APPENDIX J

Noise and Noise-Compatible Land Use

NEPA

Noise Technical Report

Noise Modeling Protocol

Construction Noise Technical Report

SEPA

Health Effects of Aviation Noise

APPENDIX J

Noise and Noise-Compatible Land Use

Noise Technical Report

Sustainable Airport Master Plan – Near-Term Projects

Noise Technical Report

March 2024

PREPARED FOR
Port of Seattle

PREPARED BY
Landrum & Brown, Incorporated

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1. Introduction

Landrum & Brown prepared this Noise Technical Report to document the potential operational noise impacts resulting from the Sustainable Airport Master Plan (SAMP) Near-Term Projects (NTPs) at the Seattle-Tacoma International Airport (SEA or Airport). This report also provides information related to noise-compatible land use.

1.1 Description of the Proposed Action

The Port of Seattle (Port) identified a set of NTPs to address the near-term activity levels projected to occur at the Airport. The NTPs include 30 projects that would improve efficiency, safety, access to the Airport, and support facilities for airlines and the Airport. The NTPs (as a whole) are the Proposed Action and are shown on **Exhibit 1-1.**

In addition to the Proposed Action, the Environmental Assessment (EA) also evaluated a Hybrid Terminal Option. For the purposes of modeling aircraft noise, the Hybrid Terminal Option resulted in no differences from the Proposed Action. Therefore, the methodology, input data, and results presented in this technical report for the Proposed Action are also representative of the Hybrid Terminal Option.

1.2 Regulatory Setting

The Federal Aviation Administration (FAA) has laws and regulations that provide a basis for local development of airport plans, analysis of potential impacts from airport development, and compatibility policies. The *Airport and Airway Improvement Act of 1982* authorized funding for noise mitigation and noise compatibility planning and projects, and established certain requirements related to noise-compatible land uses for federally funded airport development projects. The 1979 *Aviation Safety and Noise Abatement Act* directs the FAA to establish, by regulation, a single system for measuring noise and determining the exposure of people to noise and to identify land uses normally compatible with various noise exposures.

This noise analysis was conducted in accordance with FAA Order 1050.1F and its associated desk reference, which specifies a number of requirements for the noise analyses. These include:

- Acceptable noise models to be used and the circumstances under which their use is required;
- The metrics to be used for characterizing the noise environment and quantifying impacts;
- Thresholds of significance for determining whether the effects of an action would constitute a significant impact under National Environmental Policy Act.
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EXHIBIT 1:1: PROPOSED ACTION

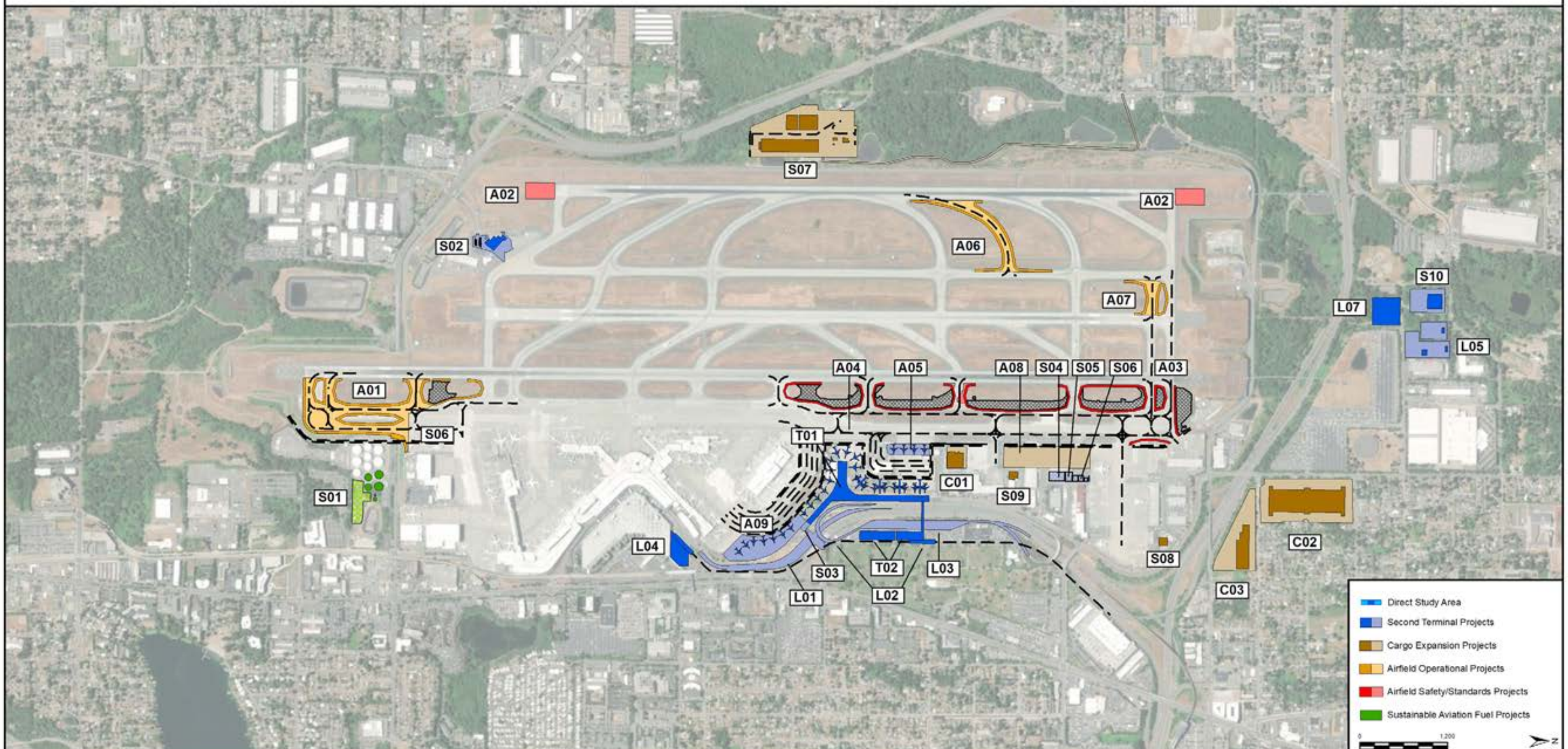
AIRSIDE
- A01 - Taxiway A/B Extension
- A02 - Runway 16R/34L Blast Pads
- A03 - Taxiway C/D Reconfiguration & RIM
- A04 - Taxiway B 500' Separation
- A05 - North Hold Pad
- A06 - Runway 34L High-Speed Exit
- A07 - Taxiway D Extension
- A08 - North Cargo Hardstand
- A09 - Central Hardstand
- A10 - Taxiway Fillets (not shown)

CARGO
- C01 - Cargo 4 South Redevelopment
- C02 - Offsite Cargo Phase 1
- C03 - Offsite Cargo Phase 2

LANDSIDE
- L01 - NAE Relocation (southbound lanes)
- L02 - Elevated Busway & Stations
- L03 - Second Terminal Roads & Curbside
- L04 - Northeast Ground Transportation Center
- L05 - North Ground Transportation Holding Lot
- L07 - Employee Parking Structure

TERMINAL
- T01 - North Gates
- T02 - Second Terminal & Parking

AIRPORT/AIRLINE SUPPORT
- S01 - Fuel Farm Expansion
- S02 - Primary ARFF Facility
- S03 - Secondary ARFF Facility
- S04 - Fuel Rack Relocation
- S05 - Triculator
- S06 - De-icing Tanks
- S07 - Westside Maintenance Campus
- S08 - North Airline Support
- S09 - West Airline Support
- S10 - Centralized Rec. & Dist. Center



Sustainable Airport Master Plan (SAMP) Environmental Review
Port of Seattle
Seattle-Tacoma International Airport

Proposed Action

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2. Background on Characteristics of Noise

Sound is created by a vibrating source that induces vibrations in the air. The vibration produces alternating bands of relatively dense and sparse particles of air, spreading outward from the source like ripples on a pond. Sound waves dissipate with increasing distance from the source. Sound waves can also be reflected, diffracted, refracted, or scattered. When the source stops vibrating, the sound waves disappear almost instantly and the sound ceases.

Sound conveys information to listeners. It can be instructional, alarming, pleasant and relaxing, or annoying. Identical sounds can be characterized by different people or even by the same person at different times, as desirable or unwanted. Unwanted sound is commonly referred to as “noise.”

