended from the existing intersection with Taxiway A to Taxiway C, remaining parallel with Runway 15/33 in order to reduce noise levels for residents along Airport Drive.*

Implementation Status: Completed. The extension of taxiway G was completed in 2023.

3.1.2 O-2: Terminal Power Installation and APU/GUP Restrictions

Original statement of recommendation: *Installation of terminal power hookups for aircraft would reduce the need for aircraft to use internal auxiliary power units (APU) or [mobile] ground power units (GPU). Following the installation, a rule prohibiting the use of APUs or GPUs between 10:00 p.m. and 7:00 a.m. would be put in place (2008 ROA Measure 2).*

Implementation Status: Implemented. The Airport terminal now has “aircraft ground power” at all Passenger Boarding Bridges. The City will not be implementing the GPU/APU rule between 10:00 p.m. and 7:00 a.m., as too many flights arrive and depart during those hours. However, use of ground power is required for all aircraft in proximity to an available hookup.

3.1.3 O-3: Nighttime Bi-direction Runway Use

Original statement of recommendation: *To minimize late-night operations over the City of Winooski, the air traffic control tower would use Runway 15 for departure and Runway 33 for arrivals, traffic conditions permitting (2008 ROA Measure 3).*

Implementation Status: Unable to implement. The BTV Air Traffic Control Tower (ATCT) is closed from midnight until 5:30 a.m., which makes implementation of this measure infeasible during these hours. The ATCT has not implemented the procedure during the remaining DNL “nighttime” hours, i.e., from 5:30 to 7:30 a.m.

3.1.4 O-4: Noise Abatement Flight Paths for Runway 15 & 33 Departures and 15 Arrivals

Original statement of recommendation*: New procedures would have civil aircraft fly over less populated areas. Runway 33 departures would turn to a heading of 310 degrees. Runway 15 departures would turn to a heading of 180 degrees.*

Implementation Status: Implemented.

3.1.5 O-5: Voluntary Limits on Military C-5A Training

Original statement of recommendation*: An informal agreement with the military limits C-5A operations to only necessary takeoffs and landings.*

Implementation status: Implemented. An agreement is not currently in place, however (1) BTV operations strongly discourage C-5A training at the airport, because the runways are only 150 feet wide and wake turbulence from C-5A operations tears up the runway-edge lighting, (2) historically the military has always coordinated the arrival of a C-5A with BTV Operations because of the constraints on the airfield, and (3) all transient military aircraft are limited to two practice approaches.

3.1.6 O-6: Voluntary Minimization of F-16 Multiple Aircraft Flights

Original statement of recommendation*: Military personnel will schedule as many single-aircraft, as opposed to multiple-aircraft, flights as possible.*

Implementation Status: No longer applicable. The VTANG fighter wing changed from the F-16 aircraft to the F-35A in 2020. The city will examine the intent of this measure during the next NCP update.

3.1.7 O-7: Voluntary Army Guard Helicopter Training Controls

Original statement of recommendation*: The National Guard helicopter training operations will be conducted away from the Airport when conditions permit. In terms of long-range planning, the Guard should consider consolidating operations at Camp Johnson.*

Implementation Status: Not implemented. The Vermont Army National Guard has continued training operations at BTV.

3.2 Land Use Measures

Land use measures are also intended to reduce the number of people and noise sensitive properties exposed to aircraft noise of DNL 65 dB or greater, but they do so by addressing the noise/land use incompatibilities identified by the NEMs. The City's Noise Mitigation Program is comprised of several programs which were initially centered around land acquisition/relocation, but which, since 2020, are now focused on sound insulation.

The NCP Update, which the City completed in 2000, examined all of the pre-existing land use measures and recommended five to be carried forward. The current Noise Mitigation Program uses the five-year forecast 2023 NEM contours accepted by FAA on September 26, 2019, as the basis for implementation of these programs. When a new NEM is accepted by FAA, the updated five-year forecast DNL contours will become the new basis for the land use measures. **Figure 3-1** shows the extents of the noise mitigation program as of April 2024, mapped with the 2023 Forecast DNL contours.

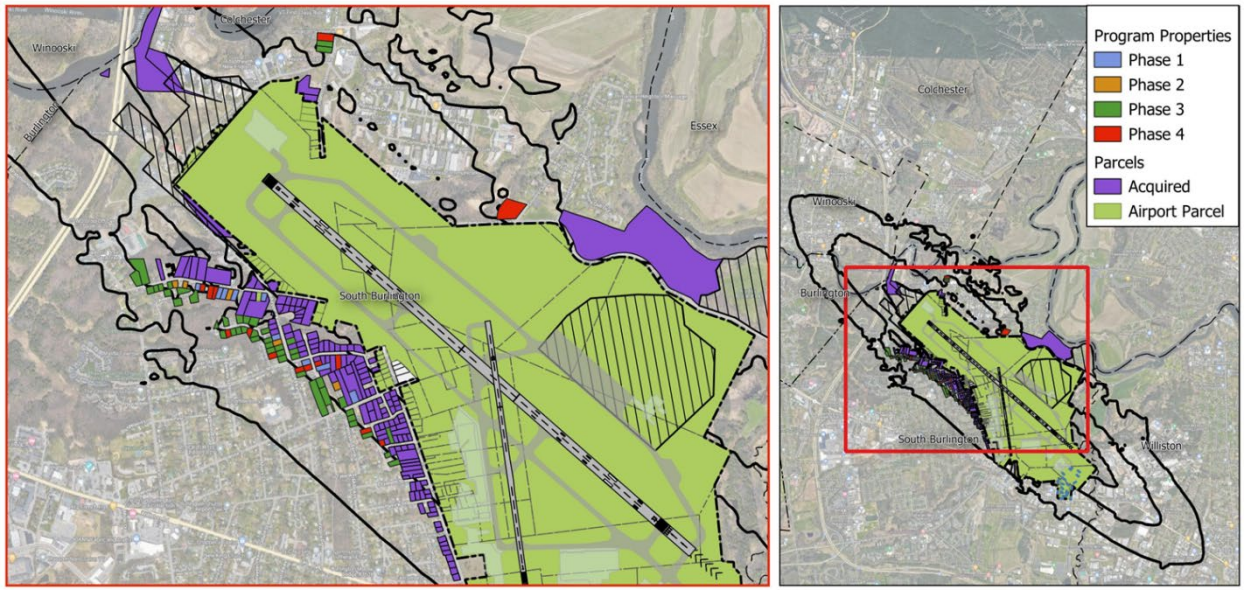


Figure 3-1. Noise Mitigation Program Extent, as of April 2024, with 2023 DNL Contours
Source: Jones Payne Group, 2024

3.2.1 L-1: Land Acquisition and Relocation

Original statement of recommendation*: The City of Burlington, Vermont (the "City") proposes to modify the existing Land Acquisition and Relocation Program to limit the eligibility to parcels where the majority of the non-compatible parcel is located within the 75 dB DNL contour.*

As with the current NCP, this program is voluntary. Eligible property owners will be paid for their property at Fair Market Value, and provided relocation assistance in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (the "Uniform Act") and implementing Department of Transportation (DOT) regulation.

The City proposes to modify the existing Land Acquisition and Relocation Program to limit eligibility to parcels where the majority of the non-compatible parcel is located within the 75 dB DNL contour. This is to preserve neighborhood continuity where terrain modeling resulted in small 75 DNL "pockets". The City recognizes that future NEM updates may shift these 75 DNL "pockets" to other areas in the neighborhood.

This will be a revision to the 2008 ROA Land Use measure #10, which included mobile homes within the 65 DNL contour and residence within the 70 DNL contour. The City, along with input from the City of South Burlington, has requested this measure be modified to apply only to the 75 DNL and higher contours.

The Land Acquisition and Relocation program was modified in the 2020 ROA to limit eligibility to parcels located within the DNL 75 dB contour. Previously, the preferred method of mitigation for homes located within the DNL 65 dB and higher contours was acquisition and relocation.

There are 10 properties identified as touching the 2023 NEM DNL 75 dB contour, as shown in **Figure 3-2**. Five of the properties were included in a 2016 AIP grant for land acquisition and each owner rejected the City's offer to purchase. The other five properties classified as being in the 2023 NEM DNL 75 dB contour were in small, isolated areas (pockets) of DNL 75 dB within the DNL 70 dB contour that resulted from high-resolution terrain elevation data used in the noise modeling process. Four of the properties, located along Kirby Road, are contiguous to each other and slightly touch the edge of one of the DNL 75 dB pockets on the 2023 NEM. The fifth property is located north of the Airport on a very large parcel which touches the 2023 DNL 75 dB contour while the residential building itself is not located near the 2023 DNL 75 dB contour.

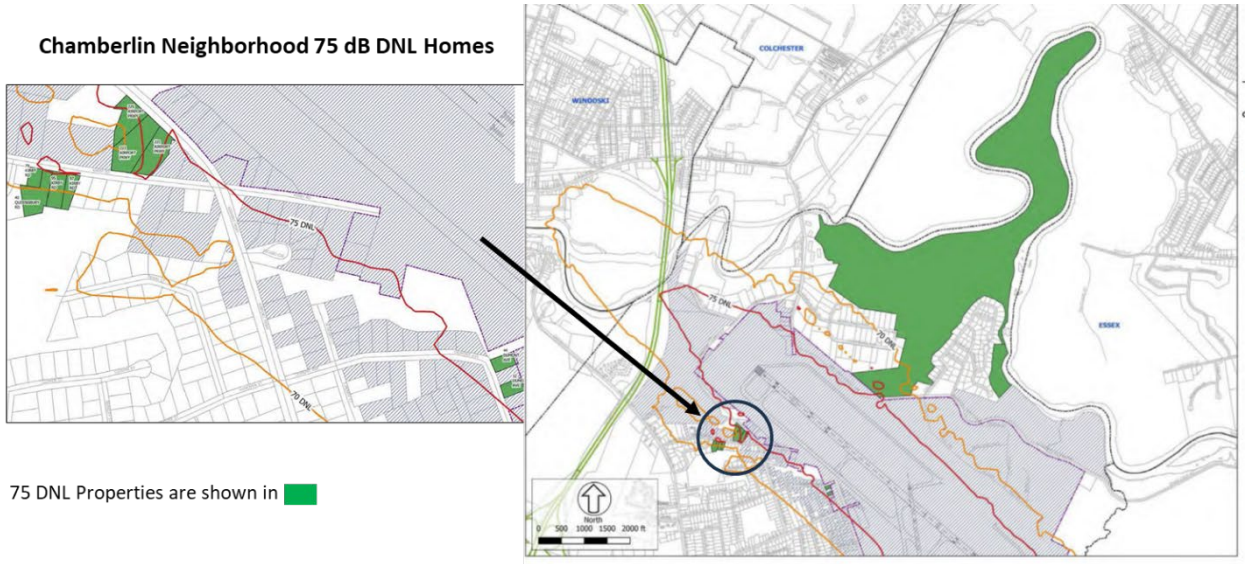


Figure 3-2. Locations of Homes Identified Under Measure L-1
Source: Jones Payne Group, 2024

Implementation Status:

The program is an approved measure under the Noise Compatibility Program. As of October 2024, no homeowners have requested the purchase of their property. There is one residential property located in 2029 NEM DNL 75 dB and higher contours.

3.2.2 L-2: Sound Insulation of Residential Structures

Original statement of recommendation*: Qualified incompatible residential land uses within the 65 and up to the 75 dB DNL contours, and residential land use located partially within the 75 dB DNL noise contours where a majority of the parcel is located outside the 75 dB DNL contour, would be included in a sound insulation program. For qualified properties, the City will provide an acoustical treatment package designed to reduce interior noise levels to 45 DNL and provide a minimum reduction of 5 dB from the existing interior noise level in accordance with FAA guidelines.*[12] *These types of parcels will be treated as 70 DNL. Sound insulation is the preferred method of noise mitigation for residences.*

Implementation Status:

There are approximately 2,440 residential units (622 single family units and 1,818 multi-family units) located within the 2029 NEM DNL 65 dB and higher contours. The Residential Sound Insulation Program has been implemented and is ongoing. Through sound insulation mitigation, the incompatible residential land uses become classified as compatible properties; they were shown to be at or below DNL 45 dB indoors with the treatments installed.

The Program began in 2021 and the City has completed construction on 14 homes. There are 68 homes for which sound insulation has been designed and which are awaiting construction. Based on available FAA AIP funding, the City will continue the sound insulation program to design and construct sound insulation treatments for approximately 50 homes per year.

3.2.3 L-3: Sound Insulation of Noise Sensitive Buildings

Original statement of recommendation*: Qualified incompatible non-residential land uses within the 65 and up to the 75 dB DNL contours would be included in a sound insulation program. For qualified properties, the City will provide an acoustical treatment package designed to reduce interior noise levels to 45 DNL and provide a minimum reduction of 5 dB from the existing interior noise level in accordance with FAA guidelines.*

Implementation Status:

There are approximately 11 non-residential land uses (schools, places of worship, learning centers and public gathering places) within the 2029 Forecast Condition DNL 65 dB and greater contours which may be eligible for the sound insulation program.

The Gertrude E. Chamberlin Elementary School, located in South Burlington, Vermont, is in the DNL 65-70 dB contour interval. At the request of the South Burlington School District, the City applied for federal funds to undertake testing to determine if the school would be eligible for acoustic treatment. The testing determined that the existing interior noise level was below DNL 45 dB and thus the school did not qualify for a full sound insulation treatment package. However, because the school would need to keep the windows and doors closed during classroom hours to maintain that low interior noise level, the

[12] FAA Order 5100.38D "Airport Improvement Program Handbook", Appendix R "Noise Compatibility Planning/Projects", Change 1, effective date February 26, 2019

building qualified for a positive ventilation system. The City received a second grant to design and construct the positive ventilation system, which was installed during 2021.

Each year, the City selects potentially eligible properties for sound insulation through the FAA AIP grant program. Properties are selected by noise level contour, starting with the highest contour and working outward, for both residential and non-residential properties within the project area based on available funding.

3.2.4 L-4: Purchase Assurance for Single Family Parcels

Original statement of recommendation*: Qualified incompatible owner-occupied single-family parcels within the 65 DNL up to the 75 DNL contours would be included in a purchase assurance program. The City would acquire the home in exchange for an avigation easement, provide sound insulation and resell the home on the open market for fair market value. Proceeds from the sale of the home would be utilized to fund further noise mitigation programs. This measure pertains to eligible properties within the 65 dB DNL noise level or higher for which the land use is considered non-compatible. (49 USC § 47502, as implemented by Table 1 of Appendix A in 14 CFR part 150). An avigation easement will be required.*

Those properties that are owner-occupied are eligible for this program.

Implementation Status:
There are 622 single family parcels located within the 2029 Forecast Condition DNL 65 dB and greater contours. Those properties that are owner-occupied are eligible for this program. The program has not been requested by any eligible homeowners. The City will apply for AIP grant funds should a homeowner wish to participate in the program.

3.2.5 L-5: Sales Assistance for Single Family Parcels

Original statement of recommendation*: Qualified incompatible owner-occupied single-family parcels within the 65 DNL up to the 75 DNL contours and not eligible for sound insulation would be included in a sales assistance program. In exchange for an avigation easement, the City would provide an incentive to assure homeowners receive fair market value for the sale of their home on the open market. Land use includes eligible properties within the 65 dB DNL noise level or higher for which the land use is not considered to be compatible (49 USC § 47502, as implemented by Table 1 of Appendix A in 14 CFR part 150). An avigation easement will be required.*

Those properties that are owner-occupied and not eligible for sound insulation may be eligible for this program. The incentive package will be tailored to each home to assist in the sale if there are no fair market value offers.

Implementation Status:

There are 622 single family parcels located within the 2029 Forecast Condition DNL 65 dB and greater contours. Those properties that are owner-occupied and are not eligible for sound insulation may be eligible for this program. The incentive package will be tailored to each home to assist in the sale if there

are no fair market value offers. This program has not been requested by any eligible homeowners. The City will apply for AIP grant funds should a homeowner wish to participate in the program.

3.3 Programmatic Measures

Programmatic measures enable the City to monitor the implementation and compliance of the recommended operational and land use management measures, as well as enhance stakeholders' understanding of aircraft noise. Programmatic measures are critical to the success of the NCP implementation.

3.3.1 P-1: Ongoing Monitoring and Review of Noise Exposure Map (NEM) and Noise Compatibility Program (NCP) Status

Original statement of recommendation*: This measure provides for revision of the NEM and NCP, citing three examples: changes in airport layout, unanticipated changes in the level of airport activity, and noncompliance with the NCP.*

In the 2008 NCP, this measure also included the recommendation for the Technical Advisory Committee to serve as a Noise Abatement Committee and for the purchase of a permanent noise monitoring system (2008 ROA measure #8).

Implementation Status: Ongoing. The City is undertaking this current NEM update to assess the noise impacts of the VTANG use of the F-35A aircraft. The permanent noise monitoring system (2008 ROA measure #8) was recommended as a separate new measure in the 2020 NCP update. The Airport currently has a Technical Advisory Committee for the NEM update and has a standing noise abatement committee (Sound Committee) that meets as directed by the Airport.

3.3.2 P-2: Noise and Flight Track Monitoring

Original statement of recommendation*: This measure recommends the implementation of a system to perform noise monitoring and flight track analysis on an ongoing basis.*

A similar measure was included in the 2008 NCP. The 2020 NCP updated the wording to more clearly indicate that the system should include both noise and flight track monitoring. The system is designed to make information available to the general public.