Sound can be defined in terms of three components:

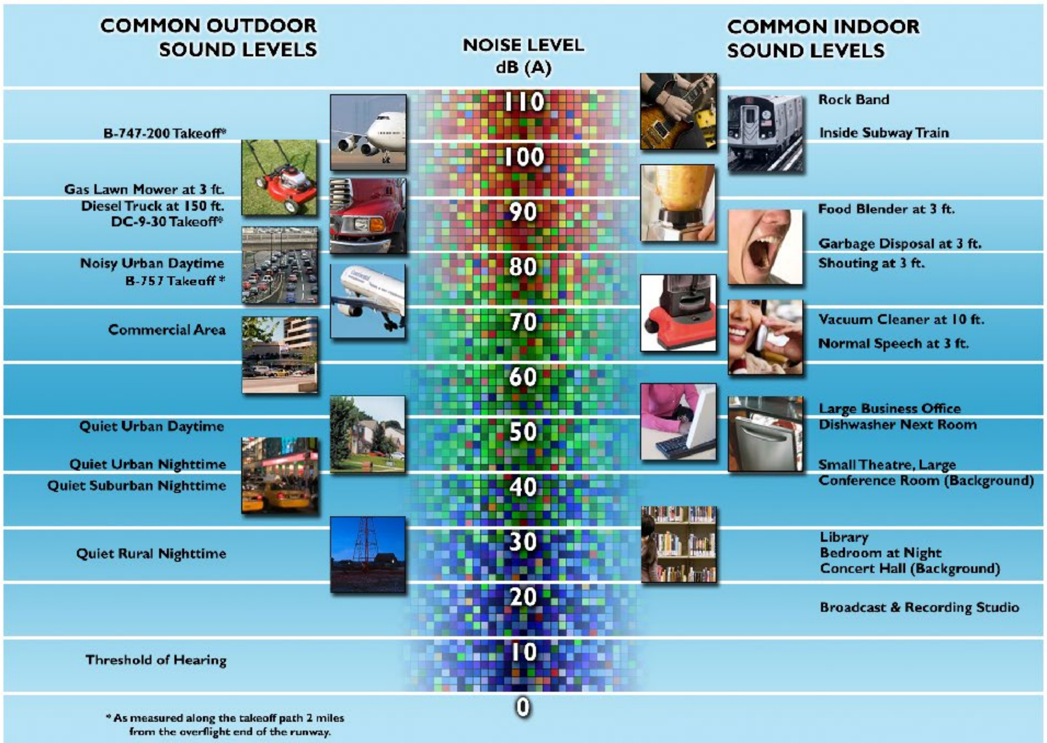
- Level (amplitude)
- Pitch (frequency)
- Duration (time pattern)

2.1 Sound Level

The level of sound is measured by the difference between atmospheric pressure (without the sound) and the total pressure (with the sound). Amplitude of sound is like the relative height of the ripples caused by the stone thrown into the water. Although physicists typically measure pressure using the linear Pascal scale, sound is measured using the logarithmic decibel (dB) scale. This is because the range of sound pressures detectable by the human ear can vary from 1 to 100 trillion units. A logarithmic scale allows us to discuss and analyze noise using numbers that are more manageable. The range of audible sound ranges from approximately 1 to 140 dB, although everyday sounds rarely rise above about 120 dB. The human ear is extremely sensitive to sound pressure fluctuations. A sound of 140 dB, which is sharply painful to humans, contains 100 trillion (10^{14}) times more sound pressure than the least audible sound. **Exhibit 2-1** shows a comparison of common sources of indoor and outdoor sounds measured on the dB scale.

By definition, a 10 dB increase in sound is equal to a tenfold (10^1) increase in the mean square sound pressure of the reference sound. A 20 dB increase is a 100-fold (10^2) increase in the mean square sound pressure of the reference sound. A 30 dB increase is a 1,000-fold (10^3) increase in mean square sound pressure.

EXHIBIT 2-1: COMPARISON OF SOUND



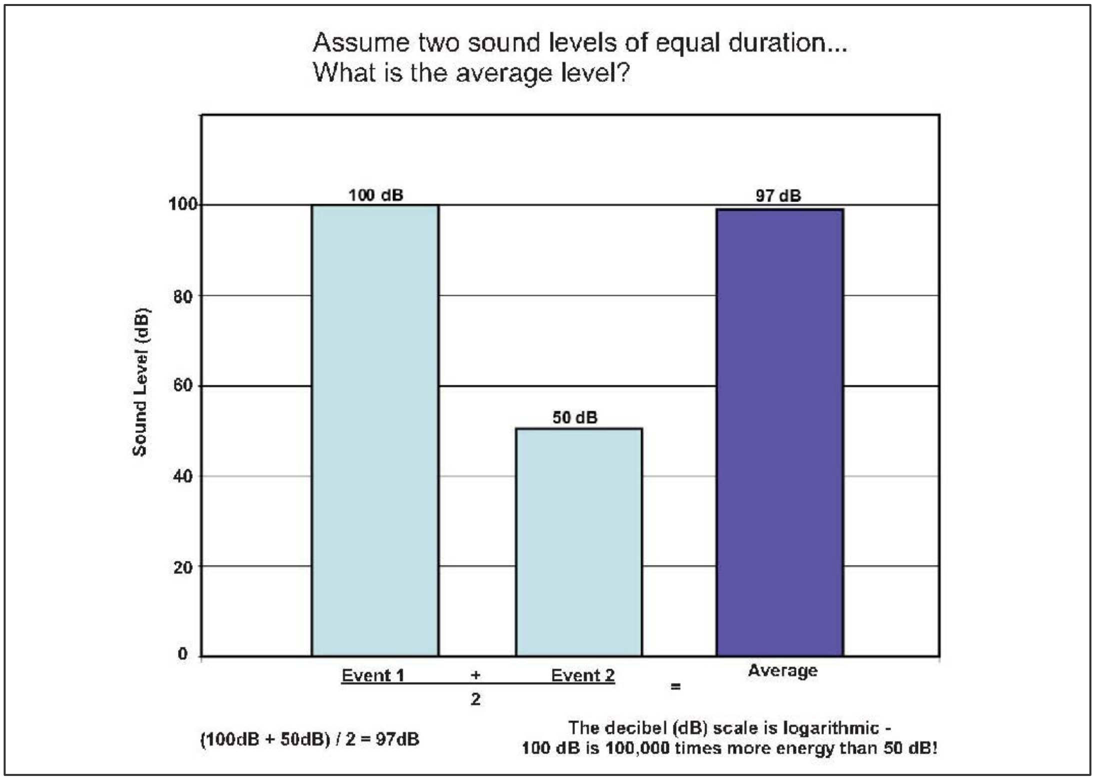
Source: Landrum & Brown

A logarithmic scale requires different mathematics than used with linear scales. The sound pressures of two separate sounds, expressed in dB, are not arithmetically additive. For example, if a sound of 80 dB is added to another sound of 74 dB, the total is a 1 dB increase in the louder sound (81 dB), not the arithmetic sum of 154 dB. If two equally loud noise events occur simultaneously, the sound pressure level from the combined events is 3 dB higher than the level produced by either event alone.

Logarithmic averaging also yields results that are quite different from simple arithmetic averaging. The example shown in **Exhibit 2-2** averages two sound levels of equal duration. One has a maximum sound level (Lmax) of 100 dB, the other 50 dB. Using conventional arithmetic, the average would be 75 dB. Using logarithmic math, the average is 97 dB. This is because 100 dB has far more energy than 50 dB (100,000 times as much) and is overwhelmingly dominant in computing the average of the two sounds.

Human perceptions of changes in sound pressure are less sensitive than a sound level meter. People typically perceive a tenfold increase in sound pressure, a 10 dB increase, as a doubling of loudness. Conversely, a 10 dB decrease in sound pressure is normally perceived as half as loud. In community settings, most people perceive a 3 dB increase in sound pressure (a doubling of the sound pressure or energy) as just noticeable. (In laboratory settings, people with good hearing are able to detect changes in sounds of as little as 1 dB.)

EXHIBIT 2-2: EXAMPLE OF SOUND LEVEL AVERAGING



Source: Landrum & Brown, 2019.

2.2 Sound Frequency

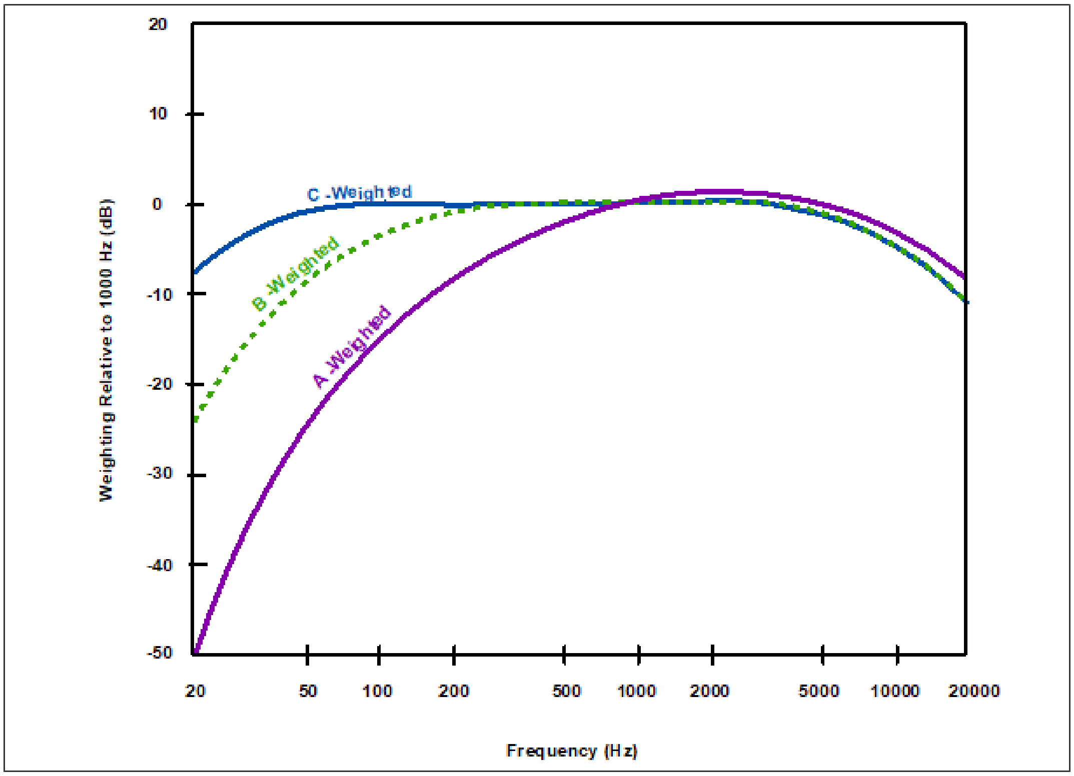
The pitch (or frequency) of sound can vary greatly from a low-pitched rumble to a shrill whistle. If we consider the analogy of ripples in a pond, high frequency sounds are vibrations with tightly spaced ripples, while low rumbles are vibrations with widely spaced ripples. The rate at which a source vibrates determines the frequency. The rate of vibration is measured in units called “Hertz” -- the number of cycles, or waves, per second. One’s ability to hear a sound depends greatly on the frequency composition. Humans hear sounds best at frequencies between 1,000 and 6,000 Hertz. Sound at frequencies above 10,000 Hertz (high-pitched hissing) and below 100 Hertz (low rumble) are much more difficult to hear.

When attempting to measure sound in a way that approximates what our ears hear, we must give more weight to sounds at the frequencies we hear well and less weight to sounds at frequencies we do not hear well. Acousticians have developed several weighting scales for measuring sound. The A-weighted scale correlates with the judgments people make about the loudness of sounds. The A-weighted decibel scale (dBA) is used in studies where audible sound is the focus of inquiry. **Exhibit 2-3** shows the A, B, and C sound weighting scale. The U.S. Environmental Protection Agency (USEPA) has recommended the use of the A-weighted decibel scale in studies of environmental noise.[1] Its use is

1 Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety. U.S. Environmental Protection Agency, Office of Noise Abatement and Control. 1974, P. A-10.

required by the FAA in airport noise studies.[2] For the purposes of this analysis, dBA was used as the noise metric and dB and dBA are used interchangeably.

EXHIBIT 2-3: SOUND FREQUENCY WEIGHTING CURVES



Source: Landrum & Brown, 2019.

2.3 Duration of Sounds

The duration of sounds – their patterns of loudness and pitch over time – can vary greatly. Sounds can be continuous like a waterfall, impulsive like a firecracker, or intermittent like aircraft overflights. Intermittent sounds are produced for relatively short periods, with the instantaneous sound level during the event roughly appearing as a bell-shaped curve. An aircraft event is characterized by the period during which it rises above the background sound level, reaches its peak, and then recedes below the background level.

[2] "Airport Noise Compatibility Planning." 14 CFR Part 150, Sec. A150.3, September 24, 2004.

2.4 Perceived Noise Level

Perceived noisiness is another method of rating sound developed for the assessment of aircraft noise. Perceived noisiness is the subjective measure of the degree to which noise is unwanted or causes annoyance to an individual. To determine perceived noise level, individuals are asked to judge in a laboratory setting when two sounds are equally noisy or disturbing if heard regularly in their own environment. These surveys are inherently subjective and thus subject to greater variability. For example, two separate events of equal noise energy may be perceived differently if one sound is more annoying to the listener than the other.

2.5 Propagation of Noise

Outdoor sound levels decrease as a function of distance from the source, and as a result of wave divergence, atmospheric absorption, and ground attenuation. Sound radiated from a source in a homogeneous and undisturbed manner travels as spherical waves. As the sound wave travels away from the source, the sound energy is distributed over a greater area, dispersing the sound energy of the wave. Spherical spreading of the sound wave reduces the noise level at a rate of 6 dB per doubling of the distance.

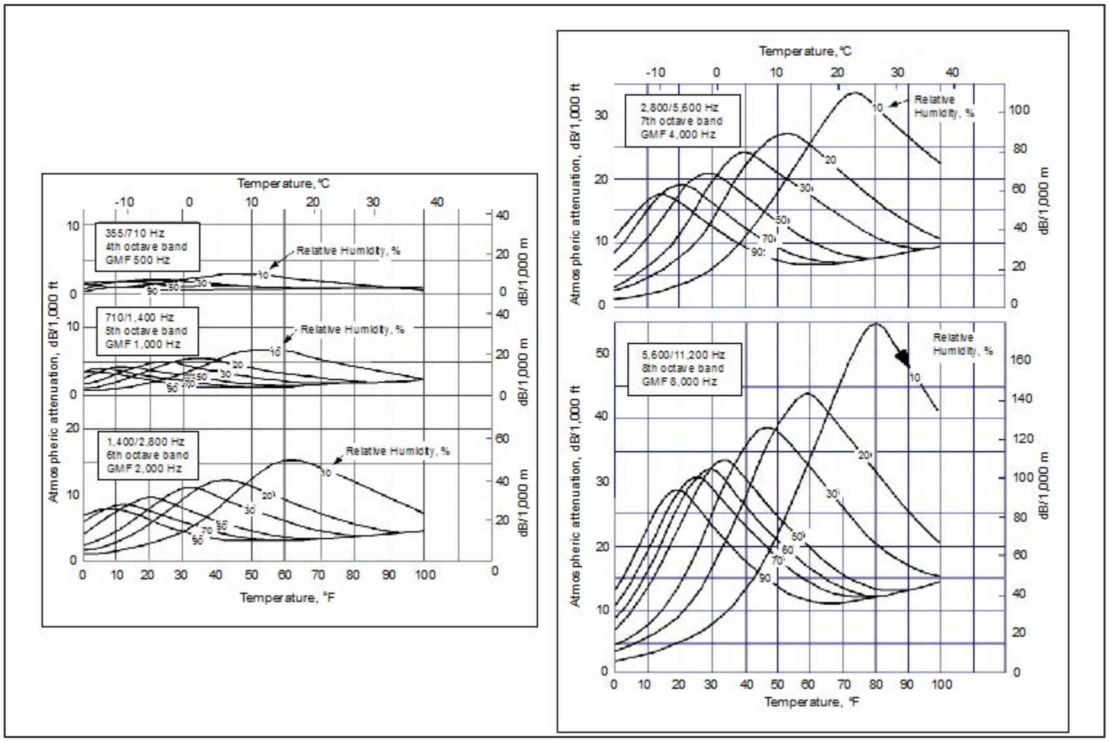
Atmospheric absorption also influences sound levels received by an observer. The greater the distance traveled, the greater the influence of the atmosphere and the resultant fluctuations. Atmospheric absorption becomes important at distances of greater than 1,000 feet. The degree of absorption is a function of the frequency of the sound as well as the humidity and temperature of the air. For example, atmospheric absorption is lowest at high humidity and higher temperatures. **Exhibit 2-4** provides sample atmospheric attenuation graphs. The graphs show noise absorption rates based on temperature, relative humidity, and distance at five different frequency ranges. For example, sounds at a frequency of 2,000 Hz, with a relative humidity of 10 percent and a temperature of 90° Fahrenheit (32° Celsius), will dissipate by 10 dB per for every 1,000 feet (305 meters) from the source.