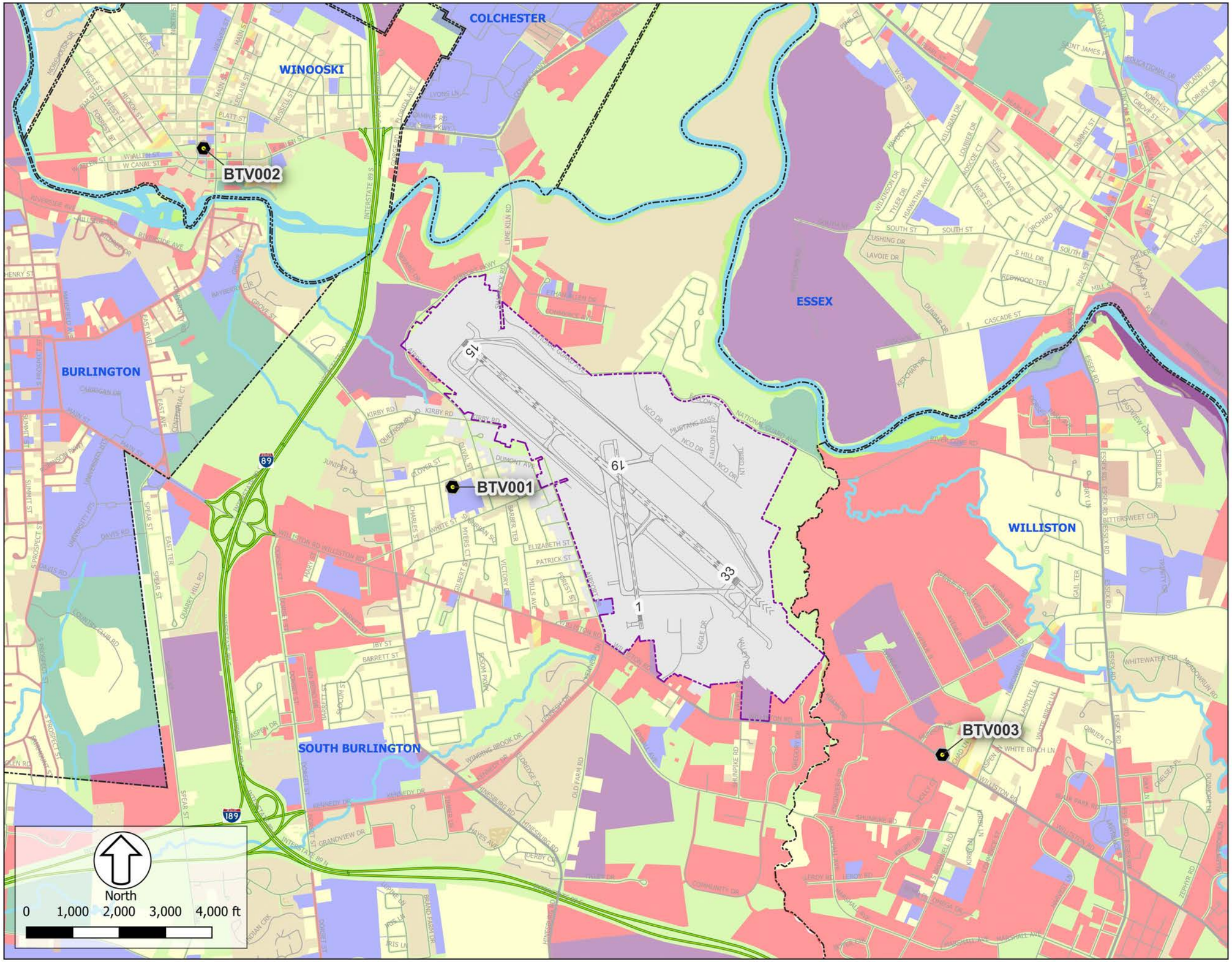
Implementation Status:

The City installed a noise and flight tracking system in 2021. The system includes three noise monitors and a public website (www.btvsound.com)for the community to view flight operations and the associated noise levels. BTV staff report monthly to the Airport Commission on the status of the system. **Figure 3-3** depicts the locations of the City's permanent noise monitors, labeled as shown in the public portal: BTV001 is at the Chamberlin School, BTV002 is at the Winooski City Hall and BTV003 is on Williston Rd near Chad Lane in Williston.

PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 3-3
Noise Monitor Sites



Noise Monitor
Town Boundary
Airport Property Boundary
Local Roads
Major Roads
Highways
Rivers & Streams

2024 Land Use
Single Family Residential (1)
Multi Family Residential (1)
Other Residential (1)
Mixed Use (1)
Public Use (1)
Airport
Commercial (2)
Manufacturing & Production (2)
Recreational (2)
Open Space

(1) Potentially non-compatible within 65 dB DNL contour as discussed in Section 2.1.
(2) Potentially non-compatible within 70 dB DNL contour as discussed in Section 2.1.

Data Source:
Vermont Center for Geographic Information Inc. (VCGI), United States Census Bureau, National Register of Historic Places, Burlington Internationa Airport, Harris Miller Miller & Hanson Inc.

December 13, 2024

The Jones Payne Group, Inc.

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4 Development of Noise Exposure Contours

Part 150 requires that the aircraft noise exposure contours for an NEM be prepared using the most recent release of the FAA's Aviation Environmental Design Tool (AEDT) that was available at the outset of the study, in this case, Version 3e. AEDT is a software system developed by the FAA that models aircraft performance in space and time to estimate fuel consumption, emissions, noise and air quality consequences.[13] AEDT is the FAA-approved tool for determining the cumulative effect of aircraft noise exposure around airports. Statutory requirements for AEDT use are defined in Part 150, "Airport Noise Compatibility Planning."

The noise exposure from the VTANG and VTARNG's aircraft operations were primarily computed[14] with the Department of Defense's NOISEMAP (NMap) software, Version 7.3. Data for the NMap modeling of F-35A and military helicopter (UH-60M and UH-72A) operations was based on the NMap modeling in the previous NEM update, revised using current information provided by the Air National Guard and Army National Guard. The noise grid output of the NMap model was combined with the AEDT output to generate contours for the average annual daily DNL contours. In accordance with the definition of the DNL metric (described in section 1.4), daytime is from 7 a.m. to 10 p.m. and nighttime is from 10 p.m. to 7 a.m. These day and night definitions are used through this NEM unless specified otherwise.

Sections 4.1 through 4.8 describe the required AEDT and NMap inputs, which include:

- Physical description of the airport layout (Section 4.1)
- Aircraft operations (Section 4.2)
- Aircraft noise and performance characteristics (Section 4.3)
- Runway use (Section 4.4)
- Flight track geometry and usage (Section 4.5)
- Ground noise inputs (Section 4.6)
- Meteorological Data (Section 4.7)
- Terrain Data (Section 4.8)

4.1 Physical Description of the Airport Layout

BTV has two operational runways: Runway 15/33 and Runway 1/19. The primary runway, Runway 15/33, is 8,319 feet long and 150 feet wide. Runway 1/19 is 4,112 feet long and 75 feet wide. The published airport elevation is 335 feet above mean sea level. **Figure 4-1** shows the current airport diagram.

[13] Noise modeling for this study commenced in October 2023 with AEDT, version 3e. Version 3f was released in December 2023.

[14] The VTARNG's C-12 is modeled as a Beechcraft 1900D in AEDT and military transient P-8 operations are represented as Boeing 737-800s in AEDT. All other military aircraft are modeled with NMap.

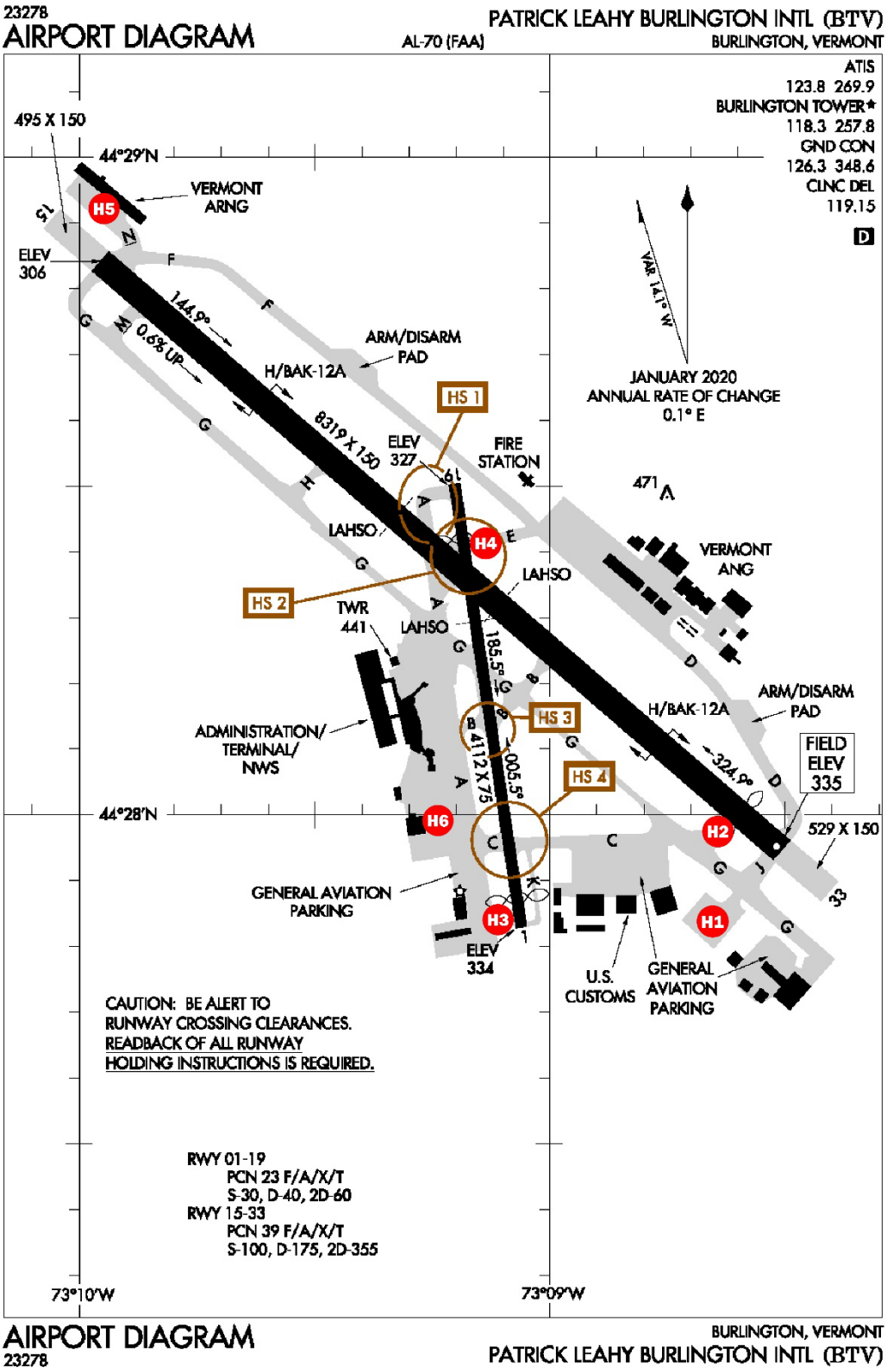

Figure 4-1. BTV Airport Diagram

Source: FAA, accessed in October 2023, HMMH addition of helipad locations

Multiple locations on the airfield serve as helicopter departure and landing points, even if they are not formally designated as helipads. For noise modeling purposes, six such locations (indicated by the red dots labeled H1 through H6 on **Figure 4-1**) are identified. **Table 4-1** provides the airport layout information used in modeling the 2024 Existing and 2029 Forecast conditions. In calculating noise, AEDT uses the following data:

- Departure thresholds (i.e. where aircraft begin their take-off roll)
- Arrival threshold (a location marked on the runway)
- Arrival threshold crossing height (TCH) (the height that arriving aircraft cross the arrival threshold)
- Runway gradient (i.e. is the runway slightly uphill or downhill)
- Runway location
- Runway direction

Runway length, runway width, instrumentation, and declared distances affect which runway an aircraft will use and under what conditions; therefore, those factors, together with weather constraints, determine runway usage proportions for each category of operations.

Table 4-1. Current Airport Layout Data

Sources: FAA 5010, BTV staff, and pilot interviews, 2023

Runway End or Helipad	Latitude	Longitude	Elevation (feet MSL)	Length (feet)	Approach Angle (degrees)	Displaced Threshold (feet)
15	44.480674	-73.165879	306	8,319	3.0	0
33	44.465758	-73.141763	335	8,319	3.2	500
19	44.474978	-73.153352	327	4,112	3.5	500
01	44.463826	-73.151003	334	4,112	4.0	225
H1	44.464083	-73.144222	320	N/A	N/A	N/A
H2	44.466368	-73.143932	333	N/A	N/A	N/A
H3	44.464046	-73.151502	332	N/A	N/A	N/A
H4	44.473678	-73.152465	328	N/A	N/A	N/A
H5	44.482399	-73.166001	300	N/A	N/A	N/A
H6	44.466413	-73.154174	323	N/A	N/A	N/A

MSL = mean sea level
Note: A helicopter can approach and land anywhere on the airfield if authorized by ATCT. The locations H1 through H6 are modeled as helicopter arrival and/or departure points but are not officially designated as helipads.

Civilian helicopters use helipads H1, H3, and H6. H1 is located between the two GA parking areas south of Runway 15/33, H3 is adjacent to the south end of Runway 1/19, and H6 is just south of the airport terminal at the north end of the GA ramp. The VTARNG operates a helipad northeast of Runway 15/33 (H5) on their ramp and they also use taxiways E (H4), C (H2), and L (H3) for helicopter takeoffs and landings.

4.2 Aircraft Operations

Personnel from the Air Force 134th Fighter Squadron provided the VTANG and VTARNG military operations data for both the Existing Conditions and the Forecast Conditions noise modeling. Civilian and transient military annual-average daily aircraft operations are based on an 18-month data sample obtained from the BTV noise and operations monitoring system[15] (NOMS), covering the period of January 1, 2022, through June 30, 2023. For each FAA category (Air Carrier, Air Taxi and GA). The Study Team used the NOMS data to determine day-night split of operations and fleet mix as required to prepare aircraft noise exposure DNL contours.

The Study Team compared the FAA ATCT counts for July 1, 2022, through June 30, 2023, to the published FAA Terminal Area Forecast (TAF) operations levels. That analysis suggested that the tower counts should be used as a basis for forecasting 2024 and 2029, rather than scaling to the TAF as was done in BTV's previous NEM update[16].

Since the control tower is closed between midnight and 5:30 a.m., NOMS flight records were used to account for overnight operations, allowing the team to develop a "tower-closed" scaling factor to apply to the tower's data. Growth rates from the FAA TAF[17] were applied to the scaled tower counts to project aircraft category totals for modeling the NEM Existing (2024) and Forecast (2029) conditions.

The Study Team met with representatives from Vermont Flight Academy, University of Vermont Health Network (Med-flight), and Beta Technologies to discuss their respective current aircraft fleets and projected operations levels for 2024 and 2029. Incorporating that information, 2022/2023 NOMS data fleet mix, and recently announced scheduled commercial service changes, the Study Team developed a detailed operational forecast for 2024. Additional expected civilian fleet changes and service-level changes are incorporated in the detailed forecast for 2029. The Study Team developed military operations forecasts in consultation with personnel from the US Air National Guard 134th Fighter Squadron (also referred to as the Vermont Air National Guard or VTANG) and personnel from the Army National Guard 86th Troop Command (also referred to as the Vermont Army National Guard or VTARNG).

Table 4-2 and **Table 4-3** provide summaries of annual aircraft operations to be modeled for the BTV NEM Existing and Forecast years. The operations are condensed into categories[18]; namely Air Carrier (AC), Air Taxi (AT), General Aviation (GA), and military (ML). AC and AT are commercial categories distinguished by aircraft capacity, while GA includes all non-commercial, non-military operations. The tables list operations as either itinerant (meaning arrivals and departures) or local (meaning aircraft that remain in the BTV airspace). For the 2029 forecast year, there are 300 more departures than arrivals. This increase is due to an estimated 300 new ALIA aircraft from BETA Technologies, which will depart from BTV's on-site factory and travel to nearby Plattsburgh Airport for final finishing before final delivery to nationwide clients.

[15] Supplied by Vector Airport Systems, LLC
[16] The tower count methodology is the more conservative option for noise modeling, resulting in totals that are 8 to 9 percent higher than TAF operations.
[17] Issued in January 2024
[18] Specified by FAA Order 7210.3 "Facility Operation and Administration"

The military operations data account for the fact that the air traffic control tower may consider multiple military aircraft flying in formation as a single count. This practice is documented in FAA Order 7210.3Y at Chapter 12, Section 12-2-1 (April 3, 2014) and verified with FAA staff. Typically, two or more aircraft take off in formation (single count) and then return individually (two or more counts). As a result, total modeled military aircraft operations numbers exceed those reported in the tower counts. A detailed discussion of the development of current and future levels of flight operations is provided in the forecast memo included in **Appendix C**. FAA reviewed the forecast memo and worked through several rounds of refinements with the Study Team from April to July 2024, until all concerns were resolved.

For the purposes of noise modeling, all local operations were modeled as closed oval-shaped patterns, which include touch-and-go operations and other practice flights.

Table 4-2. BTV Annual Aircraft Operations Summary for Existing Year 2024

Sources: FAA, 2023; HMMH, 2023; USAF 134th Fighter Squadron, 2023; BTV NOMS data, 2023

Category		Itinerant Operations				Local Operations		Totals
		Arrivals		Departures		Closed Patterns		
		Day	Night	Day	Night	Day	Night	
Civilian	Air Carrier	5,918	2,442	5,664	2,696	0	0	**16,720**
	Air Taxi	2,804	203	2,898	109	0	0	**6,013**
	GA	20,365	514	20,065	814	43,936	1,322	**87,015**
Military	VTANG	2,075	0	2,075	0	60	0	**4,210**
	VTARNG	500	31	491	40	0	0	**1,062**
	Transient	81	0	81	0	46	0	**208**
Civilian Total		**29,087**	**3,158**	**28,626**	**3,619**	**43,936**	**1,322**	**109,747**
Military Total		**2,656**	**31**	**2,647**	**40**	**106**	**0**	**5,480**
Combined Totals		**31,743**	**3,189**	**31,273**	**3,659**	**44,042**	**1,322**	**115,227**

Note: Totals may not appear to be exact due to rounding.

Table 4-3. BTV Annual Aircraft Operations Summary for Forecast Year 2029

Sources: FAA, 2023; HMMH, 2023; USAF 134th Fighter Squadron, 2023; BTV NOMS data, 2023

Category		Itinerant Operations				Local Operations		Totals
		Arrivals		Departures		Closed Patterns		
		Day	Night	Day	Night	Day	Night	
Civilian	Air Carrier	6,453	2,663	6,177	2,940	0	0	**18,233**
	Air Taxi	2,976	203	3,070	109	0	0	**6,358**
	GA	20,868	514	20,868	814	44,909	1,354	**89,327**
Military	VTANG	2,069	0	2,069	0	60	0	**4,198**
	VTARNG	500	35	498	37	0	0	**1,070**
	Transient	73	0	73	0	46	0	**192**
Civilian Total		**30,298**	**3,379**	**30,115**	**3,862**	**44,909**	**1,354**	**113,917**
Military Total		**2,642**	**35**	**2,640**	**37**	**106**	**0**	**5,460**
Combined Totals		**32,940**	**3,414**	**32,755**	**3,899**	**45,015**	**1,354**	**119,377**

Note: Totals may not appear to be exact due to rounding.

Table 4-4 and **Table 4-5** provide detailed operations data for each modeled aircraft type within the civilian and military aircraft categories. The specific aircraft types listed indicate the aircraft noise and performance (ANP) data accessed by the AEDT or NMap program in the noise calculation. The small numbers of transient military aircraft operations are grouped together in this table as fighter jets or transport aircraft. All fighter jets were modeled in NMap.