The rate of atmospheric absorption also varies with sound frequency, and turbulence and gradients of wind. The higher frequencies are more readily absorbed than the lower frequencies. Over large distances, the lower frequencies become the dominant sound as the higher frequencies are attenuated. Certain conditions, such as inversions, can result in higher noise levels than would result from spherical spreading as a result of channeling or focusing the sound waves.

The effect of ground attenuation on noise propagation is a function of the height of the source and/or receiver and the characteristics of the terrain. The closer the source of noise is to the ground, the greater the ground absorption. Terrain consisting of soft surfaces such as vegetation provide for more ground absorption than hard surfaces. Ground attenuation is important for the study of noise from airfield operations (such as thrust reversals) and in the design of noise berms or engine run-up facilities.

These factors are an important consideration for assessing in-flight and ground noise in the Puget Sound area. Atmospheric conditions will play a significant role in affecting the sound levels on a daily basis and how these sounds are perceived by the population.

EXHIBIT 2-4: SOUND ATTENUATION GRAPHS



Source: Beranek, 1981

3. Health Effects of Noise

A considerable amount of research has been conducted over the last 30 years to identify, measure, and quantify the potential effects of aviation noise on health. The various methods by which noise can be measured (e.g., single dose, long-term average, number of events above a certain level, etc.), and difficulties in separating other lifestyle factors from the analysis, increase the complexity of determining the health effects of noise, and have caused considerable variability in the results of past studies. The health effects of noise are often divided into the following topics: hearing loss, sleep disturbance, and speech/communication interference.

3.1 Hearing Loss

The potential for noise-induced hearing loss is commonly associated with occupational noise exposure from working in a noisy work environment or recreational noise such as listening to loud music. Recent studies have concluded that "because environmental noise does not approximate occupational noise levels or recreational noise exposures…it does not have an effect on hearing threshold levels." Furthermore, "aviation noise does not pose a risk factor for child or adolescent hearing loss, but perhaps other noise sources (personal music devices, concerts, motorcycles, or night clubs) are a main risk factor."[3] Because aviation noise levels near airports do not approach levels of occupational or

3 Airport Cooperative Research Program, Transportation Research Board, Effects of Aircraft Noise: Research Update on Selected Topics, 2008.

recreational noise exposures associated with hearing loss, hearing impairment is likely not caused by aircraft noise for populations living near an airport.

3.2 Sleep Disturbance

Sleep disturbance is a common complaint from people who live in the vicinity of an airport. A large amount of research has been published on the topic of sleep disturbance caused by environmental noise. This research has produced variable results due to differing definitions of sleep disturbance, different ways for measuring sleep disturbance (behavioral awakenings or sleep interruption), and different settings in which to measure it (laboratory setting or field setting).

In 1992, the Federal Interagency Committee on Noise (FICON) recommended an interim dose-response curve to predict the percent of the exposed population expected to be awakened percent awakening) as a function of the exposure to single event noise levels expressed in terms of the Sound Exposure Level (SEL). This interim curve was based on statistical adjustment of previous analysis and included data from both laboratory and field studies. In 1997, the Federal Interagency Committee on Aviation Noise (FICAN) recommended a revised sleep disturbance relationship based on data and analysis from three field studies.

Exhibit 3-1 shows the results of the 1992 and 1997 analyses. The top graph shows a comparison of the 1992 FICON and 1997 FICAN curves. The 1997 FICAN curve represents the upper limit of the observed field data and should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened" or the "maximum percent awakened" for a given residential population.

In 2008, FICAN recommended the use of a revised method to predict sleep disturbance in terms of percent awakenings based on data published by the American National Standards Institute (ANSI).[4] In contrast to the earlier FICAN recommendation, the 2008 ANSI standard indicates that the probability of awakening is lower for a single noise event in cases where the population is exposed to the given noise source for a long period of time (more than one year) compared to the probability of awakening for sound that is new to an area. In Exhibit 3-1, the lower graph shows these two relationships, with Equation 1 (blue dotted line) representing percent awakenings from long-term noise and Equation B1 (pink dashed line) representing percent awakenings from a new noise source based on the 1997 FICAN results. As shown in this exhibit, at an indoor SEL of 100 dB, the probability of awakenings would be expected to exceed 15 percent for a new noise source; yet for long-term noise sources, the probability of awakening is expected to be less than 10 percent.

The numerous studies and reports that have been developed on the subject of sleep disturbance related to environmental noise over the past several decades have produced varied results. A review of past studies conducted by the Airport Cooperative Research Program suggests that in-home sleep disturbance studies clearly demonstrate that it requires more noise to cause awakenings than was previously theorized based on laboratory sleep disturbance studies.[5]

Due to the variability of study methodologies, particularly studies outside of a laboratory, and other influencing factors, it is difficult to determine the noise level at which a high percentage of the

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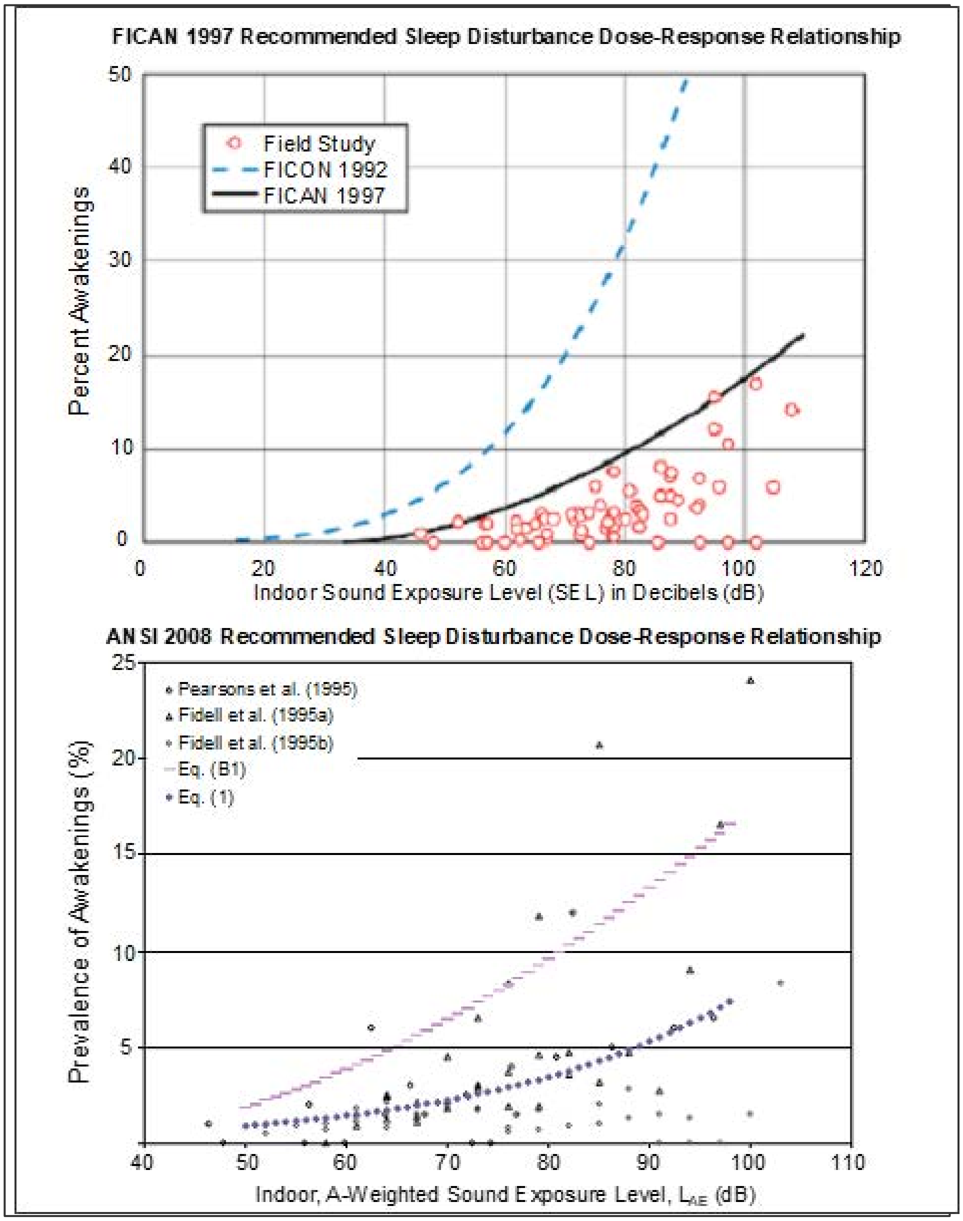
4 ANSI S12.9-2008, Quantities and Procedures for Description and Measurement of Environmental Sound — Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes, 2008

5 Airport Cooperative Research Program, Transportation Research Board, Effects of Aircraft Noise: Research Update on Selected Topics, 2008.

population would be expected to be awakened by aircraft noise. No definitive conclusions have been drawn on the percent of a population that is estimated to be awakened by a certain level of aircraft noise and recent studies have cautioned about the over-interpretation of the data.[6]

EXHIBIT 3-1: SLEEP DISTURBANCE DOSE-RESPONSE CURVES



Source: Federal Interagency Committee on Aviation (FICAN), 1997. ANSI, 2008.

3.3 Communication Interference

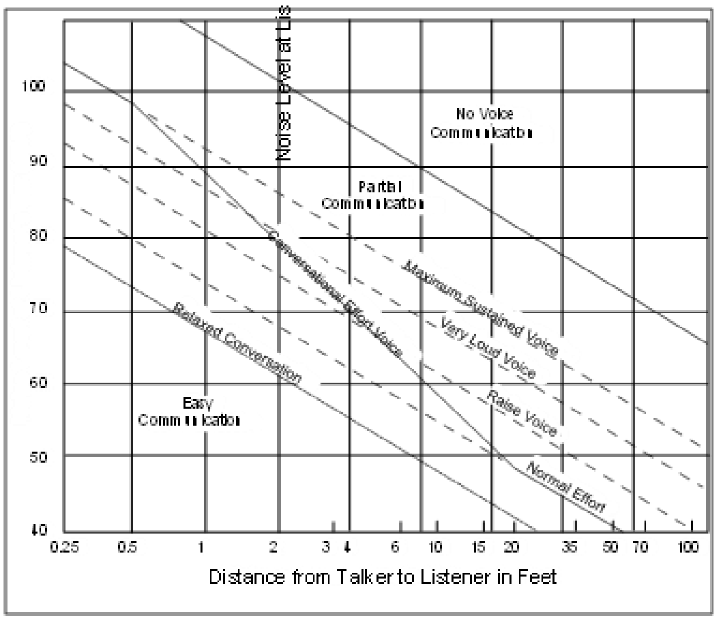
Communication interference can impact activities such as personal conversations, classroom learning, and listening to radio and television. Most studies have focused on communication interference due to

6 Airport Cooperative Research Program, Transportation Research Board, Effects of Aircraft Noise: Research Update on Selected Topics, 2008.

continual noise sources. In 1974, the USEPA published Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, which is one of the few studies to focus on intermittent noise. The study concluded that for voice communication, an indoor Leq of 45 dB allows normal conversation at distances up to 2 meters with 95 percent sentence intelligibility. **Exhibit 3-2** shows the required distance between talker and listener based on the type of speech communication (normal voice, loud voice, etc.) and the environmental noise level from the 1974 USEPA report.

Noise can also impact communication between student and teacher necessary for learning in a classroom setting. It is usually accepted that noise levels above a certain Leq may affect a child's learning experiences. Research has shown a "decline in reading when outdoor noise levels equal or exceed Leq of 65 dBA."[7] Furthermore, a study conducted by FICAN in 2007 found: "(1) a substantial association between noise reduction and decreased failure (worst-score) rates for high-school students, and (2) significant association between noise reduction and increased average test scores for student/test subgroups. In general, the study found little dependence upon student group and upon test type."[8] A study of noise exposure and the effects on school test scores between 2000/01 and 2008/09 found "…statistically significant associations between airport noise and student mathematics and reading test scores, after taking demographic and school factors into account."[9] This study also found that schools that had been provided sound insulation had better test scores than schools that were not sound insulated. This Study made no recommendation regarding the noise level at which impacts upon learning may occur.

EXHIBIT 3-2: NOISE EFFECTS ON DISTANCE NECESSARY FOR SPEECH COMMUNICATION



Source: FICON, 1992; from USEPA, 1974.

7 Airport Cooperative Research Program, Transportation Research Board, Effects of Aircraft Noise: Research Update on Selected Topics, 2008.

8 Federal Interagency Committee on Aviation Noise (FICAN), Findings of the FICAN Pilot Study on the Relationship between Aircraft Noise Reduction and Changes in Standardized Test Scores, July 2007.

9 National Academies of Sciences, Engineering, and Medicine; Assessing Aircraft Noise Conditions Affecting Student Learning, Volume 1: Final Report; 2014.

4. Standard Noise Descriptors

Given the multiple dimensions of sound, a variety of descriptors, or metrics, have been developed for describing sound and noise. The Day-Night Average Sound Level (DNL) is widely accepted as the best available metric to describe aircraft noise exposure and is the noise descriptor required by the FAA for use in aircraft noise analyses and noise compatibility planning. Because the DNL metric correlates well with the degree of community annoyance from aircraft noise, DNL has been formally adopted by most federal agencies dealing with noise exposure. In addition to the FAA, these agencies include the Environmental Protection Agency (EPA), Department of Defense, Department of Housing and Urban Development (HUD) and the Veterans Administration. Also, federal interagency committees, such as the Federal Interagency Committee on Urban Noise and the FICON, have not identified new cumulative sound descriptors or metrics of sufficient scientific standing to substitute for DNL. Other cumulative metrics can be used to supplement, but not replace, DNL. FAA Orders 1050.1F and 5050.4B require that environmental studies use the DNL metric to describe cumulative noise exposure and identify aircraft noise/land use compatibility issues.

DNL is a cumulative sound level that provides a measure of the total sound energy during a specified time-period and is typically expressed as an annual average. DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure. DNL logarithmically averages the sound levels at a location over a 24-hour period, with a 10-decibel (dB) weighted penalty added to all noise events occurring during nighttime hours between 10:00 p.m. and 6:59 a.m. The 10 dB penalty represents the added intrusiveness of noise that occurs during sleeping hours, when ambient sound levels are typically lower than during daytime hours. This weighted penalty treats one nighttime noise event as equivalent to 10 daytime events of the same magnitude.

It is important to note that due to the logarithmic nature of noise, the *loudest* noise levels control the 24-hour average. For example, 30 seconds of sound of 100 dB, followed by 23 hours, 59 minutes, and 30 seconds of silence, would compute to a DNL value of 65 dB. If the 30 seconds of sound occurred at night, it would yield a DNL of 75 dB.

5. Noise Compatibility

5.1 FAA 14 CFR Part 150

The FAA uses the 14 C.F.R. Part 150, Airport Noise Compatibility Planning, land use compatibility guidelines to determine compatibility with most land uses. The FAA has created guidelines regarding the compatibility of land uses with various aircraft noise levels measured using the DNL metric. These guidelines are defined in Appendix A to 14 C.F.R. Part 150. These guidelines are consistent with land use compatibility guidelines developed by other federal agencies such as EPA and HUD.

Based on FAA guidelines, DNL 65 dB is the noise level where noise sensitive land uses (residences, churches, schools, libraries, and nursing homes) are not compatible with aircraft noise. Below 65 DNL, all land uses are determined to be compatible with airport noise. The land use compatibility table found in 14 C.F.R. Part 150 is presented in **Table 5-1.**

TABLE 5-1: YEARLY DAY-NIGHT AVERAGE SOUND LEVEL (DNL) IN DECIBELS (DB) BY LAND USE FROM THE LAND USE COMPATIBILITY GUIDELINES – 14 C.F.R. PART 150

LAND USE	BELOW DNL 65 dB	DNL 65-70 dB	DNL 70-75 dB	DNL 75-80 dB	DNL 80-85 dB	OVER DNL 85 dB
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	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

(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 stated 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 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 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 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.