Table 4-4. BTV Annual Flight Operations for Existing Year 2024

Sources: FAA, 2023; HMMH, 2023; USAF 134th Fighter Squadron, 2023; BTV NOMS data, 2023

Category		ANP type	Arrivals		Departures		Closed Patterns		Totals
			Day	Night	Day	Night	Day	Night	
Air Carrier	Jet	757RR	160	-	155	5	-	-	**321**
		757PW	118	-	118	-	-	-	**236**
		A319-131	328	256	283	301	-	-	**1,168**
		A320-232	256	-	251	5	-	-	**512**
		717200	-	257	-	257	-	-	**515**
		737700	276	40	275	41	-	-	**632**
		737800	333	189	44	479	-	-	**1,045**
		7378MAX	51	261	-	312	-	-	**625**
		CRJ9-ER	2,764	1,435	2,912	1,287	-	-	**8,398**
		EMB170	521	-	521	-	-	-	**1,042**
		EMB175	1,110	3	1,105	8	-	-	**2,227**
Air Taxi & GA	Jet	CNA560XL	904	-	889	15	-	-	**1,808**
		CNA680	419	29	423	25	-	-	**897**
		CL600	279	21	299	-	-	-	**599**
		CNA55B	831	47	797	81	39	9	**1,803**
	Piston	GASEPF	2,169	-	2,169	-	6,876	-	**11,213**
		CNA172	10,253	216	10,039	431	23,525	1,023	**45,487**
		CNA182	1,300	-	1,300	-	293	-	**2,894**
		GASEPV	1,506	14	1,497	23	5,072	102	**8,213**
		COMSEP	1,054	6	1,048	11	162	-	**2,281**
	Turboprop	CNA208	1,217	178	1,280	115	61	-	**2,852**
		DHC6	785	-	785	-	-	-	**1,571**
	Helicopter	R22	1,660	19	1,646	34	7,759	180	**11,299**
		SA350D	158	3	150	11	88	-	**409**
		EC130	634	183	640	176	60	9	**1,701**
VTANG	Jet	F-35A	2,075	-	2,075	-	60	-	**4,210**
VTARNG	Helicopter	H-60M	149	19	156	12	-	-	**336**
		UH-72	301	12	287	26	-	-	**626**
	Turboprop	C-12	50	-	48	2	-	-	**100**
Transient	Jet	Fighters	42	-	42	-	-	-	**84**
	Jet	Transport	29	-	29	-	6	-	**64**
	Turboprop	Transport	10	-	10	-	40	-	**60**
Totals			**31,733**	**3,189**	**31,263**	**3,659**	**44,002**	**1,322**	**115,227**

Notes:
Totals may not appear to be exact due to rounding.
Military Transients include fighters (F16C, F18E/F, F-35A, and F-22) and various transport aircraft (jet KC46 and turboprop C130J), all of which were modeled in NMap, except the P-8 (which is represented by 737-800 in AEDT).
The VTARNG C-12 was modeled as a Beechcraft 1900D in AEDT.
Military helicopters were modeled in Nmap.

Table 4-5. BTV Annual Flight Operations for Forecast Year 2029

Sources: FAA, 2023; HMMH, 2023; USAF 134th Fighter Squadron, 2023; BTV NOMS data, 2023

Category		ANP type	Arrivals		Departures		Closed Patterns		Totals
			Day	Night	Day	Night	Day	Night	
Air Carrier	Jet	757RR	175	-	170	5	-	-	**349**
		757PW	129	-	129	-	-	-	**258**
		A319-131	357	279	309	328	-	-	**1,273**
		A320-232	279	-	274	5	-	-	**558**
		737800	364	487	48	803	-	-	**1,701**
		737700	301	44	300	45	-	-	**690**
		7378MAX	56	285	-	341	-	-	**681**
		CRJ9-ER	3,014	1,565	3,175	1,404	-	-	**9,158**
		EMB170	568	-	568	-	-	-	**1,136**
		EMB175	1,211	3	1,205	9	-	-	**2,428**
Air Taxi & GA	Jet	CNA560XL	926	-	911	15	-	-	**1,852**
		CNA680	445	29	449	25	-	-	**949**
		CL600	296	21	317	-	-	-	**633**
		CNA55B	858	47	824	81	39	9	**1,858**
	Piston	GASEPF	2,201	-	2,201	-	6,999	-	**11,402**
		CNA172	9,239	195	9,037	397	19,070	893	**38,832**
		CNA182	1,349	-	1,349	-	308	-	**3,007**
		GASEPV	2,816	35	2,794	56	9,967	254	**15,923**
		COMSEP	1,069	6	1,064	11	164	-	**2,313**
	Turboprop	CNA208	1,269	178	1,331	115	62	-	**2,956**
		DHC6	825	-	825	-	-	-	**1,649**
	Helicopter	R22	1,744	19	1,730	34	8,147	189	**11,864**
		SA350D	166	3	158	11	92	-	**429**
		EC130	642	183	648	176	60	9	**1,718**
	Electric	GASEPV	-	-	300	-	-	-	**300**
VTANG	Jet	F-35A	2,069	-	2,069	-	60	-	**4,198**
VTARNG	Helicopter	H-60M	150	20	150	20	-	-	**340**
		UH-72	300	15	300	15	-	-	**630**
	Turboprop	C-12	50	-	48	2	-	-	**100**
Transient	Jet	Fighters	34	-	34	-	-	-	**68**
	jet	Transport	29	-	29	-	6	-	**64**
	Turboprop	Transport	10	-	10	-	40	-	**60**
Totals			**32,940**	**3,414**	**32,755**	**3,899**	**45,015**	**1,354**	**119,377**

Notes:
Totals may not appear to be exact due to rounding.
Military Transients include fighters (F16C, F18E/F, F-35A, and F-22) and various transport aircraft (jet KC46 and turboprop C130J), all of which were modeled in NMap, except the P-8 (which is represented by 737-800 in AEDT).
The VTARNG C-12 was modeled as a Beechcraft 1900D in AEDT.
Military helicopters were modeled in Nmap.

4.3 Aircraft Noise and Performance Characteristics

AEDT and NMap require the use of specific noise and performance data for each aircraft type operating at the Airport. Noise data is in the form of Sound Exposure Level (SEL) at a range of distances (from 200 feet to 25,000 feet) from a particular aircraft with engines at a range of thrust levels. Performance data include thrust, speed and altitude profiles for takeoff and landing operations. The AEDT database contains standard noise and performance data for over 300 different fixed-wing aircraft types, most of which are civilian aircraft. NMap includes noise data for various military aircraft types, though unlike AEDT, NMap does not contain an internal aircraft performance database. Performance data for modeling of aircraft in NMap is developed based on information obtained through interviews with aircraft operators. Collectively, the aircraft data in both models is referred to as aircraft noise and performance (ANP) data.

Within the AEDT database, aircraft takeoff (departure) profiles are defined by a range of trip distances identified as "stage lengths." Higher stage lengths (longer trip distances) are associated with heavier aircraft due to the increase in fuel requirements for the flight. For this study, stage lengths are derived using the city-pairs information from the 2022/2023 NOMS data, determined by the distance from the originating airport (BTV) to the planned arrival city.

The Study Team used AEDT STANDARD profiles for all modeled fixed-wing civilian aircraft types. For military aircraft types modeled in NMap, the Study Team used interviews with on-base pilots to develop locally accurate representative flight profiles that are indicative of how the fighter jets operate at BTV.

Additional modeling inputs for this study were developed and submitted to the FAA for approval. The details of these inputs are included in the Study Team's correspondence with FAA in **Appendix C**. In summary, these changes include the following topics:

- Non-standard substitutions for selection of representative AEDT aircraft types
- Modeling of aircraft taxi activity
- Non-standard flight profiles for medical helicopters between BTV and a nearby hospital

4.3.1 Non-Standard Substitutions

Not all aircraft types operating at BTV have specific AEDT aircraft types or pre-approved substitutions. For those aircraft types not in the AEDT standard database, the following FAA-approved substitutions were used:

- Guimbal G-2 Cabri helicopter (substitution with ANP type R22)
- Tecnam P-Mentor (SIRA) single-engine aircraft (substitution with GASEPV)
- Piper 16 Clipper (PA16) single-engine aircraft (substitution with GASEPF)
- Pipistrel Velis Electro (PIVE) single-engine aircraft (substitution with GASEPF)
- Beta Technologies ALIA electric aircraft (substitution with GASEPV)

4.3.2 Aircraft Taxi Modeling

Taxiway noise is associated with aircraft taxiing to and from the runways to their respective parking areas or gates on the ramp. The taxiing may also include a queue time, where the aircraft is stationary, awaiting clearance to proceed, and the engines are at idle power. Non-standard modeling inputs were prepared so that AEDT could represent taxiway operations. **Appendix C** provides additional details.

4.3.3 Medical Center Helicopter Operations

The local hospital, University of Vermont Medical Center, has a helipad to facilitate patient transportation by helicopter. The helipad, designated in FAA's records as 67VT, is located approximately 2 miles west of BTV. The helicopters, mainly Eurocopter EC 135 (modeled as AEDT ANP type EC130), are serviced, maintained, and stored at FBO facilities on the east side of BTV. The helicopters fly the 2 miles between the FBO and the helipad 67VT, within the 30,000-foot radius study area requirement in 14 CFR Part 150.[19] The average altitude of the helicopters is approximately 465 feet above field elevation. **Appendix C** provides additional details on the development of the helicopter flight profiles for AEDT input.

4.3.4 Military Aircraft Flight Profile Development

The Study Team used the Department of Defense's Nmap software for modeling the noise exposure of the VTANG F-35A aircraft operations at BTV, as well as for the transient military fighter jet and the VTARNG helicopter activity. The team updated the 2018 NEM F-35A modeling data with multiple iterations of input development and refinement with the VTANG to reflect current and projected future F-35A flying operations.

The Study Team developed flight profiles for transient aircraft by using the standard profiles included with NMap and adapting them for BTV as appropriate.

4.4 Runway Use

The primary factor affecting runway use at airports is weather; specifically, the wind direction and speed. Additional factors that may affect runway use include the position of airport facilities, including passenger terminals, GA ramps, fixed based operators, and other unique factors related to an airport's configuration relative to the position and direction of the runways.

Civilian runway utilization percentages input to the noise model are based on the most recent 12 months of data obtained from the BTV NOMS. The data provides counts of operations using each runway by category (Air Carrier, Air Taxi, or General Aviation) and aircraft category (jet, turboprop, piston, or helicopter). There are no known changes to the airport configuration or any known changes to aircraft flight procedures expected during the five-year forecast period of this Part 150 Study, and as such, the same runway utilization rates are used for both 2024 and 2029.

[19] 14 CFR Part 150 Appendix-A-to-Part-150(b)(1)

Table 4-6, **Table 4-7**, and **Table 4-8** provide the modeled runway use percentages for arrivals, departures, and closed patterns, respectively. VTANG provided the Study Team with all military runway use. The transient military category includes military fighter jets and military transport aircraft.

Table 4-6. BTV Arrival Runway Use, Fixed Wing Aircraft

Sources: USAF 134th Fighter Squadron, 2023; HMMH analysis of BTV NOMS data, 2023

Aircraft Category	Day Usage Percent By Runway End					Night Usage Percent By Runway End				
	15	33	1	19	Total	15	33	1	19	Total
Air Carrier Jet	54.4%	45.6%	--	--	**100%**	60.7%	39.3%	--	--	**100%**
Air Taxi/GA Jet	53.0%	47.0%	--	--	**100%**	58.2%	41.8%	--	--	**100%**
Civilian Non-Jet	28.5%	31.3%	16.1%	24.1%	**100%**	53.9%	29.2%	7.8%	9.1%	**100%**
VTANG Jet (F-35As)	50.0%	50.0%	--	--	**100%**	--	--	--	--	
VTARNG Turboprop	53.0%	47.0%	--	--	**100%**	--	--	--	--	
Transient Military	53.0%	47.0%	--	--	**100%**	--	--	--	--	

Notes:
Totals may not appear to add to 100% due to rounding.
No military arrivals were modeled in the nighttime frame (10 p.m. to 7 a.m.).

Table 4-7. BTV Departure Runway Use, Fixed Wing Aircraft

Sources: USAF 134th Fighter Squadron, 2023; HMMH analysis of BTV NOMS data, 2023

Aircraft Category	Day Usage By Runway End					Night Usage By Runway End				
	15	33	1	19	Total	15	33	1	19	Total
Air Carrier Jet	50.9%	49.1%	--	--	**100%**	64.8%	35.2%	--	--	**100%**
Air Taxi/GA Jet	51.6%	48.4%	--	--	**100%**	42.7%	57.3%	--	--	**100%**
Civilian Non-Jet	21.4%	28.0%	18.2	32.4	**100%**	24.8%	32.2%	18.9%	24.1	**100%**
VTANG Jet (F-35As)	50.0%	50.0%	--	--	**100%**	--	--	--	--	
VTARNG Turboprop	44.0%	56.0%	--	--	**100%**	44.0%	56.0%	--	--	**100%**
Transient Military	44.0%	56.0%	--	--	**100%**	--	--	--	--	

Notes:
Totals may not appear to add to 100% due to rounding.
The rare military departures modeled in the nighttime frame (10 p.m. to 7 a.m.) are VTARNG C-12s.

Table 4-8. BTV Closed Pattern Runway Use

Sources: USAF 134th Fighter Squadron, 2023; HMMH analysis of BTV NOMS data, 2023

Aircraft Category	Day Usage By Runway End					Night Usage By Runway End				
	15	33	1	19	Total	15	33	1	19	Total
GA Fixed Wing Aircraft	12.6%	26.3%	20.8	40.4	**100%**	18.7%	23.9%	15.9%	41.5	**100%**
GA Helicopters	4.0%	2.9%	28.1	65.0	**100%**	9.1%	0.0%	29.5%	61.4	**100%**
VTANG Jet (F-35As)	50.0%	50.0%	--	--	**100%**	--	--	--	--	
Transient Military	44.0%	56.0%	--	--	**100%**	--	--	--	--	

Notes:
Totals may not appear to add to 100% due to rounding.
Military pattern operations are only conducted in the day period (7 a.m. to 10 p.m.)
Civilian helicopter patterns are modeled using the runway ends instead of the helipads; military helicopters do not fly pattern operations at BTV.

Arrow diagrams provide the same modeled runway use data in a graphical format for the most important aircraft categories[20]. **Figure 4-2** and **Figure 4-3** depict the modeled civilian and military jet runway use, respectively. **Figure 4-4** and **Figure 4-5** show the modeled runway use for the civilian non-jet fixed wing arrivals/departures and closed pattern flights, respectively. The arrows indicate the direction of flight and percentages are provided for day and night runway usage (where night is defined as 10 p.m. to 7 a.m.).

Table 4-9 provides helipad use at BTV, with the helipad numbering[21] as shown on **Figure 4-1**. Civilian helicopters arrive and depart from helipads H1, H3, and H6, with most arrivals and departures occurring on H1 and H3. The civilian helipad usage was derived from the NOMS data. Based military helicopters arrive and depart from helipads H2, H3, H4, and H5, with most arrivals and departures occurring to or from H5 (the VTARNG ramp). VTARNG provided the Study Team with the military helipad usage for modeling.

Table 4-9. BTV Helipad Usage

Sources: VTARNG, BTV staff; HMMH analysis of BTV NOMS data, 2024

Helipad Designation	Military Helicopters Arrivals & Departures		Civilian Helicopters Arrivals		Civilian Helicopters Departures	
	Day	Night	Day	Night	Day	Night
H1	-	-	42.8%	20.6%	29.5%	21.8%
H2	30%	30%	-	-	-	-
H3	4%	4%	50.2%	77.5%	51.9%	74.4%
H4	10%	10%	-	-	-	-
H5	56%	56%	-	-	-	-
H6	-	-	7.0%	2.0%	18.6%	3.8%
Totals	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Note: Totals may not appear to add to 100% due to rounding.

[20] From a noise perspective, the most important aircraft categories at BTV are the based VTANG Jets (F-35As) and the civilian jets, due to their noise levels, and the civilian non-jets, due to their frequency of operation.
[21] The helipad numbering was applied for noise modeling purposes only; these are not official airport designations.