Notes:

1. The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable 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 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.
2. SLUCM=Standard Land Use Coding Manual.
3. Y (Yes)=Land Use and related structures compatible without restrictions.
4. N (No)=Land Use and related structures are not compatible and should be prohibited.
5. NLR=Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
6. 25, 30, or 35=Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Source: 14 C.F.R. § 150 Airport Noise Compatibility Planning, Appendix A, Table 1.

5.2 Thresholds of Significance

FAA Order 1050.1F identifies the threshold of “significant impact” based on the yearly DNL and an incorporation of compatible land use standards found at 14 CFR Part 150, Airport Noise Compatibility Planning, specifically in Appendix A of that regulation. Implementation of a proposed action would have a significant impact with respect to aircraft noise if it would cause an increase in noise of 1.5 dB or more to a noise sensitive land use at the 65 DNL or greater contour.

FAA Order 1050.1F also provides direction for disclosing changes in aircraft noise exposure that while not meeting the threshold of significance, are nonetheless of interest to stakeholders. These are referred to as “reportable” changes. This implements a 1992 FICON recommendation that in addition to significant impacts, less-than-significant noise level changes be identified for noise sensitive locations exposed to Project-related increases. FICON recommended reporting any increases in DNL of 3 dB or more between 60 and 65 dB DNL, and increases of DNL 5 dB or more between 45 and 60 dB DNL. These recommendations ordinarily only apply to cases where the significance threshold (increase of 1.5 dB or more within the 65 dB DNL contour) is met or exceeded.

6. Noise Model

For this noise analysis, noise contours were developed using the FAA’s Aviation Environmental Design Tool (AEDT). AEDT is the FAA-approved, industry-accepted tool for determining the total effect of aircraft noise exposure near an airport. AEDT has been the FAA's required model for estimating aircraft noise exposure near airports for NEPA studies since May of 2015 when it replaced the Integrated Noise Model.

AEDT uses runway and flight track information, aircraft operation levels distributed by time of day, aircraft fleet mix, and aircraft performance characteristics as inputs. The program includes a built-in Geographic Information System (GIS) platform, tools for comparing contours, and utilities that facilitate easy export to other GIS software suites. AEDT can also calculate predicted noise at specific sites such as hospitals, schools, or other noise sensitive locations. This analysis was prepared using AEDT Version 3f, which was the latest version of the model when modeling began.

Detailed inputs to AEDT fall into two general categories:

- Physical Characteristics – airfield layout, flight track geometry, terrain, climatological data, and aircraft noise and performance data.
- Operational Characteristics – aircraft operations, runway use, and flight track use.

6.1 Aircraft Activity Levels and Fleet Mix

In order to calculate DNL noise exposure levels for SEA, the average number of operations, types of aircraft, and the time of day at which the aircraft operate by specific AEDT airframe model and engine code were prepared for input into AEDT. AEDT airframe models are based on the manufactured aircraft types included in the fleet mix while the engine code refers to the version of engines that is associated with the defined airframe model.

6.2 Airfield Layout

The airfield layout is a physical description of the airfield configuration, including location, length and orientation of all runways and taxiways, and airport elevation. SEA's airfield system consists of three Runways (16L/34R, 16C/34C, 16R/34L), oriented in a north-south direction. **Table 6-1** provides the length and width of the runways at SEA.

TABLE 6-1: SEA RUNWAYS

Runway	Length (feet)	Width (feet)
16R/34L	8,500	150
16C/34C	9,425	150
16L/34R	11,899	150

Source: AEDT Version 3f

Table 6-2 provides the coordinates, elevation, crossing height and glide slope of the current runway ends at SEA used in AEDT:

TABLE 6-2: RUNWAY DEFINITION

Runway	Latitude	Longitude	Elevation (feet)	Crossing Height[1] (feet)	Glide Slope[2] (degrees)
16L	47.4637952222	-122.307750222	432.3	76	3
34R	47.4311722778	-122.30803825	346.7	81	2.75[3]
16C	47.4638098611	-122.31098375	429.4	71	3
34C	47.4379712778	-122.311209833	362.9	73	3
16R	47.4638363611	-122.317856833	414.8	69	3
34L	47.4405338056	-122.318058056	356.2	75	3

1 Crossing height is the height above the runway threshold at which the aircraft would be if maintaining the proper glide slope.
2 Glide slope represents the proper path (or angle) of descent for arriving aircraft.
3 AEDT utilizes a standard 3.0-degree glide on arrival profiles. Runway 34R glide slope of 2.75 is modeled as a 3.0-degree glide slope until threshold crossing.
Source: Port of Seattle, SEA Airport Layout Plan; AEDT Version 3f

6.3 Runway End Utilization

Runway end utilization refers to the frequency with which aircraft utilize each runway during the course of a year, as dictated or permitted by wind, weather, aircraft weight, air traffic control conditions, and noise considerations. Aircraft generally take-off and land facing into the wind, making it the primary factor in selecting a runway for take-off or landing. The efficient and safe use of the runways, taxiways, and airspace generally encourages the use of a single direction of “flow.” “Head-to-head” operations, where aircraft depart in one direction and arrive in the opposite direction on the same runway are generally only possible when aircraft operations are well separated in both time and space.

6.4 Engine Run-Ups

Engine run-ups are routine engine maintenance or diagnostic tests where the engine is run at various settings to test performance. Depending on the frequency, engine run-ups may influence the size and location of noise contours.

6.5 Flight Tracks

A flight track is the path over the ground as aircraft fly to or from an airport. In order to model the arrival and departure flight corridors for SEA, consolidated flight tracks were developed from 2022 radar data and given a track ID. The radar data provide the location, density, and width of existing flight corridors. The AEDT models aircraft flight corridors with a system of primary flight tracks (or “backbone” tracks) and additional “dispersed” tracks. The backbone track lies at the center of the corridor, flanked by one or more dispersed tracks on each side. The AEDT distributes the operations assigned to a track among the backbone and dispersed tracks using a normal distribution or a user-defined distribution based on the observed flight track density. This dispersion more accurately models each flight corridor by accounting for variability attributed to weather, aircraft type, traffic, pilot technique and other factors.

Departure corridors are defined by a series of individual flight tracks located across the width of the corridor. Generally, aircraft on approach to a runway end are located within a smaller corridor due to the use of navigational instruments.

6.6 Aircraft Trip Length and Operational Profiles

Aircraft weight during departure is a factor in the dispersion of noise because it impacts the rate at which an aircraft is able to climb. Generally, the heavier an aircraft is, the slower the rate of climb and the wider the dispersion of noise along its route of flight. Where specific aircraft weights are unknown, AEDT uses the distance flown to the first stop as a surrogate for the weight, by assuming that the weight has a direct relationship with the fuel load necessary to reach the first destination. AEDT groups trip lengths into nine categories as shown in **Table 6-3.**

TABLE 6-3: AEDT STAGE LENGTH CATEGORIES

Stage Length	Distance
1	0-500 nautical miles
2	500-1000 nautical miles
3	1000-1500 nautical miles
4	1500-2500 nautical miles
5	2500-3500 nautical miles
6	3500-4500 nautical miles
7	4500-5500 nautical miles
8	5500-6500 nautical miles
9	6500-11000 nautical miles
M	Maximum range at maximum take-off weight

Source: Landrum & Brown analysis, 2024

AEDT includes standard flight procedure data for each aircraft that represents each phase of flight to or from an airport. Information related to aircraft speed, altitude, thrust settings, flap settings, and distance is available and used by AEDT to calculate noise levels on the ground. Additionally, terrain data was used to account for ground elevation variations under the flight paths.

6.7 Atmospheric Conditions

Weather is an important factor in the performance of aircraft and the amount of noise generated on landing and take-off. AEDT default weather parameters are based on Integrated Surface Data[10] average weather data (2012 -2021) from the National Oceanic and Atmospheric Administration. **Table 6-4** shows the default AEDT atmospheric settings for SEA.

TABLE 6-4: ATMOSPHERIC ELEMENTS

Atmospheric Element	Default AEDT Value
Temperature	52.67° Fahrenheit
Sea Level Pressure	1,018.13 millibars
Static Pressure	1,001.43 millibars
Dew Point	43.82° Fahrenheit
Relative Humidity	71.79%
Wind Speed	6.74 knots

Source: AEDT Version 3f, Landrum & Brown analysis, 2024.

7. Aircraft Noise

The following sections present the methodology and modeling input assumptions for the Existing (2022) condition, Future (2032) condition, and Future (2037) condition.

7.1 Existing Conditions

The following describes the input data and methodologies used in preparing the Existing (2022) Condition noise contour.

Aircraft Activity Levels and Fleet Mix

Information on aircraft operations was collected from FAA Air Traffic Activity System (ATADS) and the Port's EnvironmentalVue Flight Track Monitoring System. During the baseline condition year (2022), 401,351 total annual operations occurred at SEA. Additionally, specific AEDT airframe and engine combinations were developed from the EnvironmentalVue Flight Track Monitoring System data and a widely used airline fleet database.[11] **Table 7-1** presents the average daily operations by AEDT airframe and AEDT engine code that were used to calculate the Existing (2022) Contour.

The average daily number of aircraft arrivals and departures for the Existing (2022) Condition was calculated by determining the total annual operations and dividing by 365 (days in a year). The baseline conditions annual average day included 1,100 total operations, 15.9 percent of which occurred during the nighttime hours of 10:00 p.m. to 6:59 a.m.

10 https://www.ncdc.noaa.gov/isd, provided in AEDT Version 3f.
11 Diio Mi: Market Intelligence for the Aviation Industry, Accessed on February 3, 2022, https://mi.diio.net.

TABLE 7-1: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – EXISTING (2022) CONDITION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Commercial Jets						
Airbus A319-100 Series	01P10IA020	0.01	0.00	0.01	0.00	0.03
Airbus A319-100 Series	3CM028	0.10	0.02	0.10	0.02	0.24
Airbus A319-100 Series	3IA006	2.26	0.45	2.36	0.35	5.42
Airbus A319-100 Series	3IA007	1.21	0.24	1.26	0.19	2.90
Airbus A319-100 Series	4CM035	0.09	0.02	0.09	0.01	0.22
Airbus A319-100 Series	8IA09	0.04	0.01	0.04	0.01	0.10
Airbus A320-200 Series	01P08CM105	16.35	2.34	15.89	2.79	37.36
Airbus A320-200 Series	01P10IA021	1.47	0.21	1.43	0.25	3.35
Airbus A320-200 Series	01P10IA022	0.32	0.05	0.31	0.05	0.72
Airbus A320-200 Series	1CM008	0.40	0.06	0.39	0.07	0.91
Airbus A320-200 Series	1CM009	1.62	0.23	1.57	0.28	3.70
Airbus A320-200 Series	1IA003	3.09	0.44	3.00	0.53	7.06
Airbus A320-200 Series	3CM026	1.76	0.25	1.71	0.30	4.02
Airbus A320-200 Series	8IA010	0.00	0.00	0.00	0.00	0.01
Airbus A320-NEO	01P20CM128	0.87	0.06	0.72	0.22	1.86
Airbus A320-NEO	01P22PW163	1.39	0.09	1.13	0.34	2.95
Airbus A321-200 Series	01P08CM104	1.11	0.25	0.75	0.61	2.72
Airbus A321-200 Series	01P10IA025	6.73	1.54	4.54	3.72	16.52
Airbus A321-200 Series	3CM025	1.14	0.26	0.77	0.63	2.81
Airbus A321-NEO	01P18PW157	1.71	0.50	1.51	0.69	4.42
Airbus A321-NEO	01P20CM132	5.06	1.50	4.49	2.06	13.11
Airbus A330-200 Series	2RR023	1.15	1.37	2.49	0.02	5.03
Airbus A330-200 Series	9PW094	0.02	0.02	0.04	0.00	0.07
Airbus A330-300 Series	2RR023	0.64	0.02	0.64	0.02	1.33
Airbus A330-300 Series	4GE080	0.65	0.02	0.65	0.02	1.35
Airbus A330-300 Series	7PW082	0.09	0.00	0.09	0.00	0.18
Airbus A330-300 Series	9PW094	1.84	0.07	1.84	0.07	3.82
Airbus A330-300 Series	9PW095	0.43	0.02	0.43	0.02	0.90
Airbus A330-900N Series (Neo)	02P23RR141	3.13	0.51	3.35	0.29	7.29
Airbus A340-300 Series	2CM015	0.07	--	0.07	--	0.15
Airbus A350-1000 Series	18RR080	0.00	0.00	0.01		0.01
Airbus A350-900 series	01P18RR124	1.02	0.02	1.04	0.01	2.09
Boeing 717-200 Series	4BR002	0.00	--	0.00	--	0.00
Boeing 737-300 Series	1CM004	0.01	--	0.01	--	0.02
Boeing 737-300 Series	1CM005	0.01	--	0.01	--	0.02
Boeing 737-700 Series	3CM030	0.43	0.15	0.44	0.14	1.16
Boeing 737-700 Series	3CM031	14.65	5.01	15.01	4.65	39.32
Boeing 737-700 Series	3CM032	2.67	0.91	2.73	0.85	7.16
Boeing 737-700 Series	8CM051	0.01	0.00	0.01	0.00	0.03
Boeing 737-700 Series	8CM062	0.11	0.04	0.11	0.03	0.28
Boeing 737-700 Series	8CM063	2.48	0.85	2.55	0.79	6.67
Boeing 737-8	01P20CM135	0.04	0.02	0.04	0.02	0.11

TABLE 7-1: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – EXISTING (2022) CONDITION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 737-8	01P20CM136	1.17	0.67	1.17	0.67	3.67
Boeing 737-8	01P20CM140	1.08	0.62	1.08	0.62	3.39
Boeing 737-800 Series	01P11CM114	0.48	0.07	0.47	0.07	1.09
Boeing 737-800 Series	01P11CM116	6.51	0.94	6.45	1.00	14.90
Boeing 737-800 Series	01P11CM122	3.55	0.51	3.52	0.55	8.13
Boeing 737-800 Series	01P11CM125	0.79	0.11	0.78	0.12	1.81
Boeing 737-800 Series	01P11CM126	0.07	0.01	0.07	0.01	0.17
Boeing 737-800 Series	3CM032	19.93	2.88	19.74	3.08	45.62
Boeing 737-800 Series	3CM034	1.92	0.28	1.91	0.30	4.40
Boeing 737-800 Series	8CM051	27.28	3.95	27.02	4.21	62.45
Boeing 737-800 Series	8CM064	0.20	0.03	0.20	0.03	0.45
Boeing 737-800 Series	8CM065	2.55	0.37	2.52	0.39	5.83
Boeing 737-800 Series	8CM066	11.96	1.73	11.85	1.85	27.39
Boeing 737-800BCF	3CM034	0.18	0.01	0.15	0.03	0.38
Boeing 737-9	01P20CM136	0.60	0.11	0.58	0.13	1.42
Boeing 737-9	01P20CM140	23.54	4.42	22.93	5.03	55.92
Boeing 737-900 Series	01P11CM114	0.98	0.13	0.98	0.13	2.21
Boeing 737-900 Series	8CM051	11.05	1.43	11.07	1.41	24.97
Boeing 737-900-ER	01P11CM116	22.62	3.69	20.95	5.35	52.62
Boeing 737-900-ER	01P11CM121	64.23	10.46	59.49	15.20	149.39
Boeing 737-900-ER	01P11CM125	0.20	0.03	0.18	0.05	0.46
Boeing 737-900-ER	3CM034	0.91	0.15	0.84	0.22	2.12
Boeing 737-900-ER	8CM065	1.02	0.17	0.94	0.24	2.36
Boeing 737-900-ER_MA*	01P11CM121_MA	2.74	0.09	1.37	0.05	4.26
Boeing 757-200 Series	4PW072	6.00	1.84	6.21	1.63	15.68
Boeing 757-200 Series	4PW073	0.21	0.06	0.21	0.06	0.54
Boeing 757-200 Series	5RR038	0.59	0.18	0.62	0.16	1.55
Boeing 757-200 Series	5RR039	0.04	0.01	0.04	0.01	0.10
Boeing 757-300 Series	3RR028	0.00	0.00	0.00	0.00	0.01
Boeing 757-300 Series	5RR039	0.01	0.00	0.01	0.00	0.03
Boeing 757-300 Series	XPW204	1.58	0.81	1.99	0.39	4.77
Boeing 767-300 ER	12PW102	0.01	0.00	0.01	0.00	0.03
Boeing 767-300 ER	1GE029	0.08	0.03	0.09	0.02	0.21
Boeing 767-300 ER	1GE030	0.78	0.26	0.86	0.17	2.06
Boeing 767-300 ER	1PW043	0.56	0.18	0.62	0.12	1.49
Boeing 767-300 ER	1RR011	0.00	0.00	0.00	0.00	0.00
Boeing 767-300 ER	2GE055	0.31	0.10	0.35	0.07	0.83
Boeing 767-400 ER	8GE101	0.33	0.03	0.35	0.01	0.72
Boeing 777-200-ER	10PW099	0.11	0.00	0.11	0.00	0.22
Boeing 777-200-ER	2RR027	0.39	0.01	0.39	0.01	0.79
Boeing 777-200-ER	3GE060	0.17	0.00	0.17	0.00	0.35
Boeing 777-200-ER	3GE064	0.00	0.00	0.00	0.00	0.01
Boeing 777-200-ER	8GE100	0.18	0.00	0.18	0.00	0.36