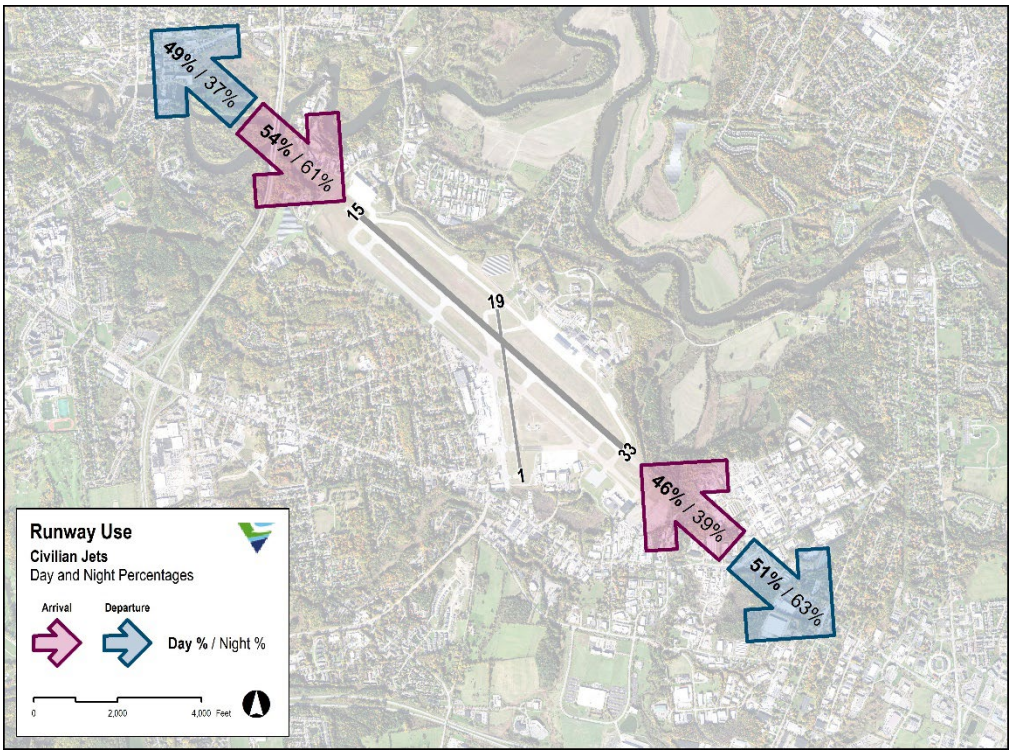

Figure 4-2. Civilian Jets Runway Use

Source: HMMH analysis of BTV NOMS data, 2024

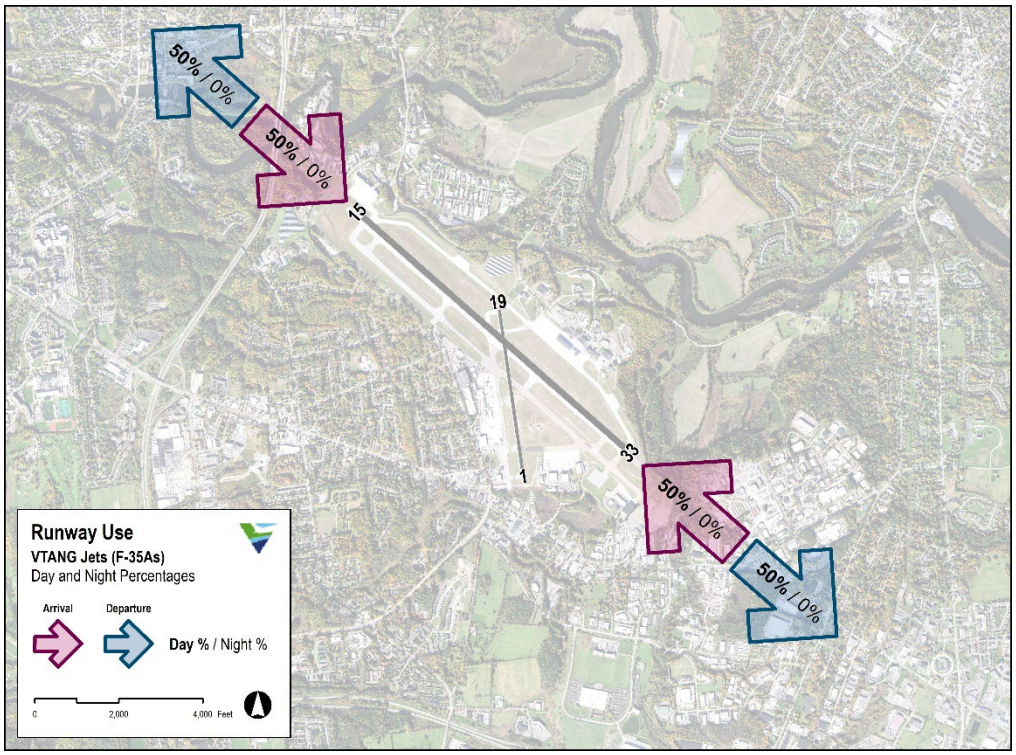

Figure 4-3. Military Jets Runway Use

Source: VTARNG, 2024

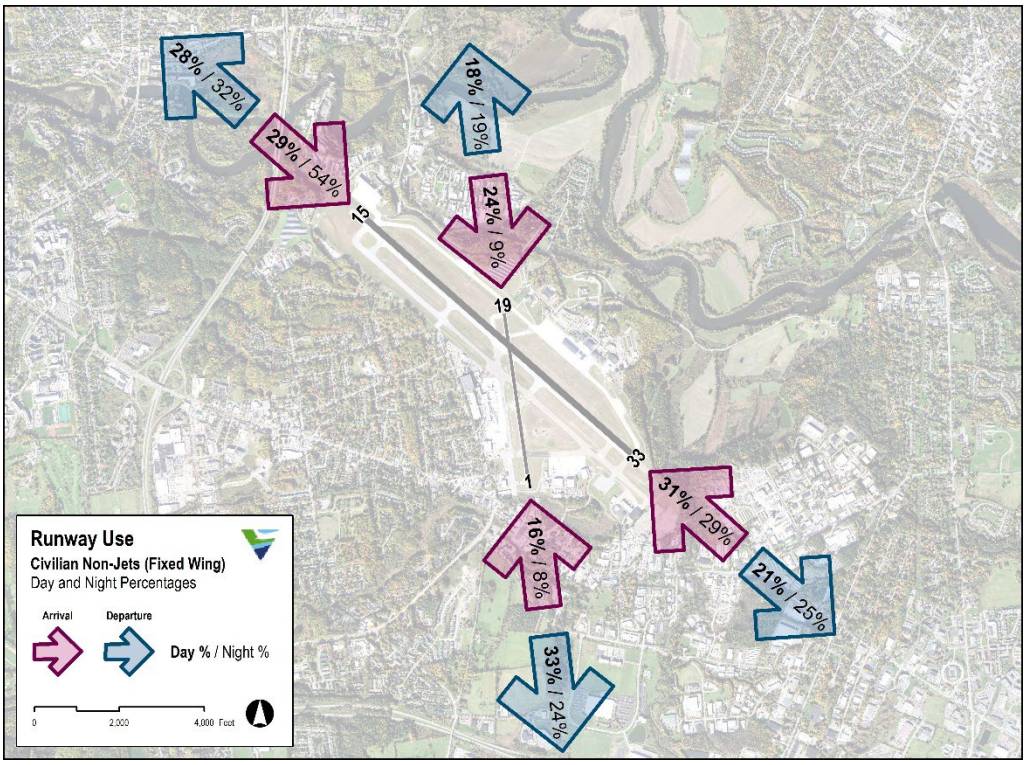

Figure 4-4. Civilian Non-Jets Runway Use, Arrivals and Departures

Source: HMMH analysis of BTV NOMS data, 2024

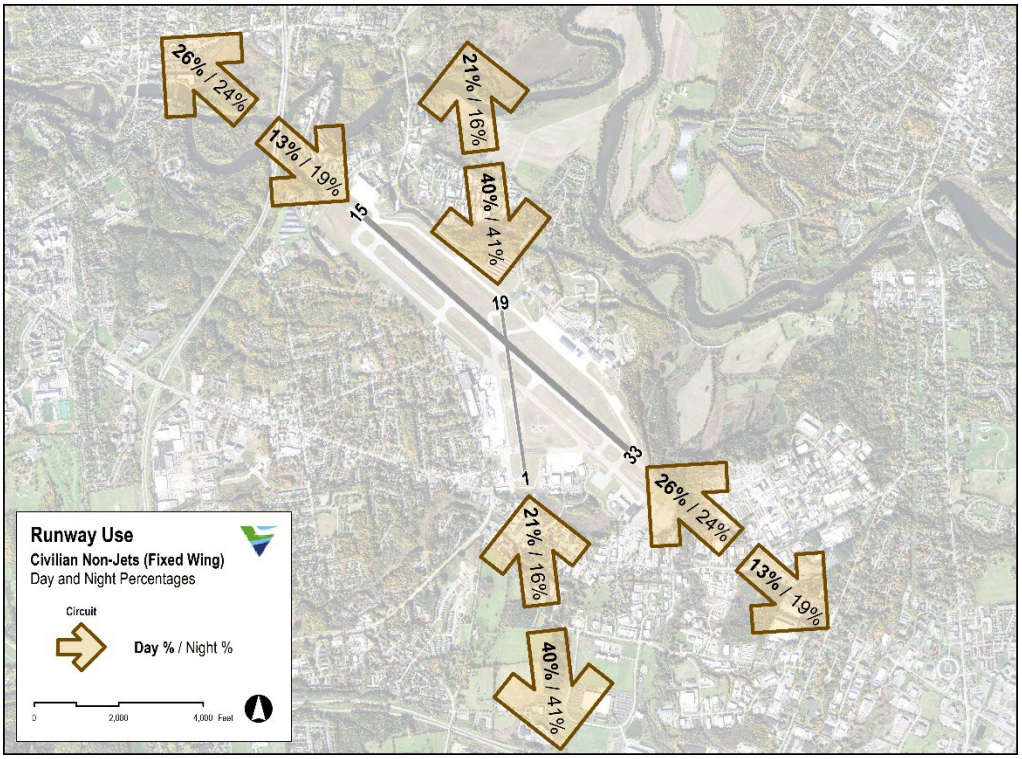

Figure 4-5. Civilian Non-Jets Runway Use, Closed Patterns

Source: HMMH analysis of BTV NOMS data, 2024

4.5 Flight Track Geometry and Usage

AEDT requires flight tracks for each runway and type of operation. Flight tracks are defined in the model as the ground path that the aircraft flies; assigned flight track utilization defines how often that track is flown by each category of aircraft. All flight track utilization rates for this study are defined relative to the runway end. The number of operations modeled on any given track is determined by multiplying the operations (presented in **Section 4.2**) by the runway use (presented in **Section 4.4**) and finally by the track usage for each individual aircraft type.

The Study Team examined actual flight tracks from the BTV NOMS and built representative model flight tracks for each grouping of similar tracks. The development process separates flight tracks by operation type (e.g., arrival or departure), runway end, and engine category (jet, propeller, helicopter). Next, flight track groups are "bundled" according to flight path direction and similarity of geometry for each set of operations. Each bundle is then used to create a "backbone" model flight track with an equal number of dispersion sub-tracks on either side of the backbone track. **Figure 4-6** provides an example for one grouping of flight tracks, specifically those for jet aircraft arriving from the northwest to Runway 15.

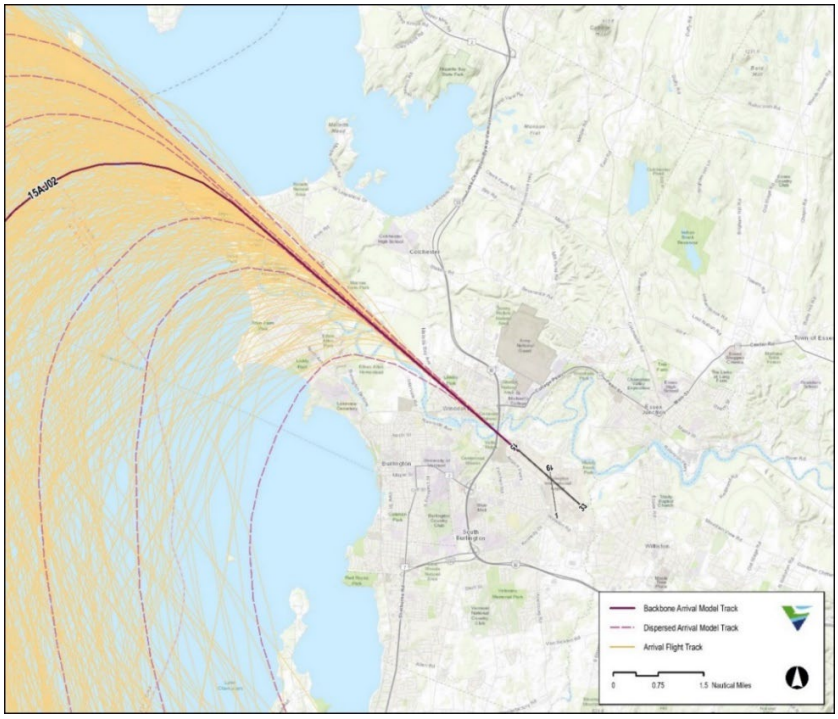

Figure 4-6. Example Model Track (15AJ02) with Sub-tracks
Sources: BTV NOMS, HMMH analysis, 2023

The software calculated the geometric mean of the group to form model track 15AJ02. The flight track naming convention uses the runway as the first two characters, then A, D, or C (for arrival, departure, or closed pattern), followed by J, N, or H (for jet, non-jet, or helicopter), with a final two-digit number for distinction. The dispersion around a backbone track is represented by a set of sub-tracks, distanced from the backbone according to the distribution of the original flight track data. Operations are assigned to

the tracks in each bundle using percentages from a mathematical bell curve. **Figure 4-6** shows the backbone track as a solid line, the distribution sub-tracks as dashed lines, and the actual flight tracks from the BTV NOMS plotted under the modeled tracks in orange.

4.5.1 Civilian Aircraft Flight Tracks

Figure 4-7 through **Figure 4-15** present the full set of civilian model flight tracks overlaid on the corresponding actual flight tracks for each group of civilian aircraft operations**. Table 4-10** through **Table 4-15** provide flight track usage; the track names in the tables match the labels on the Figures.

- Civilian jet operations: **Figure 4-7**, **Figure 4-8** and **Table 4-10**
- Civilian non-jets arrivals and departures: **Figure 4-9**, **Figure 4-10**, **Table 4-11** and **Table 4-12**
- Civilian non-jet closed patterns: **Figure 4-11** and **Table 4-13**.
- Civilian helicopter operations: **Figure 4-12** through **Figure 4-15**, **Table 4-14** and **Table 4-15**.

Civilian helicopters perform short-hop operations between the helipads at BTV and the helipad at the University of Vermont (UVM) Medical Center, which is located about a mile west of the Airport. These operations and the corresponding model flight tracks are shown in **Figure 4-15**.

The Part 150 regulation specifies that flight tracks for the existing condition and forecast year timeframes may be on supplemental graphics but must use the same land use base map and scale as the existing condition and forecast year NEM. These flight track maps are provided in **Appendix D**.

PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-7
Model Flight Tracks - Civilian Jet Arrivals

15AJ01
15AJ06
15AJ02
15AJ04
15AJ05
33AJ06
15AJ03
33AJ03
33AJ02
33AJ01
33AJ05

COLCHESTER
WINOOSKI
BURLINGTON
ESSEX
ESSEX JUNCTION
SOUTH BURLINGTON
WILLISTON
RICHMOND
SHELBURNE

Backbone Arrival Model Track
Dispersed Arrival Model Track
Arrival Flight Track

Runway
Major / Minor Road
Town Boundary
Railroad
Water / Stream

Land Use
- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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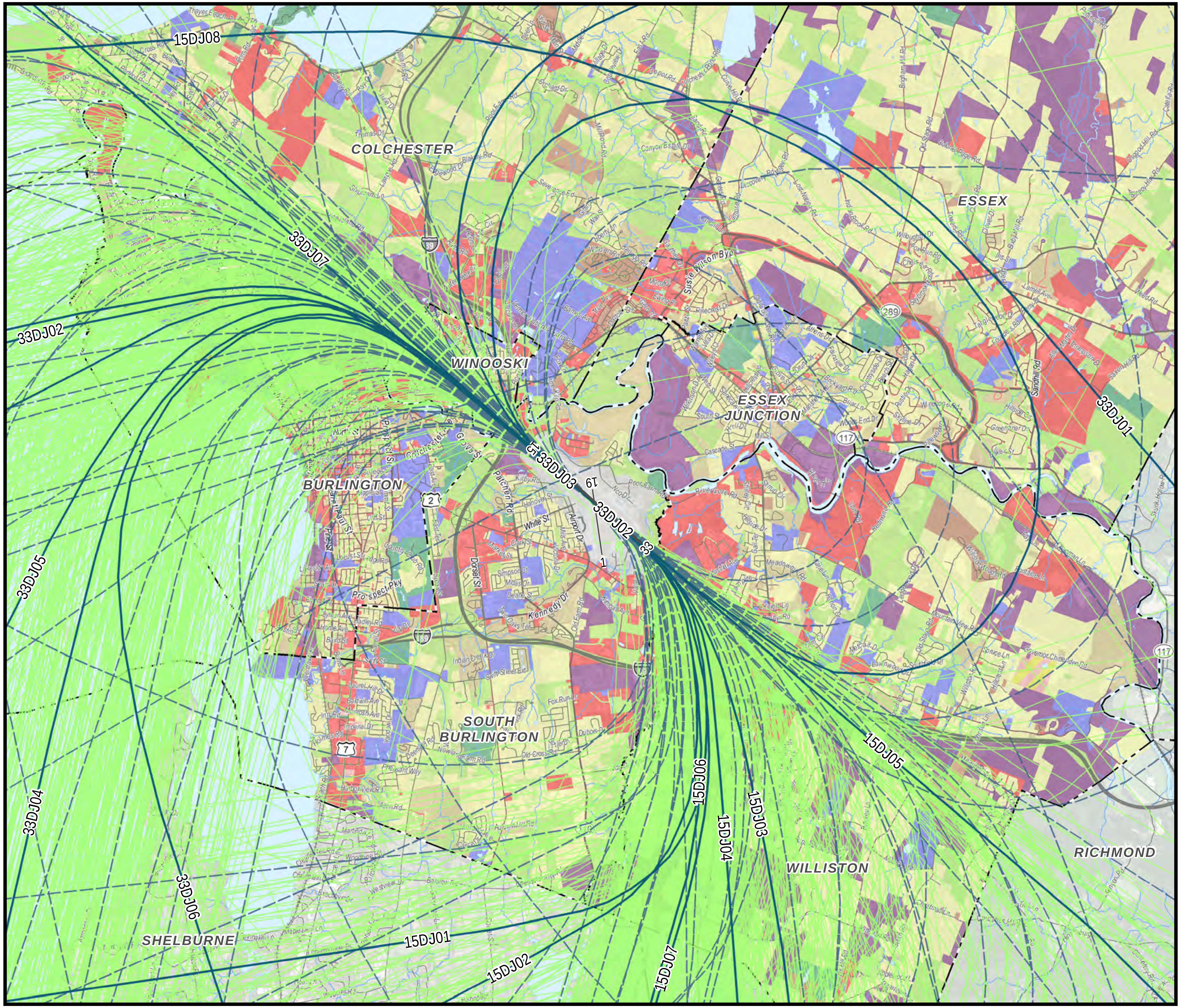
PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-8
Model Flight Tracks - Civilian Jet Departures



- Backbone Departure Model Track
- Dispersed Departure Model Track
- Departure Flight Track
- Runway
- Major / Minor Road
- Railroad
- Town Boundary
- Water / Stream

Land Use

- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-9
Model Flight Tracks - Civilian Non-Jet Arrivals

15AN01
15AN02
15AN04
19AN06
15AN06
33AN01
01AN07
33AN05
19AN01
19AN05
15AN03
01AN03
19AN07
33AN06
19AN02
01AN06
15AN07
01AN02
01AN04
01AN05
19AN03
33AN07
33AN02
33AN04
33AN08
33AN03
19AN04
01AN01

COLCHESTER
WINOOSKI
BURLINGTON
ESSEX
ESSEX JUNCTION
SOUTH BURLINGTON
WILLISTON
RICHMOND
SHELBURNE

Backbone Arrival Model Track
Dispersed Arrival Model Track
Arrival Flight Track

Runway
Major / Minor Road
Railroad
Town Boundary
Water / Stream

Land Use
- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-10
Model Flight Tracks - Civilian Non-Jet Departures

- Backbone Departure Model Track
- Dispersed Departure Model Track
- Departure Flight Track

- Runway
- Major / Minor Road
- Railroad
- Town Boundary
- Water / Stream

Land Use

- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-11
Model Flight Tracks - Civilian Non-Jet Closed Patterns

- Backbone Circuit Model Track
- Dispersed Circuit Model Track
- Circuit Flight Track

- Runway
- Major / Minor Road
- Railroad
- Town Boundary
- Water / Stream

Land Use

- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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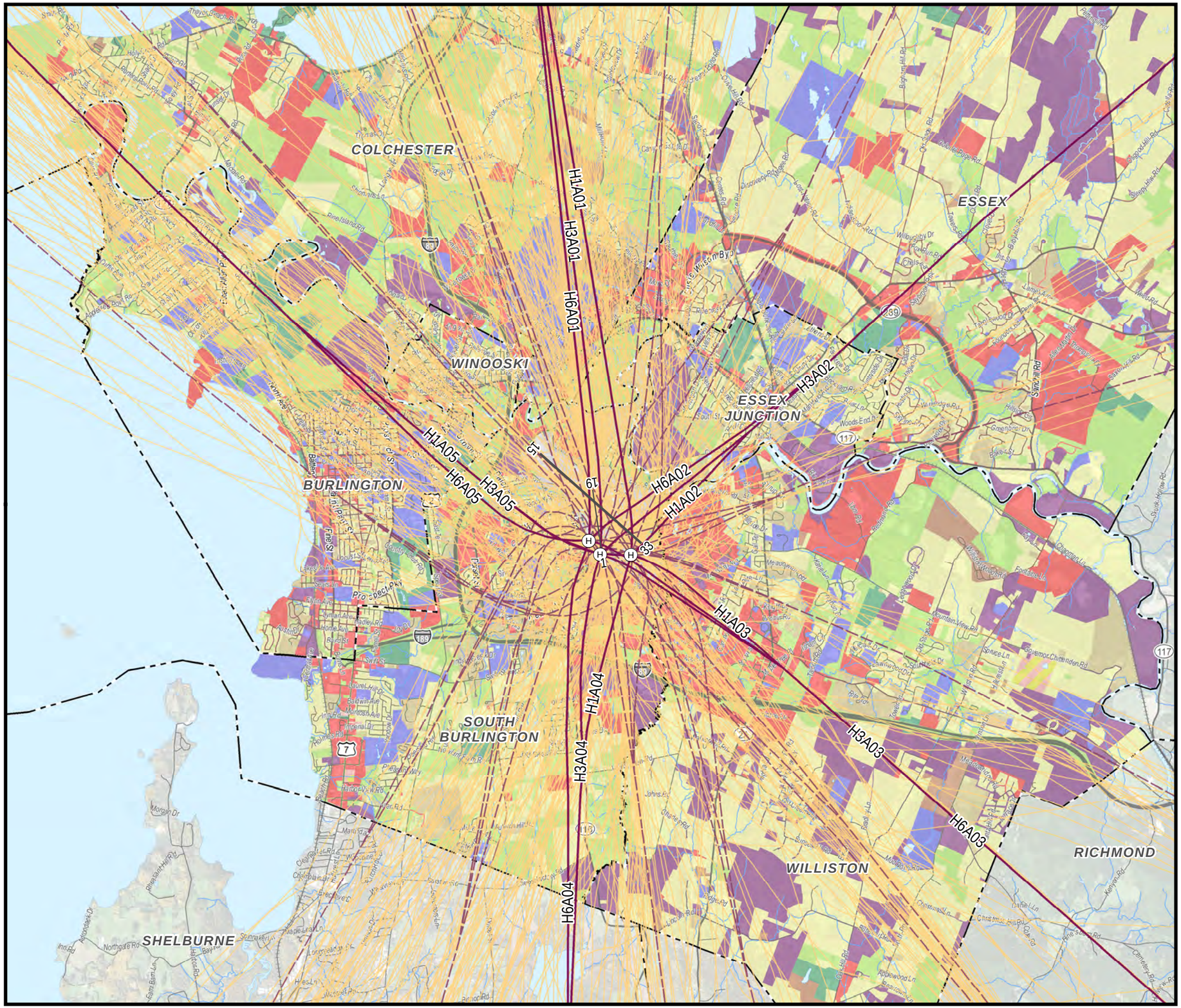
PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-12
Model Flight Tracks - Civilian Helicopter Arrivals



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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-13
Model Flight Tracks - Civilian Helicopter Departures

- Backbone Departure Model Track
- Dispersed Departure Model Track
- Departure Flight Track

- Runway
- Major / Minor Road
- Town Boundary
- Helicopter Pad
- Railroad
- Water / Stream

Land Use
- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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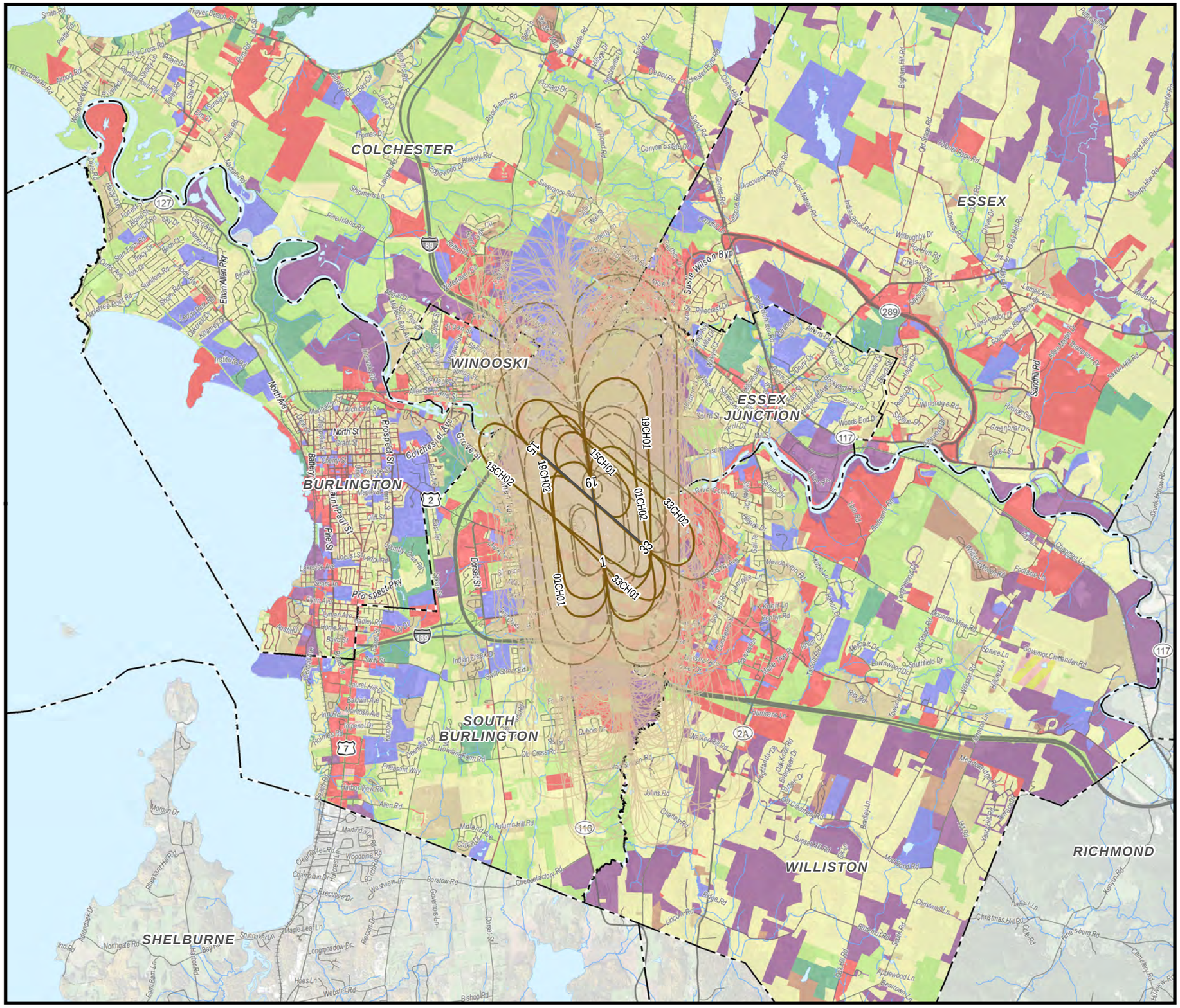
PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-14
Model Flight Tracks - Civilian Helicopter Circuits



Backbone Circuit Model Track
Dispersed Circuit Model Track
Circuit Flight Track

Runway
Major / Minor Road
Town Boundary
Railroad
Water / Stream

Land Use
- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-15
Model Flight Tracks - Civilian Helicopter Traffic between BTV and UVM Helipad

- Departure Model Track
- Departure Flight Track
- Arrival Model Track
- Arrival Flight Track

- Runway
- Helicopter Pad
- Major / Minor Road
- Railroad
- Town Boundary
- Water / Stream

Land Use

- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.25 0.5 Nautical Miles

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Table 4-10. Civilian Jet Aircraft Flight Track Use

Sources: HMMH, 2023; BTV NOMS data, 2023

Track Name	Air Carrier		Air Taxi		GA	
	Day	Night	Day	Night	Day	Night
Arrivals						
Runway 15						
15AJ01	16.1%	6.7%	13.6%	11.7%	16.6%	22.0%
15AJ02	65.5%	52.0%	57.9%	37.9%	53.4%	44.1%
15AJ03	0.7%	0.2%	7.5%	1.0%	10.5%	2.5%
15AJ04	0.0%	0.0%	4.4%	0.0%	3.9%	0.0%
15AJ05	0.6%	0.8%	0.8%	0.0%	0.9%	1.7%
15AJ06	17.0%	40.3%	15.8%	49.5%	14.8%	29.7%
Runway 33						
33AJ01	49.6%	2.5%	50.2%	7.5%	37.3%	7.2%
33AJ02	47.5%	96.1%	41.7%	90.0%	53.4%	89.2%
33AJ03	0.1%	0.0%	0.6%	0.0%	1.0%	0.0%
33AJ04	1.9%	0.1%	4.3%	1.3%	4.1%	2.4%
33AJ05	0.9%	1.4%	0.4%	1.3%	0.3%	0.0%
33AJ06	0.1%	0.0%	2.7%	0.0%	3.9%	1.2%
Departures						
Runway 15						
15DJ01	6.5%	8.4%	10.8%	2.3%	10.0%	15.4%
15DJ02	12.1%	5.4%	7.9%	4.5%	8.8%	5.1%
15DJ03	1.9%	0.4%	1.9%	1.1%	2.2%	2.6%
15DJ04	32.4%	17.9%	38.1%	46.6%	33.0%	23.1%
15DJ05	2.7%	1.3%	10.0%	8.0%	14.7%	15.4%
15DJ06	0.2%	0.0%	1.6%	2.3%	4.2%	0.0%
15DJ07	43.7%	66.6%	28.9%	35.2%	25.4%	35.9%
15DJ08	0.5%	0.0%	0.7%	0.0%	1.7%	2.6%
Runway 33						
33DJ01	0.0%	0.2%	6.5%	10.4%	12.1%	12.1%
33DJ02	10.1%	10.0%	9.3%	10.4%	11.5%	15.2%
33DJ03	17.6%	4.7%	9.2%	7.8%	12.7%	10.6%
33DJ04	61.9%	77.9%	47.3%	35.1%	36.8%	45.5%
33DJ05	8.8%	6.6%	16.1%	28.6%	9.4%	3.0%
33DJ06	1.1%	0.5%	6.0%	5.2%	6.9%	3.0%
33DJ07	0.5%	0.2%	3.6%	0.0%	6.5%	7.6%
33DJ08	0.1%	0.0%	2.0%	2.6%	4.2%	3.0%

Table 4-11. Civilian Non-jet Aircraft Arrival Flight Track Use

Sources: HMMH, 2023; BTV NOMS data, 2023

	Turboprops				Pistons			
	Air Taxi		GA		Air Taxi		GA	
Track Name	Day	Night	Day	Night	Day	Night	Day	Night
Runway 15								
15AN01	2.0%	1.0%	8.7%	20.7%	7.1%	11.1%	12.8%	19.6%
15AN02	32.2%	29.2%	20.2%	20.7%	33.3%	22.2%	16.3%	15.5%
15AN03	41.3%	1.0%	12.8%	6.9%	14.3%	11.1%	9.2%	18.6%
15AN04	1.0%	0.0%	5.3%	0.0%	7.1%	0.0%	12.6%	1.0%
15AN06	9.5%	1.0%	27.9%	24.1%	9.5%	33.3%	24.9%	10.3%
15AN07	14.0%	67.7%	25.1%	27.6%	28.6%	22.2%	24.2%	35.1%
Runway 33								
33AN01	6.6%	0.0%	15.2%	12.0%	2.1%	0.0%	14.5%	2.3%
33AN02	11.6%	49.1%	20.0%	12.0%	29.8%	0.0%	20.0%	30.2%
33AN03	1.8%	0.0%	12.1%	12.0%	0.0%	16.7%	6.4%	18.6%
33AN04	57.5%	47.4%	31.1%	44.0%	46.8%	66.7%	16.5%	23.3%
33AN05	2.9%	0.0%	12.4%	4.0%	4.3%	0.0%	23.1%	2.3%
33AN06	0.3%	0.0%	2.3%	4.0%	0.0%	0.0%	6.0%	2.3%
33AN07	4.5%	1.8%	1.7%	0.0%	2.1%	0.0%	8.5%	16.3%
33AN08	14.8%	1.8%	5.1%	12.0%	14.9%	16.7%	5.0%	4.7%
Runway 01								
01AN01	23.3%	0.0%	70.8%	50.0%	52.4%	0.0%	27.2%	22.2%
01AN02	0.0%	0.0%	0.0%	0.0%	9.5%	0.0%	11.4%	13.9%
01AN03	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	0.0%
01AN04	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	3.2%	2.8%
01AN05	6.7%	100.0%	16.7%	50.0%	14.3%	0.0%	24.3%	38.9%
01AN06	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	2.8%
01AN07	70.0%	0.0%	12.5%	0.0%	9.5%	0.0%	23.8%	19.4%
Runway 19								
19AN01	0.0%	0.0%	3.6%	0.0%	3.7%	0.0%	6.5%	0.0%
19AN02	86.0%	0.0%	32.1%	0.0%	33.3%	50.0%	14.8%	32.4%
19AN03	6.5%	100.0%	0.0%	0.0%	18.5%	0.0%	4.6%	16.2%
19AN04	2.7%	0.0%	46.4%	100.0%	18.5%	0.0%	32.4%	32.4%
19AN05	4.3%	0.0%	17.9%	0.0%	0.0%	0.0%	5.5%	5.4%
19AN06	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	7.4%	5.4%
19AN07	0.0%	0.0%	0.0%	0.0%	14.8%	0.0%	19.7%	8.1%
19AN08	0.5%	0.0%	0.0%	0.0%	11.1%	0.0%	9.1%	0.0%

Table 4-12. Civilian Non-Jet Aircraft Departure Flight Track Use

Sources: HMMH, 2023; BTV NOMS data, 2023

Track Name	Turboprops				Pistons			
	Air Taxi		GA		Air Taxi		GA	
	Day	Night	Day	Night	Day	Night	Day	Night
Runway 15								
15DN01	0.6%	0.0%	7.9%	15.6%	0.0%	0.0%	5.1%	6.3%
15DN02	4.3%	9.1%	15.4%	12.5%	2.6%	12.5%	5.6%	3.2%
15DN03	20.0%	86.4%	27.9%	40.6%	25.6%	0.0%	18.1%	31.7%
15DN04	13.4%	0.0%	12.9%	6.3%	12.8%	12.5%	11.4%	6.3%
15DN05	1.6%	0.0%	9.8%	15.6%	0.0%	0.0%	9.9%	7.9%
15DN06	11.9%	0.0%	7.9%	0.0%	7.7%	12.5%	16.4%	9.5%
15DN07	2.7%	0.0%	4.0%	6.3%	0.0%	0.0%	7.2%	9.5%
15DN08	44.3%	4.5%	9.4%	3.1%	41.0%	50.0%	9.2%	12.7%
15DN09	1.1%	0.0%	4.8%	0.0%	10.3%	12.5%	17.1%	12.7%
Runway 33								
33DN01	4.8%	0.0%	6.0%	0.0%	6.2%	0.0%	6.1%	4.4%
33DN02	0.2%	0.0%	3.1%	2.1%	9.2%	0.0%	10.2%	4.4%
33DN03	2.8%	0.0%	21.5%	39.6%	4.6%	5.0%	13.3%	10.3%
33DN04	38.7%	82.5%	30.9%	25.0%	27.7%	0.0%	29.1%	35.3%
33DN05	35.4%	5.0%	14.6%	4.2%	26.2%	75.0%	14.7%	23.5%
33DN06	7.4%	5.0%	18.3%	22.9%	6.2%	0.0%	10.1%	8.8%
33DN07	10.5%	7.5%	5.6%	6.3%	20.0%	20.0%	16.4%	13.2%
Runway 01								
01DN01	79.0%	0.0%	21.3%	0.0%	60.0%	100.0%	13.8%	20.5%
01DN02	0.9%	0.0%	2.2%	25.0%	0.0%	0.0%	5.6%	8.4%
01DN03	0.0%	0.0%	6.7%	0.0%	20.0%	0.0%	11.9%	8.4%
01DN04	11.3%	0.0%	48.3%	50.0%	0.0%	0.0%	30.4%	27.7%
01DN05	0.9%	0.0%	10.1%	0.0%	0.0%	0.0%	5.9%	9.6%
01DN06	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.0%	3.6%
01DN07	7.8%	100.0%	11.2%	25.0%	20.0%	0.0%	23.5%	21.7%
Runway 19								
19DN01	27.8%	0.0%	15.4%	0.0%	21.9%	11.1%	17.1%	17.0%
19DN02	13.2%	66.7%	18.9%	18.2%	25.0%	0.0%	21.4%	22.0%
19DN03	0.7%	33.3%	12.4%	27.3%	1.6%	0.0%	7.6%	4.0%
19DN04	21.2%	0.0%	13.0%	9.1%	21.9%	77.8%	12.9%	22.0%
19DN05	0.7%	0.0%	6.5%	0.0%	7.8%	0.0%	8.8%	5.0%
19DN06	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	2.9%	0.0%
19DN07	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	4.4%	3.0%
19DN08	36.4%	0.0%	33.7%	45.5%	18.8%	11.1%	24.8%	27.0%

Table 4-13. Civilian Fixed Wing (Non-Jet) Closed Pattern Track Use

Sources: HMMH, 2023, BTV NOMS data, 2023

Track Name	Fixed Wing Aircraft	
	Day	Night
Runway 01		
01CN01	83.5%	55.6%
01CN02	16.5%	44.4%
Runway 15		
15CN01	91.2%	100.0%
15CN02	8.8%	0.0%
Runway 19		
19CN01	92.3%	67.6%
19CN02	7.7%	32.4%
Runway 33		
33CN01	76.4%	58.3%
33CN02	23.6%	41.7%

Table 4-14. Civilian Helicopter Flight Track Use, Arrivals and Departures

Sources: HMMH, 2023; BTV NOMS data, 2023

Track Name	H1		H3		H6	
	Day	Night	Day	Night	Day	Night
Arrivals						
H*A01	20.7%	0.3%	35.9%	2.4%	35.9%	2.4%
H*A02	2.8%	0.5%	4.8%	3.7%	4.8%	3.7%
H*A03	7.7%	6.7%	13.3%	51.2%	13.3%	51.2%
H*A04	16.5%	2.5%	28.6%	19.5%	28.6%	19.5%
H*A05	10.1%	3.0%	17.4%	23.2%	17.4%	23.2%
H*A06*	42.4%	87.0%	0.0%	0.0%	0.0%	0.0%
Departures						
H*D01	15.0%	3.2%	16.6%	4.4%	16.6%	4.4%
H*D02	6.3%	7.5%	7.0%	10.4%	7.0%	10.4%
H*D03	24.5%	26.6%	27.0%	36.6%	27.0%	36.6%
H*D04	27.0%	12.7%	29.8%	17.5%	29.8%	17.5%
H*D05	17.9%	22.6%	19.7%	31.1%	19.7%	31.1%
H*D06*	9.2%	27.3%	0.0%	0.0%	0.0%	0.0%

Note: The H1A06* and H1D06* tracks are “short hops” between BTV and UVM, shown on Figure 4-15; all other helicopter arrival and departure tracks are shown in Figure 4-12 and Figure 4-13.

Table 4-15. Civilian Helicopter Circuit Track Use

Sources: HMMH, 2023, BTV NOMS data, 2023

Track Name	Helicopters	
	Day	Night
Runway 01		
01CH01	79.0%	85.7%
01CH02	21.0%	14.3%
Runway 15		
15CH01	83.3%	100.0%
15CH02	16.7%	0.0%
Runway 19		
19CH01	77.3%	54.5%
19CH02	22.7%	45.5%
Runway 33		
33CH01	48.5%	100.0%
33CH02	51.5%	0.0%

4.5.2 Military Aircraft Flight Tracks

Military flight track data was not available in the BTV NOMS. Military fighter jet and transient fixed wing aircraft flight tracks were derived through several meetings and data package revisions between HMMH and VTANG personnel; these are presented in **Figure 4-16** through **Figure 4-18**. **Table 4-16** provides the corresponding flight track usage. The flight tracks are named by the runway ends and types of operation. The numbers are non-sequential because the track names used in prior NEM modeling efforts were retained for consistency where tracks were re-used.

Military helicopter flight tracks were developed through meetings with the VTARNG. The helicopter flights were modeled following the same ground tracks for both arrivals and departures, as shown in **Figure 4-19**. **Table 4-17** provides corresponding track usage. Military helicopter flight tracks names include a 2-letter identifier of AG for “Army Guard”, an A or D to indicate arrival or departure, and a final letter for differentiation.

The model flight track maps required by the Part 150 regulation must use the same land use base map and scale as the existing condition and forecast year NEM. These are provided in **Appendix D**, with **Figure D-4** collectively portraying all modeled military flight tracks.

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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-16
Model Flight Tracks - Military Fixed Wing Aircraft Arrivals

Arrival Model Track

Runway

Major / Minor Road

Railroad

Town Boundary

Water / Stream

Land Use

- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-17
Model Flight Tracks - Military Fixed Wing Aircraft Departures

Departure Model Track

Runway

Major / Minor Road

Railroad

Town Boundary

Water / Stream

Land Use

- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-18
Model Flight Tracks - Military Fixed Wing Aircraft Closed Patterns

Circuit Model Track

Runway

Major / Minor Road

Railroad

Town Boundary

Water / Stream

Land Use

- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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jp

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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 4-19
Model Flight Tracks - Military Helicopter Flight Tracks

AG-AA
AG-AB
AG-AC
AG-AD
AG-AE
AG-AF
AG-AG
AG-DA
AG-DB
AG-DC
AG-DD
AG-DE
AG-DF
AG-DG

COLCHESTER
WINOOSKI
BURLINGTON
SOUTH BURLINGTON
ESSEX
ESSEX JUNCTION
WILLISTON
RICHMOND
SHELBURNE

Helicopter Model Track

Runway
Major / Minor Road
Town Boundary
Helicopter Pad
Railroad
Water / Stream

Land Use

- Single Family Residential
- Multi Family Residential
- Other Residential
- Mixed Use
- Public Use
- Airport
- Transportation
- Commercial Use
- Manufacturing & Production
- Recreational
- Open Space

0 0.5 1 2 Nautical Miles

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Table 4-16. Military Fixed-Wing Aircraft Flight Track Use

Sources: HMMH, 2023; USAF 134th Fighter Squadron, 2023

Flight Track	Based		Transient			
	F-35A		Fighter		Transport	
	Day	Night	Day	Night	Day	Night
Arrivals						
Runway 15						
15A1	35.7%	35.7%	14.3%	14.3%	100.0%	100.0%
15A4	63.9%	63.9%	85.7%	85.7%	0.0%	0.0%
15A5	0.5%	0.5%	0.0%	0.0%	0.0%	0.0%
Runway 33						
33A1	35.8%	35.8%	14.3%	14.3%	100.0%	100.0%
33A5	64.2%	64.2%	85.7%	85.7%	0.0%	0.0%
Departures						
Runway 15						
15D1	95%	95%	0.0%	0.0%	0.0%	0.0%
15D3	1%	1%	0.0%	0.0%	0.0%	0.0%
15D4	3%	3%	100.0%	100.0%	100.0%	100.0%
15D5	1%	1%	0.0%	0.0%	0.0%	0.0%
Runway 33						
33D1	95%	95%	0.0%	0.0%	0.0%	0.0%
33D2	1%	1%	0.0%	0.0%	0.0%	0.0%
33D3	3%	3%	100.0%	100.0%	100.0%	100.0%
33D4	1%	1%	0.0%	0.0%	0.0%	0.0%
Closed Patterns						
Runway 15						
15C1	100%	100%	0.00%	0.00%	0.00%	0.00%
15C3	0%	0%	0.00%	0.00%	100.00%	100.00%
Runway 33						
33C1	100%	100%	0.00%	0.00%	0.00%	0.00%
33C3	0%	0%	0.00%	0.00%	100.00%	100.00%

Table 4-17. Military Helicopter Flight Track Use

Sources: HMMH, 2023; USAF 134th Fighter Squadron, 2023; VTARNG 2023

Flight Track	Day	Night	Flight Track	Day	Night
Arrivals			**Departures**		
VTARNG Ramp (H5)					
AG-AA	20%	20%	AG-DA	20%	20%
AG-AC	15%	15%	AG-DC	15%	15%
AG-AD	20%	20%	AG-DD	20%	20%
AG-AF	1%	1%	AG-DF	1%	1%
Taxiway E (H4)					
AG-AB	10%	10%	AG-DB	10%	10%
Taxiway C (H2)					
AG-AG	30%	30%	AG-DG	30%	30%
Taxiway L (H3)					
AG-AE	4%	4%	AG-DE	4%	4%

4.6 Ground Noise Modeling Inputs

The 2024 BTV NEM includes noise from aircraft engine ground run-up operations that aircraft perform as part of pre-flight and regular maintenance. The NEM also includes noise from aircraft taxiing to and from the runways.

4.6.1 Aircraft Run-ups

NMap flight profiles include a pre-flight run-up to represent the noise at the beginning of an aircraft's takeoff roll. F-35A aircraft at BTV perform pre-flight runups at the runway ends; prior to departure, pilots hold the aircraft at Mil power[22] for approximately 1 second before brake release.

Single engine propeller-driven civilian aircraft perform pre-flight runups immediately prior to each departure flight. For modeling purposes, the AEDT inputs include single engine aircraft runups at 100 percent power for one minute at the hold-short points on the taxiways, which are represented by yellow dots marked with the prefix "HS-" and runway end on **Figure 4-20**. The aircraft heading during the runup is modeled as parallel to the runway it will depart from.

Table 4-18 summarizes the modeled maintenance runup operations. **Figure 4-20** shows the runup locations for military aircraft as blue dots, corresponding with the data in the table. Military maintenance runups are performed by VTANG F-35A aircraft at the locations marked R1, R2, and R3 on the diagram. Civilian maintenance runups in the model consist of Cessna 680 civilian jets, on Taxiway G near the Pratt & Whitney engine repair facility, and, less often, at another location south of the Pratt & Whitney facility. These locations are shown as green dots in **Figure 4-20**.

The same number and type of maintenance runups were assumed to occur under the Forecast Condition as for the Existing Condition.

[22] Mil power, or military power, is the maximum thrust level an aircraft engine can produce without engaging afterburners.

Table 4-18. F-35A Maintenance Runups at BTV

Sources: HMMH, 2023; USAF 134th Fighter Squadron, 2023; BTV staff, 2023

Aircraft Type	Engines Running	Power	Minutes per Year at Power	Runup Pad	Aircraft Heading (degrees)	% of Time at Runup Pad
F-35A	1	10%	3,888	R1	192	33%
				R2	192	33%
				R3	90	34%
		31%	100	R1	192	33%
				R2	192	33%
				R3	90	34%
Cessna 680	2	4495 LB	1,850	Txy_G	270	100%
		4259 LB	1,850	Txy_G	270	100%
		4022 LB	1,850	Txy_G	270	100%
		4732 LB	370	Txy_G	270	100%
		100 LB	1,850	Txy_G	270	100%
		208 LB	1,850	Txy_G	270	100%
		623 LB	1,850	Txy_G	270	100%
		3786 LB	1,850	Txy_G	270	100%
		3549 LB	1,850	Txy_G	270	100%
		706 LB	1,850	Txy_G	270	100%
		208 LB	1,850	VW_1	270	100%

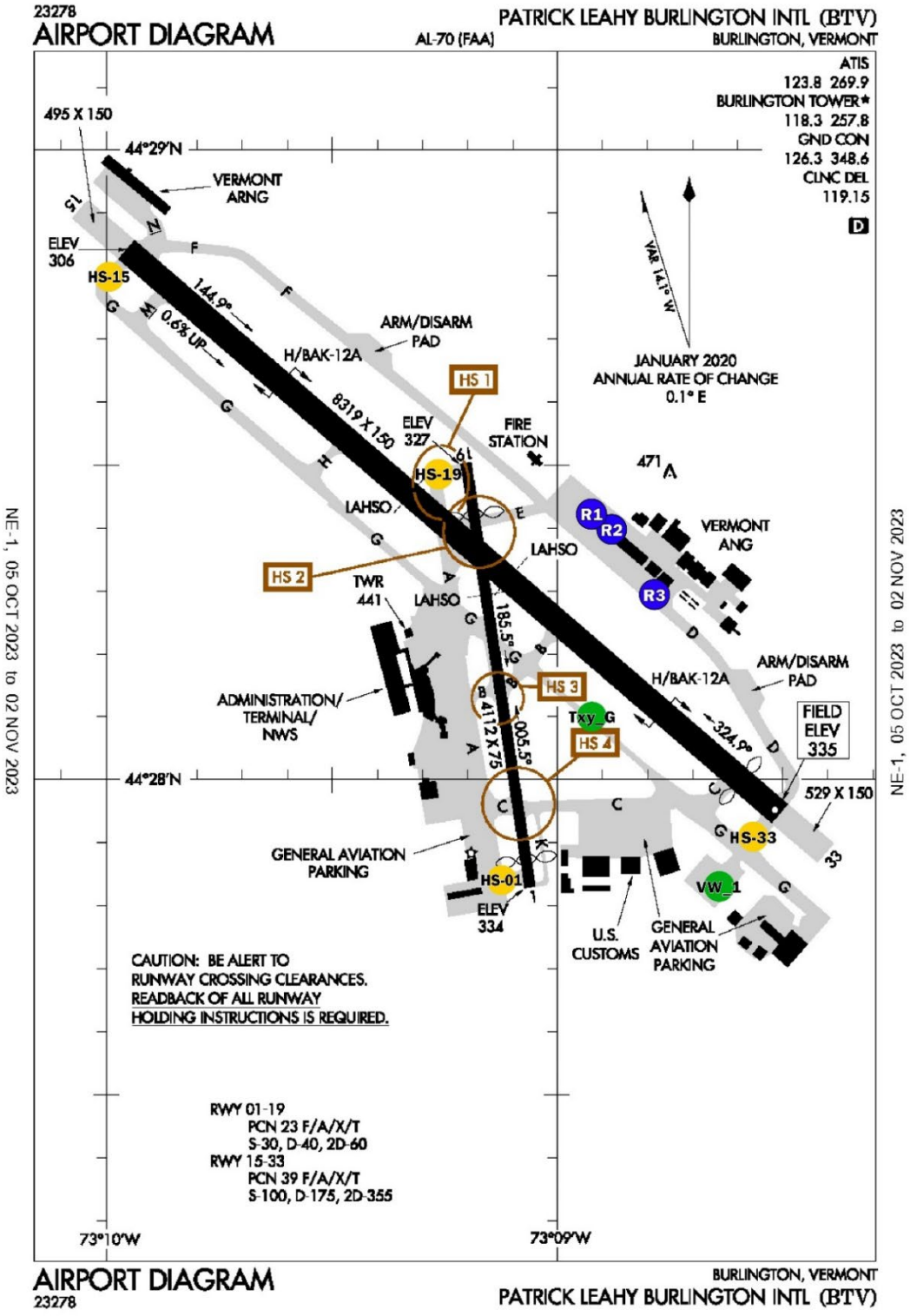

Figure 4-20. Model Runup Locations

Source: FAA, accessed in October 2023, HMMH addition of runup locations

4.6.2 Aircraft Taxi Operations

Aircraft taxiing has historically been included in noise modeling at BTV due to the proximity of several homes to BTV taxiways and consequent community interest. The taxi noise analysis methodology for this NEM update is similar to what was performed for the prior three NEM updates. The modeled taxi paths are shown on the current airport layout in **Figure 4-21**. Taxi operations for the Existing Conditions and Forecast Conditions correspond to the aircraft operations data provided in Section 4.2.

Using AEDT to represent taxi operations constitutes nonstandard modeling and thus requires FAA approval[23], which has been granted for previous NEM updates at BTV. Full details of the taxiway modeling assumptions and AEDT modeling inputs are documented in the non-standard modeling request submitted to FAA, reproduced in **Appendix C**.

The outline of the method is as follows[24]:

- An overflight operational profile is used, with an altitude of 10 ft to account for engine height.
- All taxiing occurs at a speed of 10 knots.
- The locations at which an aircraft is stationary and holding for clearance (hold points) are represented by very slow-moving aircraft. These stationary segments include:
    - Two-minute idle warm-up
    - Five-and-a-half-minute taxi hold/queue[25]
    - One-minute hold for crossing Runway 1/19
- Idle power is used for the aircraft at hold points
    - A setting of 30% maximum static thrust is used briefly to accelerate from hold points up to the taxiing speed of 10 knots.

Taxi noise modeling for this NEM update excludes taxiing of VTANG F-35A aircraft along Taxiways F and D. Taxiway modeling of the F-35A aircraft is not currently possible in NMap or AEDT and has not been included in any NEM update at BTV. Other military aircraft average less than 1 operation per day, so their taxi activities are not modeled for simplicity. In addition, there are no noise sensitive receptors near the east taxiways.

[23] Non-standard modeling approval requested in memorandum submitted to FAA from HMMH on June 12, 2024. Approval provided from FAA Office of Environment and Energy to FAA Region Environmental Protection Specialist on June 25, 2024

[24] These assumptions are consistent with the 2019 BTV NEM taxiway modeling unless otherwise noted.

[25] Based on data provided by US Department of Transportation, Bureau of Transportation Statistics for 2022 and 2023. The database is titled "Airline On-Time Performance Data, Marketing Carrier On-Time Performance (Beginning January 2018)" and is available at https://www.transtats.bts.gov.

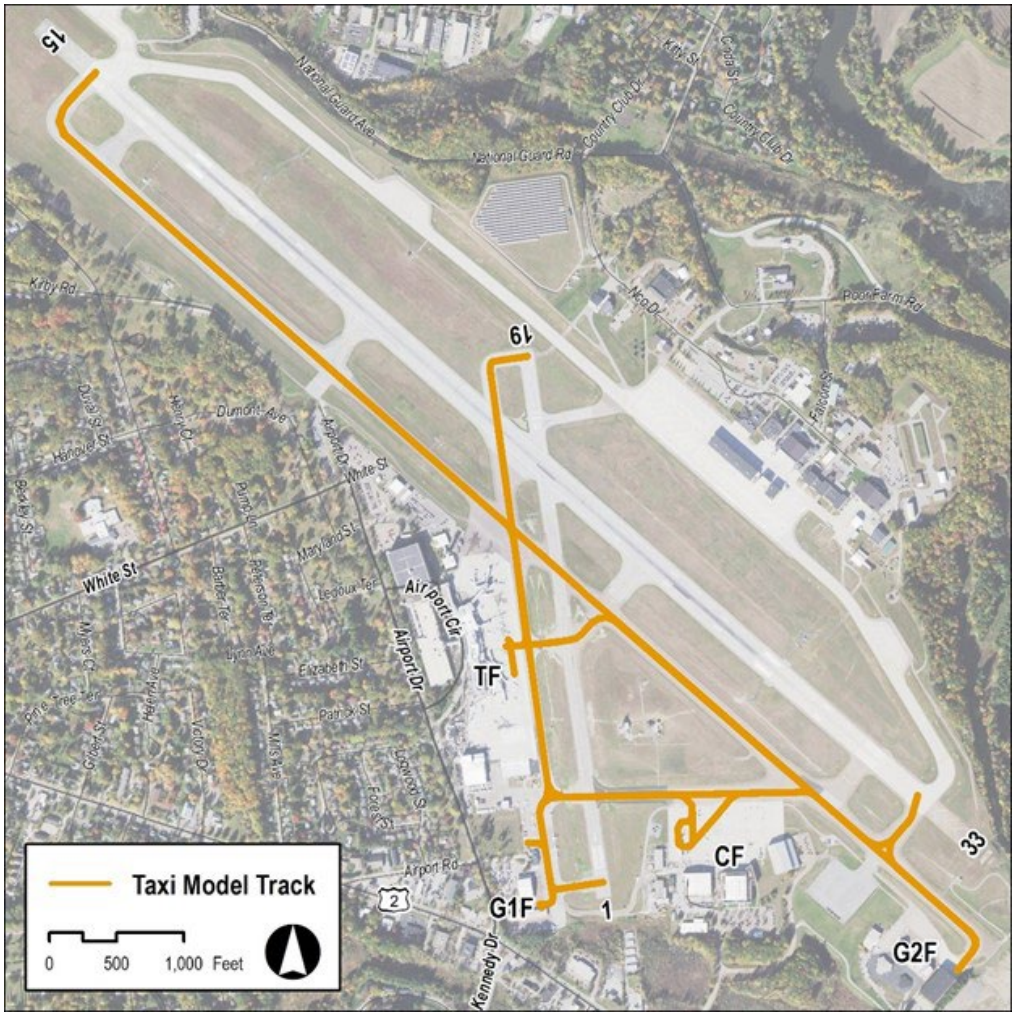

Figure 4-21. BTV Taxiways and Aircraft Taxiing Paths
Sources: HMMH, 2023; BTV NOMS data, 2023

4.7 Meteorological Conditions

The AEDT and NMap have several settings that affect aircraft performance profiles and sound propagation based on meteorological data. Meteorological settings include average annual temperature, barometric pressure, and relative humidity at the Airport. The Study Team applied the 10-year average data from the National Climatic Data Center (NCDC), which are provided in the AEDT database, to the noise modeling:

- Temperature: 47.0° F
- Sea-level Pressure: 1002.6 millibars
- Relative Humidity 65.9%
- Dew Point: 36.2° F
- Wind Speed: 6.7 knots

4.8 Terrain Data

Terrain data describes the elevation of the ground surrounding the airport and on airport property. The AEDT uses terrain data to adjust the ground level under the flight paths. The terrain data does not change the aircraft's performance or noise levels in AEDT, but it alters the vertical distance between the aircraft and a "receiver" on the ground. NMap does the same, and NMap also incorporates ground impedance data into its noise calculations as well as using terrain elevation data to account for the effect of varying topography along propagation paths from a source to a receiver. The NMap model requires the user to specify areas of land as acoustically "soft" or "hard" surfaces, based on data from the United States National Land Cover Database.

Both the AEDT and Nmap models used the terrain data from the National Elevation Dataset (NED), obtained via the United States Geological Survey (USGS) National Map Viewer.[26] The noise models accept Digital Elevation Model (DEM) data[27]. Typical input is the USGS 1 arc-second or 1/3 arc-second DEM grid data[28], with elevation data available at 1-meter vertical resolution. The latest USGS data was initially published in 2019[29]. USGS makes use of multiple available data sources, one of which is LiDAR[30], to develop the data.

At the suggestion of a TAC member during the NEM update process, the Study Team investigated an alternative terrain data source, in the form of Vermont Center for Geographic Information (VCGI)[31] data, published in 2014.[32] The VCGI DEM data is a raster grid[33] with a 0.7-meter lateral cell size and 1 cm vertical precision that is based solely on LiDAR[34]. A comparison of the USGS data to the VCGI data showed that, in most areas, the USGS and VCGI data agree when placed in the format and resolution expected by the noise models. In a few isolated locations in the NEM study area, the two data sources appeared to differ by 3 meters (approximately 10 feet) or more.

The Study Team decided to run the noise analysis with the USGS 1/3 arc second data, as is standard procedure. During the quality control review of the draft DNL contours, the noise results were compared to both the USGS and VCGI data, looking for instances in which a disagreement between the two data sources may have affected the DNL results. No apparent discrepancies were identified.

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[26] https://viewer.nationalmap.gov/basic/

[27] Elevation data given as bare earth, devoid of structures. https://www.usgs.gov/faqs/what-difference-between-lidar-data-and-digital-elevation-model-dem

[28] At a latitude of 44.4 degrees, where BTV is, an arc second is about 22 meters (about 72 feet). Correspondingly, 1/3 arc second data would be in a grid with points spaced about 7.3 meters or 24 feet apart.

[29] USGS 1/3 DEM metadata: thor-f5.er.usgs.gov/ngtoc/metadata/waf/elevation/1-3_arc-second/undefined/USGS_13_n45w074_20190416.xml

30 LiDAR stands for Light Detection and Ranging. It is a remote sensing method that uses light in the form of a pulsed laser to measure variable distances to the Earth

[31] https://vcgi.vermont.gov/

[32] VCGI metadata: https://maps.vcgi.vermont.gov/gisdata/metadata/ElevationDEM_DEMHE0p7M2014.htm

[33] A raster is a matrix of cells (or pixels) organized into rows and columns (or a grid) where each cell contains a value representing information

[34] More information on VCGI LiDAR data: https://vcgi.vermont.gov/resources/frequently-asked-questions/lidar-program-faqs

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5 2024 and 2029 Noise Exposure Maps

This chapter presents the BTV modeled aircraft noise exposure contours for calendar year 2024 (the Existing Condition) and 2029 (the five-year Forecast Condition) and the associated land use compatibility.

Modeled noise exposure contours are the fundamental elements and the key outcome of an NEM update process. The noise contours display 5-decibel increments using the DNL metric for both Existing and Forecast conditions. The contours are presented over land use maps depicting the airport layout, local land-use control jurisdictions, major land-use categories, discrete non-residential noise sensitive sites, and other information as required by Part 150.

5.1 Noise Exposure Map Figures

Figure 5-1 and **Figure 5-2** represent the formal NEMs as submitted herein for FAA acceptance as compliant with Part 150 pursuant to §150.21. As noted in item IV.D of the Part 150 Noise Exposure Maps Checklist, the regulation requires that Noise Exposure Maps depict DNL 65-, 70-, and 75- dB contours at a scale of 1 inch to 2,000 feet. **Figure 5-1** and **Figure 5-2** contain all graphical elements that Part 150 requires on NEMs, except for flight tracks, which Part 150 permits airports to submit in supplemental graphics.[35]

As noted on the NEM Checklist, the formal NEM figures include the locations of noise monitoring sites. Using data from the system, the Study Team calculated the average daily DNL values for each site for the 12-month period from July 1, 2022, through June 30, 2023. The measured DNL includes all sound sources, not just aircraft noise.

- BTV001: Chamberlain Elementary School – DNL 63.4 dB
- BTV002: Winooski City Hall – DNL 68.2 dB
- BTV003: Williston Rd & Chad Ln – DNL 73.5 dB

Figure 5-3 shows both sets of NEM contours over the land use base map for easy comparison between the Existing and Forecast Conditions contour sets. The modeling assumptions for each of the contour sets are documented in **Chapter 4** of this document. Many of the input categories do not change between the 2024 and 2029 scenarios. The main differences are in the level and mix of aircraft operations for each year, with only minimal changes over time. There is an overall increase of 3.6 percent in operations expected from 2024 to 2029, and the contour comparison figure shows minor noise increases in noise, as evidenced by the slightly larger area covered by the 2029 contours.

[35] Large-scale flight track figures (printed at 1 inch to 2,000 feet) using the same land use base map as the DNL contours are included in Appendix D, to meet FAA requirements. In printed form, these maps would measure 44 inches by 34 inches.

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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 5-1
2024 Noise Exposure Map

2024 DNL Contour (Existing Conditions)

- Town Boundary
- Airport Property Boundary
- Historic Districts
- Historic Sites
- Local Roads
- Major Roads
- Highways
- Education
- Place of Worship
- Public Gathering
- Noise Monitor
- Rivers & Streams
- Sound Insulated

2024 Land Use

- Single Family Residential (1)
- Multi Family Residential (1)
- Other Residential (1)
- Mixed Use (1)
- Public Use (1)
- Airport
- Commercial (2)
- Manufacturing & Production (2)
- Recreational (2)
- Open Space

(1) Potentially non-compatible within 65 dB DNL contour as discussed in Section 2.1.
(2) Potentially non-compatible within 70 dB DNL contour as discussed in Section 2.1.

Data Source:
Vermont Center for Geographic Information Inc. (VCGI), United States Census Bureau, National Register of Historic Places, Burlington Internationa Airport, Harris Miller Miller & Hanson Inc.

December 13, 2024

The Jones Payne Group, Inc.

North
0 1,000 2,000 3,000 4,000 ft

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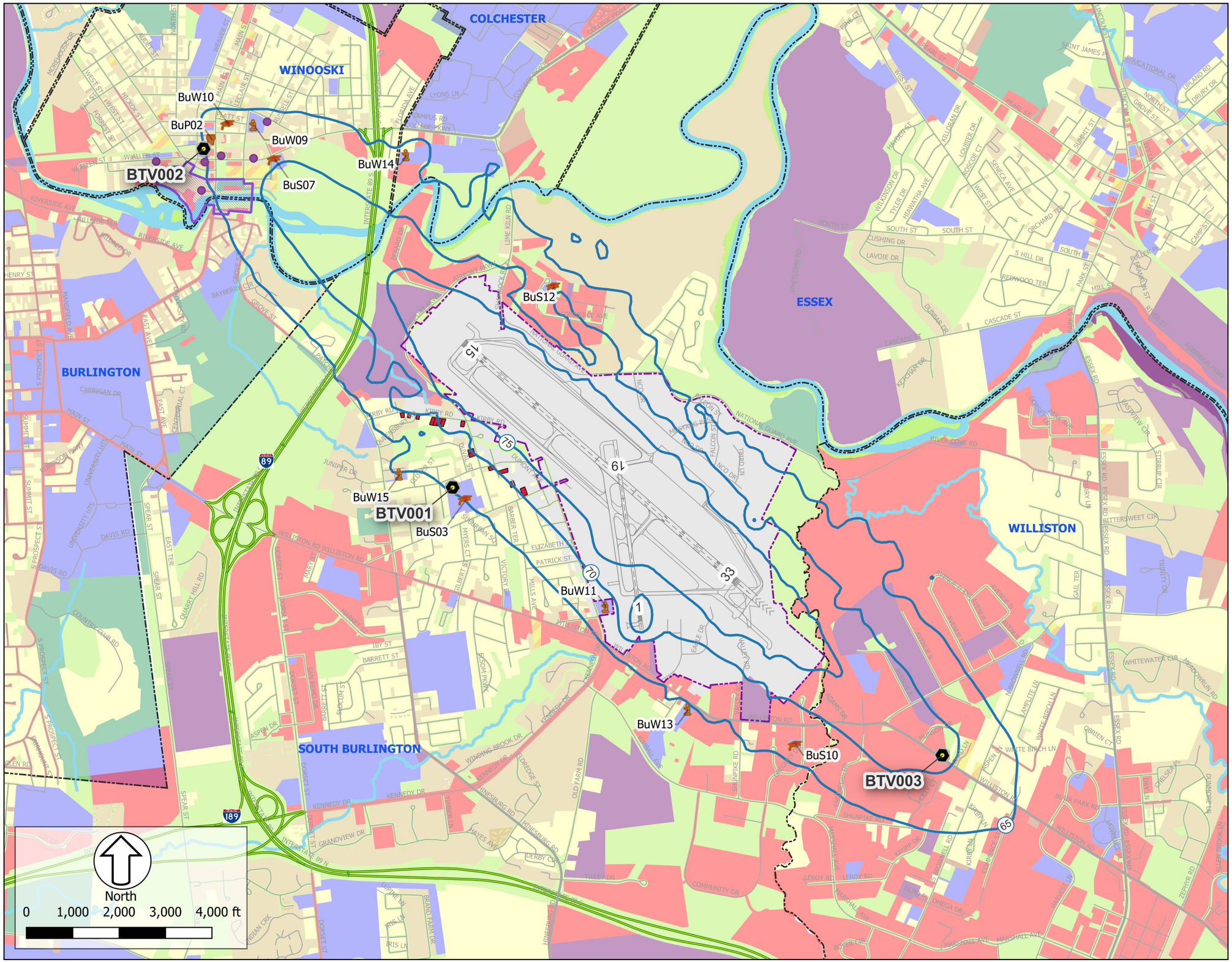

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PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 5-2
2029 Noise Exposure Map

2029 DNL Contour (Forecast Conditions)

- Town Boundary
- Airport Property Boundary
- Historic Districts
- Historic Sites
- Local Roads
- Major Roads
- Highways
- Education
- Place of Worship
- Public Gathering
- Noise Monitor
- Rivers & Streams
- Sound Insulated

2024 Land Use

- Single Family Residential (1)
- Multi Family Residential (1)
- Other Residential (1)
- Mixed Use (1)
- Public Use (1)
- Airport
- Commercial (2)
- Manufacturing & Production (2)
- Recreational (2)
- Open Space

(1) Potentially non-compatible within 65 dB DNL contour as discussed in Section 2.1.
(2) Potentially non-compatible within 70 dB DNL contour as discussed in Section 2.1.

Data Source:
Vermont Center for Geographic Information Inc. (VCGI), United States Census Bureau, National Register of Historic Places, Burlington Internationa Airport, Harris Miller Miller & Hanson Inc.

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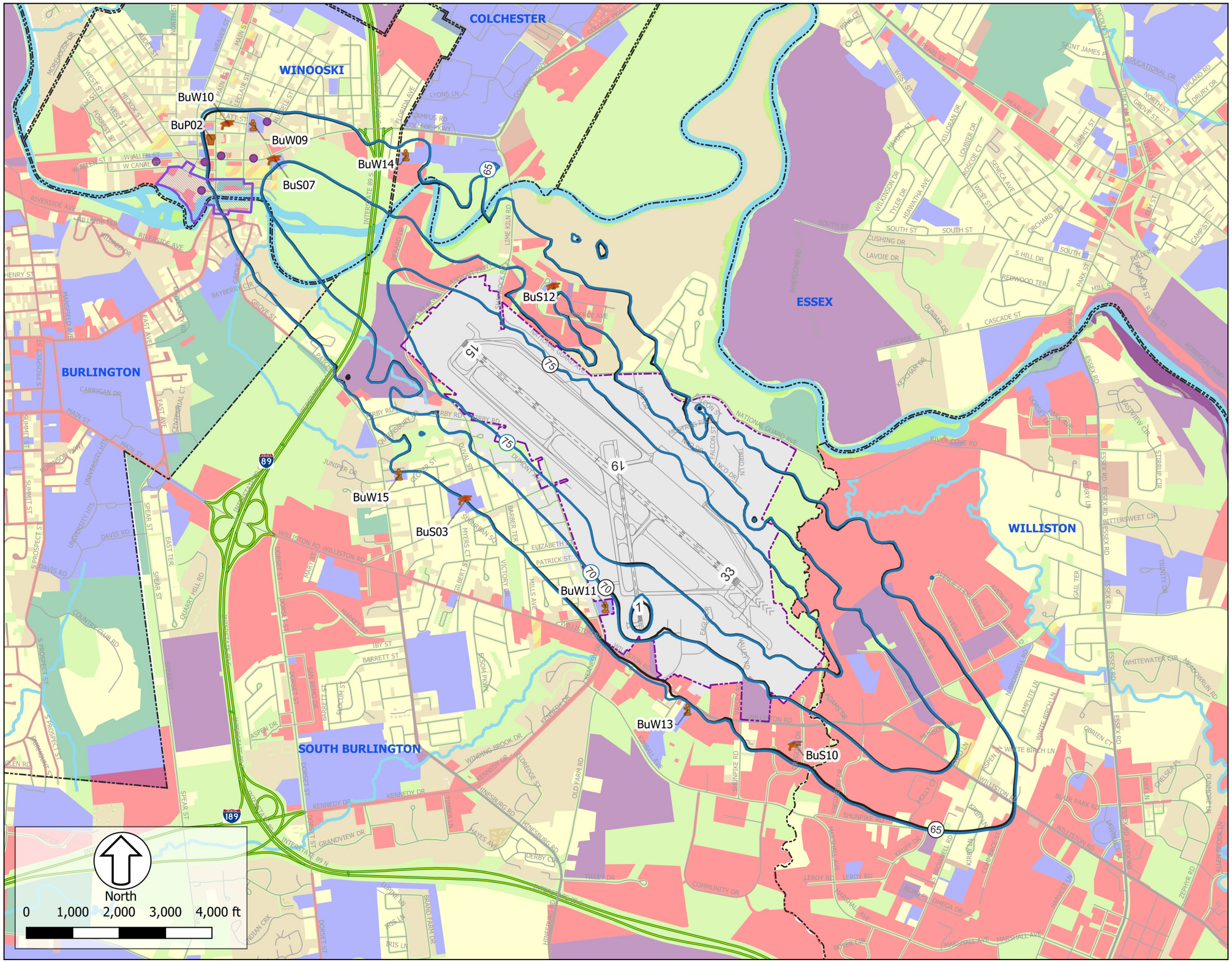

PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 5-3
Comparison of 2024 DNL contours to 2029

- 2029 DNL Contour (Forecast Conditions)
- 2024 DNL Contour (Existing Conditions)

- Town Boundary
- Airport Property Boundary
- Historic Districts
- Historic Sites
- Local Roads
- Major Roads
- Highways
- Education
- Place of Worship
- Public Gathering
- Rivers & Streams

2024 Land Use

- Single Family Residential (1)
- Multi Family Residential (1)
- Other Residential (1)
- Mixed Use (1)
- Public Use (1)
- Airport
- Commercial (2)
- Manufacturing & Production (2)
- Recreational (2)
- Open Space

(1) Potentially non-compatible within 65 dB DNL contour as discussed in Section 2.1.
(2) Potentially non-compatible within 70 dB DNL contour as discussed in Section 2.1.

Data Source:
Vermont Center for Geographic Information Inc. (VCGI), United States Census Bureau, National Register of Historic Places, Burlington Internationa Airport, Harris Miller Miller & Hanson Inc.

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5.2 Land Use Compatibility within the 2024 and 2029 Noise Exposure Maps

Based on the FAA's land use compatibility guidelines presented in **Table 2-1**, the following land uses are *potentially* incompatible with aircraft noise exposure, within the DNL 65 dB contours.[36]

- Residential land use within the DNL 65 dB and higher contours (shown in various shades of yellow or beige in the figures, including residential elements of areas shown as "Mixed Use").
- Residential homes on agricultural land within DNL 65 dB and higher contours.
- Public and private schools within DNL 65 dB and higher contours.
- Places of worship within DNL 65 dB and higher contours.
- Auditoriums, concert halls, and public meeting areas within 65 dB and higher contours.
- Government service, Manufacturing and Wholesale Trade, General Sales and Services, Transportation, Communication, and Utilities buildings within the DNL 70 dB and higher contours.

These potential incompatible land uses fall into two principal categories: (1) discrete noise sensitive receptors (e.g., educational facilities and houses of worship), and (2) residential units.

The local municipalities (land use control jurisdictions) within the 2023 DNL 65 dB NEM contour include:

- Town of Williston
- City of South Burlington
- City of Burlington
- City of Winooski
- Town of Colchester

These municipalities are all within Chittenden County. Some non-contiguous DNL 65 dB contour areas and irregular finger-shaped projections are present on the 2024 and 2029 NEMs, but to a lesser extent than for the previous NEM update.

A key element of the FAA-approved NCP for BTV in 2008 was voluntary property acquisitions and associated relocation.[37] BTV pursued that program with FAA funding support until the NCP update in 2020. The affected local municipalities expressed interest in ending the voluntary acquisition program and in transitioning to other mitigation options. The City would like to continue acquisitions to the extent the homeowner, land use jurisdiction, the FAA and the Airport/City are in agreement, but starting in 2020, the City's preference has been to implement sound insulation as the primary mitigation measure. Comparison of the 2024 and 2029 contours, as depicted in **Figure 5-3**, shows that the area within the DNL 65 dB contours is expected to increase very slightly for the 2029 forecast year, resulting in only small increases to incompatible land uses.

[36] As indicated in the notes to Table 2-1, the ultimate compatibility determination depends on the amount of outdoor to indoor "Noise Level Reduction" incorporated into the building, or for some land uses, certain portions of the building.
[37] The 2008 ROA Land Use measure #10 included voluntary property acquisitions of mobile homes within the DNL 65 dB contour and non-mobile residences within the DNL 70 dB contour.

5.2.1 Discrete Sensitive Receptors and National Register of Historic Places within the Noise Contours

The NEMs also show the locations of the identified potentially noise sensitive non-residential receptors with noise levels of DNL 65 dB or greater for either of the NEM conditions. **Table 5-1** provides a summary of the sites. **Table 5-2** lists each of the identified facilities and the calculated DNL interval on the 2024 NEM and the 2029 NEM are noted. None of these locations is currently listed on the National Register of Historic Places. **Figure 5-1** and **Figure 5-2** indicate each of the locations, labeled with the IDs designated in **Table 5-2**.

The identified noise sensitive locations could be compatible or incompatible with the aircraft noise level, depending on the building's outdoor-to-indoor Noise Level Reduction (NLR). The appropriate NLR for each activity is specified in the FAA's Land Use Compatibility table provided for reference in **Chapter 2**. The facilities identified in **Table 5-2** which are all in the DNL 65-70 dB contour interval would require an NLR of 25 dB. The NLR provided by the building is only beneficial for activities within the facilities' structure and does not provide benefit for outdoor activities.

Table 5-1. Existing (2024) and Forecast (2029) Inventory of Noise Sensitive Sites

Sources: HMMH and JPG, 2024

Contour Interval DNL (dB)	Schools		Places of Worship		Public Gathering	
	2024	2029	2024	2029	2024	2029
65-70	5	5	5	5	1	1
70-75	0	0	0	0	0	0
>75	0	0	0	0	0	0
Total	**5**	**5**	**5**	**5**	**1**	**1**

Table 5-2. Discrete Noise Sensitive Locations within the DNL 65 dB Contours for 2024 and 2029

Sources: HMMH and JPG, 2024

City/Town	Type	Facility Name	2024 Contour Interval DNL (dB)	2029 Contour Interval DNL (dB)	ID on NEMs	Acreage
Winooski	Place of Worship	Saint Stephen Church	65-70	65-70	BuW09	3.1
South Burlington	Place of Worship	Eldredge Cemetery	65-70	65-70	BuW11	2.6
South Burlington	Place of Worship	Vibrant Church	65-70	65-70	BuW13	3.4
Colchester	Place of Worship	St Stephens Cemetery	65-70	65-70	BuW14	3.5
South Burlington	Place of Worship	Ahavat Gerim Cemetery	65-70	65-70	BuW15	1.5
Winooski	Public Gathering	Veterans of Foreign Wars	65-70	65-70	BuP02	0.7
South Burlington	Education	Chamberlin Elementary School	65-70	65-70	BuS03	10.3
South Burlington	Education	Union Training Ctr, IBEW Local 300	65-70	65-70	BuS10	0.9
South Burlington	Education	Kid Logic Learning	65-70	65-70	BuS12	2.0
Winooski	Education	Heartworks Child Care Center	65-70	65-70	BuW10	0.2
Winooski	Education	Community College of Vermont	70-75	70-75	BuS07	1.8

Notes: Facility designators are the same as in the US Air Force's Final Environmental Impact Statement (2013) and the 2018 NEM where appropriate. The site ID for Heartworks Child Care Center (previously named Loveworks Child Care Center) contains a W because the building was once a place of worship.

5.2.2 Residential Population within the Noise Contours

Table 5-3 presents estimates of the land use within the 2024 and 2029 DNL contours, based on data compiled from multiple sources, including the Vermont Center for Geographic Information, airport staff, aerial photography, and street view. Each jurisdiction provided zoning information and building point data that further refined the current land use database. In the analysis, if a parcel is intersected by a contour, all dwelling units within that parcel are counted within the higher interval level. The estimated residential population is developed by multiplying the number of dwelling units within each DNL contour band by the average number of residents per dwelling unit. Based on 2020 Census data, the average household size for units within the Census blocks encompassed by the 2024 and 2029 DNL 65 dB contours is 2.33 residents.

Table 5-3. Existing (2024) and Forecast (2029) Residential Land Use Compatibility

Sources: US Census (2020), HMMH and JPG, 2024

Contour Interval DNL (dB)	Potentially Incompatible[1]		Compatible Residences		Total	
	2024	2029	2024	2029	2024	2029
Off-Airport Acreage[3]						
65-70	248	257	1	1	249	257
70-75	318	320	3	3	321	323
>75	<1	<1	0	0	<1	<1
Total	**566**	**577**	**4**	**4**	**570**	**581**
Housing Units						
65-70	1,946	2,002	3	3	1,949	2,005
70-75	472	474	18	18	490	492
>75	1	1	0	0	1	1
Total	**2,419**	**2,477**	**21**	**21**	**2,440**	**2,498**
Population (Census 2020)						
65-70	4,534	4,665	7	7	4,541	4,672
70-75	1,100	1,104	42	42	1,142	1,146
>75	2	2	0	0	2	2
Total	**5,636**	**5,771**	**49**	**49**	**5,685**	**5,820**

Notes: Acreage is calculated using the GIS parcel data obtained from the cites which may differ from the deeded acres.
1. "Potentially Incompatible" includes residential and other noise sensitive land uses; compatibility can depend on the building's outdoor-to-indoor Noise Level Reduction (NLR).
2. "Compatible" quantities in this table refer to noise-sensitive parcels made compatible by sound insulation or by easements.
3. Acreage does not include airport owned property.

The 2029 NEM contour will be utilized by the City for future land-use planning, much as the 2023 forecast contour from the previous NEM update has been used to implement the City's Residential Sound Insulation Program to date. As noted in **Section 3.2.2**, the City has completed sound insulation construction on 14 homes. The noise mitigation provided by sound insulation is designed to reduce interior noise levels to DNL 45 dB or below, which results in compatible land use. **Table 5-3** lists the 14 properties and their associated population estimates as being compatible with the aircraft noise level. **Table 5-4** presents the number of residential dwelling units and the associated population in each DNL contour interval by city or town, categorized as single-family land parcels or multi-family/mixed use.

Table 5-4 Estimated Residential Population and Dwelling Units within the DNL 65 dB Contours

Sources: US Census (2020), HMMH and JPG, 2024

Contour Interval DNL (dB)	Residential Analysis	Burlington		Colchester		South Burlington		Williston		Winooski		TOTAL	
		2024	2029	2024	2029	2024	2029	2024	2029	2024	2029	2024	2029
Single Family Parcels													
65-70	Dwelling	69	70	6	6	310	317	75	80	68	75	**528**	**548**
	Population	161	163	14	14	722	739	175	186	158	175	**1,230**	**1,277**
70-75	Dwelling	0	0	0	0	24	26	2	2	0	0	**26**	**28**
	Population	0	0	0	0	56	61	5	5	0	0	**61**	**65**
75 +	Dwelling	0	0	0	0	1	1	0	0	0	0	**1**	**1**
	Population	0	0	0	0	2	2	0	0	0	0	**2**	**2**
Total 65 +	Dwelling	**69**	**70**	**6**	**6**	**335**	**344**	**77**	**82**	**68**	**75**	555	577
	Population	**161**	**163**	**14**	**14**	**781**	**802**	**179**	**191**	**158**	**175**	1,293	1,344
Multi-Family & Mixed-Use Parcels													
65-70	Dwelling	180	185	3	3	226	234	7	7	1,005	1,028	**1,421**	**1,457**
	Population	419	431	7	7	527	545	16	16	2,342	2,395	**3,311**	**3,395**
70-75	Dwelling	98	98	0	0	23	23	1	1	342	342	**464**	**464**
	Population	228	228	0	0	54	54	2	2	797	797	**1,081**	**1,081**
75 +	Dwelling	0	0	0	0	0	0	0	0	0	0	**0**	**0**
	Population	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Total 65 +	Dwelling	**278**	**283**	**3**	**3**	**249**	**257**	**8**	**8**	**1,347**	**1,370**	1,885	1,921
	Population	**648**	**659**	**7**	**7**	**580**	**599**	**19**	**19**	**3,139**	**3,192**	4,392	4,476
Estimated Totals - All Parcel Types													
65-70	Dwelling	249	255	9	9	536	551	82	87	1,073	1,103	**1,949**	**2,005**
	Population	580	594	21	21	1,249	1,284	191	203	2,500	2,570	**4,541**	**4,672**
70-75	Dwelling	98	98	0	0	47	49	3	3	342	342	**490**	**492**
	Population	228	228	0	0	110	114	7	7	797	797	**1,142**	**1,146**
75 +	Dwelling	0	0	0	0	1	1	0	0	0	0	**1**	**1**
	Population	0	0	0	0	2	2	0	0	0	0	**2**	**2**
Total 65 +	Dwelling	**347**	**353**	**9**	**9**	**584**	**601**	**85**	**90**	**1,415**	**1,445**	2,440	2,498
	Population	**809**	**822**	**21**	**21**	**1,361**	**1,400**	**198**	**210**	**3,297**	**3,367**	5,685	5,820

5.3 Comparison of Updated DNL Contours to Previous NEM

Figure 5-4 compares the 2024 Existing Conditions DNL contours to the 2023 forecast contour that the FAA accepted on September 26, 2019. For both of these contour sets, the F-35A aircraft are the dominant noise source. In 2019, the VTANG was transitioning from F-16C aircraft to F-35A aircraft at BTV and the 2023 forecast contour was based on modeled projections of expected VTANG F-35A operations levels with flight profile data from F-35A squadrons operating elsewhere. In contrast, the 2024 Existing Conditions modeling is based on data from VTANG representing their current operating procedures and flight volume.

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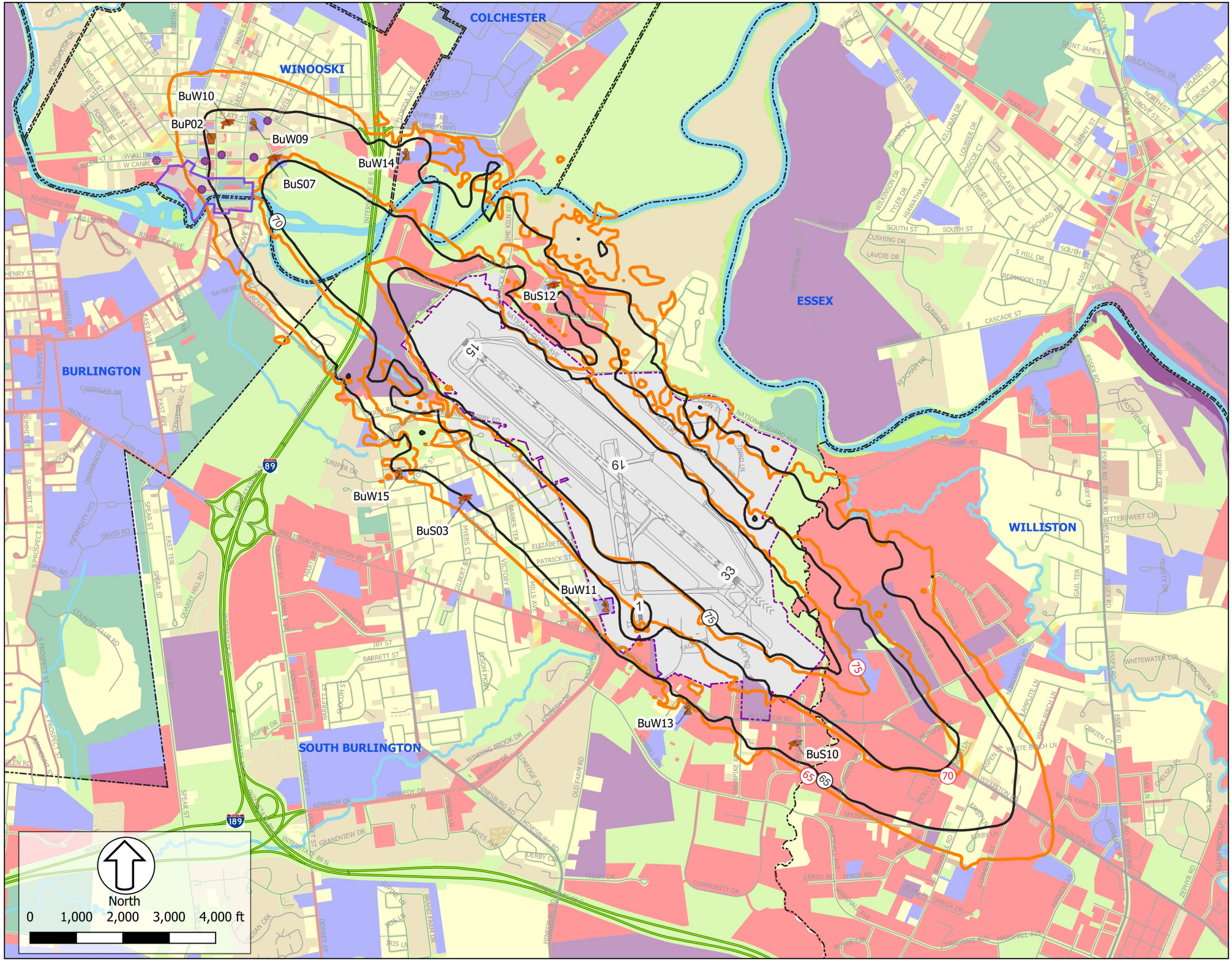

PATRICK LEAHY BURLINGTON INTERNATIONAL AIRPORT

PART 150 - NOISE EXPOSURE MAP UPDATE

Figure 5-4
Comparison of 2024 DNL contours to previous NEM's Forecast 2023

- 2024 DNL Contour (Existing Conditions)
- 2023 DNL Contour

- Town Boundary
- Airport Property Boundary
- Historic Districts
- Historic Sites
- Local Roads
- Major Roads
- Highways
- Education
- Place of Worship
- Public Gathering
- Rivers & Streams

2024 Land Use

- Single Family Residential (1)
- Multi Family Residential (1)
- Other Residential (1)
- Mixed Use (1)
- Public Use (1)
- Airport
- Commercial (2)
- Manufacturing & Production (2)
- Recreational (2)
- Open Space

(1) Potentially non-compatible within 65 dB DNL contour as discussed in Section 2.1.
(2) Potentially non-compatible within 70 dB DNL contour as discussed in Section 2.1.

Data Source:
Vermont Center for Geographic Information Inc. (VCGI), United States Census Bureau, National Register of Historic Places, Burlington Internationa Airport, Harris Miller Miller & Hanson Inc.

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The Jones Payne Group, Inc.

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Table 5-5 compares the number of residential dwelling units and the associated population identified as being exposed to DNL 65 dB or greater for forecast year 2023 in the previous NEM update to the corresponding data for 2024 and 2029. As shown in **Figure 5-4**, the 2023 forecast contour covered more area, with each contour line (DNL 65, 70, and 75 dB) generally outside of the area enclosed by the equivalent noise level contour for the 2024 Existing Conditions. Accordingly, the number of dwelling units potentially incompatible with the aircraft noise levels was greater in that earlier analysis.

Table 5-5. Comparison of Estimated Population and Dwelling Units Exposed to DNL 65 dB or Greater

Sources: 2023 Forecast NEM data as published in Burlington International Airport 14 CFR Part 150 Update 2018 and 2023 Noise Exposure Maps, September 2019, US Census (2020), HMMH and JPG, 2024

	Dwelling Units			Population		
	2023	2024	2029	2023	2024	2029
Single Family Parcels	890	598	622	2,065	1,392	1,449
Multi-Family & Mixed-Use Parcels	1,750	1,770	1,818	4,060	4,123	4,238
Estimated Totals - All Parcel Types	**2,640**	**2,368**	**2,440**	**6,125**	**5,515**	**5,687**

Note: Residential land use analysis completed in 2019 for the 2023 Forecast Conditions accessed 2010 US Census data; the current analysis for the 2024 Existing Conditions and 2029 Forecast Conditions use 2020 US Census data.

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6 Stakeholder Engagement

Part 150 study represents a unique opportunity for the study sponsor to collaborate with stakeholders on aircraft noise and to share information related to land use compatibility around the airport. This chapter describes outreach efforts conducted throughout the development of the NEM to engage airport stakeholders, including the public. Airlines, pilots, airport tenants, neighboring communities, federal, state, local agencies and those interested in aircraft noise compatibility planning were afforded an ongoing opportunity to learn about the Part 150 Study and provide comments. This occurred through various mechanisms as described in the following subsections.

6.1 Technical Advisory Committee

The Technical Advisory Committee (TAC) is the core advisory group that was consulted throughout the NEM update process. The members reviewed and provided input on study content and materials, representing their constituents' interests. Four TAC meetings took place over the course of the study and the committee was kept informed of study progress throughout. At key points in the study process, the Study Team presented information related to the NEM update and solicited input from members.

Major topics discussed at each of the TAC meetings are presented in **Table 6-1.** Copies of the TAC meeting presentations are included in **Appendix E**.

Table 6-1. Technical Advisory Committee Meetings for 2024 BTV NEM Update
Sources: Jones Payne Group, HMMH, 2024

Date	Topics covered
October 12, 2023	• Part 150 Overview • Existing NEM and NCP • Land Use Compatibility Guidelines • Noise Terminology and Noise Modeling Overview • NEM Update Study Schedule
November 30, 2023	• Noise Modeling Overview • Proposed Noise Modeling Inputs
April 11, 2024	• Review of Existing BTV Noise Compatibility Program • Responses to Questions from Previous Meeting
October 23, 2024	• Noise Modeling Results • Presentation of the Noise Exposure Map Document • Public Review Process

6.2 Project Website

Members of the public were given opportunities to follow the Study's progress and provide input. The public was encouraged to stay abreast of progress by visiting the Part 150 Study website at www.btvsound.com. All Study-related information and resources are posted on this site, including the slides presented at each of the TAC meetings.

6.3 Public Participation

As the noise modeling process progressed and this document was being developed and refined, the City and airport management offered the public opportunities to learn about the NEM and its findings and to provide input.

The draft NEM was presented at public workshops on October 23, 2024, at Chamberlin Elementary School in South Burlington, and on October 24, 2024, at Winooski High School. These workshops were advertised in local newspapers, surrounding community publications, and on social media. Staff from BTV, along with consultants from The Jones Payne Group and HMMH, were available to answer questions and explain study details. Draft copies of the NEM were available for review, and comment sheets were provided for attendees to submit feedback either at the workshops or later by mail or email.

Airport staff held meetings with officials from Burlington, South Burlington and Winooski, and verbally briefed them about the draft NEM. The draft NEM document was made available for review through the Burlington International Airport's sound Mitigation Program website, http://www.btvsound.com. A copy of the draft document was available for public review at the airport offices 1200 Airport Rd, Suite 1, South Burlington, VT, 05403.

A 30-day period was provided for public review and comment of the draft Noise Exposure Map document, starting on October 23, 2024, and ending on November 22, 2024.

6.4 Public Comments on the Draft NEM Report

During the comment period, a total of seven written comments were submitted by members of the public, elected officials, and representatives of municipal organizations. **Appendix F** presents copies of all comments received at the Airport's offices or website by November 22, 2024. In the spirit of Part 150 requirements, copies of any additional written comments will be filed with the FAA, including comments received after the deadline.

Table 6-2 lists, and provides summary descriptions of, the comments received prior to the closing of the 30-day public comment period on November 22, 2024.

Table 6-2. Summary of Received Public Comments

Source: City of Burlington, Jones Payne Group, and HMMH, 2024

Comment Category	Description
Noise Exposure Map Methodology	Concerns about reliance on noise modeling as opposed to actual noise measurements. Comments on the NCP elements. Request for description of differences between the 2023 and 2024 NEMs. Concern that sound maps only focus on average sound – not intensity. Request for additional noise monitoring. Concern that Winooski is left out of the NEM and complaint about aircraft departures late at night, especially helicopters.
F-35 Noise Measurement and Impact	Concerns about reliance on pilot interviews for F-35 noise modeling input accuracy; requesting comparison between noise recorded from monitors and the modeling based on pilot interviews. Concerns regarding the high noise levels of F-35 jets and requesting how to initiate noise measurements for F-35s. Observation that noise has worsened since 2020. Concern that F-35 taxiing was not included in the noise modeling. Concern that NCP measures are not being updated in response to the F-35 flights.
Noise Mitigation	Requesting details on soundproofing plans and more detailed maps. Requesting sound insulation, such as windows, to address noise issues.

Appendix F includes a table that lists all the comments received. Scanned copies of each of the written comments received are also contained in **Appendix F**. The following items were entered into the table for each comment:

- First and last name
- Address (city only)
- The medium in which the comment originated – written on Comment Form or email
- Comment identification number (including sub-identification number for comments addressing multiple topics)
- Comment topic (general categories addressed in each comment)

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