TABLE 7-1: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – EXISTING (2022) CONDITION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 777-200-LR	01P21GE216	0.07	0.00	0.07	0.00	0.14
Boeing 777-200-LR	01P21GE217	0.26	0.00	0.25	0.00	0.52
Boeing 777-300 ER	01P21GE217	1.89	0.01	1.82	0.08	3.81
Boeing 787-10 Dreamliner	01P17GE211	0.18	0.00	0.04	0.14	0.36
Boeing 787-10 Dreamliner	02P23RR134	0.20	0.00	0.04	0.15	0.40
Boeing 787-10 Dreamliner	01P17GE213	0.39	0.00	0.09	0.31	0.78
Boeing 787-8 Dreamliner	01P17GE206	0.16	0.00	0.16	0.00	0.33
Boeing 787-8 Dreamliner	01P17GE210	0.01	0.00	0.01	0.00	0.01
Boeing 787-8 Dreamliner	11GE137	0.26	0.00	0.26	0.00	0.52
Boeing 787-8 Dreamliner	11GE138	0.64	0.00	0.64	0.00	1.28
Boeing 787-9 Dreamliner	01P17GE211	1.22	--	1.06	0.16	2.44
Boeing 787-9 Dreamliner	01P17GE214	0.01	--	0.01	0.00	0.02
Boeing 787-9 Dreamliner	02P23RR131	0.28	--	0.24	0.04	0.55
Boeing 787-9 Dreamliner	12RR067	1.26	--	1.09	0.17	2.52
Boeing 787-9 Dreamliner	12RR068	0.53	--	0.46	0.07	1.06
Bombardier CRJ-900-ER	01P08GE190	0.03	--	0.03	--	0.06
Bombardier CS100	04P20PW196	11.85	1.53	12.06	1.33	26.77
Bombardier CS300	04P20PW196	0.09	0.04	0.12	0.01	0.27
Bombardier CS300	04P20PW197	2.11	0.88	2.66	0.33	5.97
Bombardier Global Express	01P04BR013	0.01	--	0.01	--	0.01
Embraer ERJ175-LR	01P08GE197	81.63	11.10	80.82	11.91	185.46
Embraer ERJ175-LR_MA*	01P08GE197_MA	1.36	0.17	0.68	0.09	2.30
Subtotal		*397.49*	*67.69*	*384.75*	*78.24*	*928.17*
Cargo Jets						
Airbus A300F4-600 Series	1GE020	0.00	0.00	0.00	0.00	0.01
Airbus A300F4-600 Series	1PW048	0.12	0.00	0.01	0.11	0.24
Airbus A300F4-600 Series	3GE056	0.21	0.00	0.01	0.20	0.43
Boeing 747-400 ERF	12PW102	0.07	0.06	0.08	0.04	0.24
Boeing 747-400 Series	1GE024	0.67	0.41	0.63	0.45	2.17
Boeing 747-400 Series Freighter	01P03GE187	0.08	0.03	0.04	0.07	0.21
Boeing 747-400 Series Freighter	1GE024	0.01	0.00	0.00	0.01	0.02
Boeing 747-400 Series Freighter	1PW041	0.01	0.00	0.00	0.01	0.02
Boeing 747-400 Series Freighter	4RR037	0.08	0.03	0.04	0.06	0.20
Boeing 747-400BCF	1GE024	0.27	0.07	0.25	0.09	0.68
Boeing 747-400BCF	1PW041	0.01	0.00	0.01	0.00	0.03
Boeing 747-8F	01P17GE215	0.19	0.19	0.18	0.20	0.77
Boeing 747-8F	13GE156	0.05	0.05	0.05	0.05	0.20

TABLE 7-1: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – EXISTING (2022) CONDITION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 747-8F	8GENX1	0.16	0.17	0.16	0.17	0.66
Boeing 757-200 Series Freighter	3RR028	0.13	0.01	0.02	0.12	0.28
Boeing 757-200 Series Freighter	4PW072	0.06	0.00	0.01	0.06	0.13
Boeing 757-200 Series Freighter	4PW073	0.07	0.00	0.01	0.06	0.14
Boeing 757-200 Series Freighter	5RR039	0.00	0.00	0.00	0.00	0.01
Boeing 767-200 Series Freighter	1GE010	0.30	0.05	0.27	0.08	0.71
Boeing 767-200 Series Freighter	1GE012	0.15	0.03	0.14	0.04	0.35
Boeing 767-200 Series Freighter	1PW026	0.03	0.00	0.02	0.01	0.06
Boeing 767-300 ER Freighter	1GE030	4.35	3.43	4.75	3.03	15.56
Boeing 767-300 ER Freighter	2GE055	0.43	0.34	0.47	0.30	1.53
Boeing 767-300BCF	2GE055	0.03	0.05	0.07	0.01	0.16
Boeing 777 Freighter	01P21GE216	0.94	0.46	0.97	0.42	2.78
Boeing 777 Freighter	01P21GE217	0.02	0.01	0.02	0.01	0.07
Boeing 777-200-LR_C	01P21GE216_C	0.05	0.00	0.03	0.02	0.11
Boeing MD-10-30	3GE074	0.06	0.03	0.06	0.03	0.18
Boeing MD-11 Freighter	12PW102	0.22	0.19	0.29	0.12	0.81
Boeing MD-11 Freighter	1GE031	1.10	0.94	1.46	0.58	4.08
Boeing MD-11 Freighter	1PW052	0.36	0.30	0.47	0.19	1.33
Subtotal		*10.22*	*6.86*	*10.53*	*6.56*	*34.17*
Regional Jets						
Bombardier CRJ-200-LR	01P05GE189	0.01	0.00	0.01	--	0.02
Bombardier CRJ-700	01P08GE192	0.01	--	0.01	0.00	0.02
Bombardier CRJ-700-ER	01P08GE190	0.02	0.00	0.01	0.01	0.03
Bombardier CRJ-700-ER	01P08GE192	0.12	0.01	0.09	0.04	0.26
Bombardier CRJ-700-ER	5GE083	0.06	0.00	0.04	0.02	0.13
Subtotal		*0.22*	*0.01*	*0.16*	*0.07*	*0.46*
Turboprops						
Bombardier de Havilland Dash 8 Q400	PW150A	54.40	6.68	53.40	7.68	122.16
Raytheon Beech 99	PT6A27	0.01	--	0.01	0.00	0.03
Raytheon Beech 99	PT6A36	0.82	--	0.81	0.00	1.63
Raytheon C-12 Huron	PT660A	0.03	--	0.03	--	0.05
Raytheon Super King Air 200	PT6A42	0.00	--	0.00	--	0.01
Subtotal		*55.26*	*6.68*	*54.25*	*7.69*	*123.88*
Cargo Props						
Cessna 208 Caravan	P6114A	1.59	--	1.55	0.04	3.18
Cessna 208 Caravan	PT6A14	1.57	--	1.53	0.04	3.14

TABLE 7-1: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – EXISTING (2022) CONDITION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Raytheon Super King Air 300	PT660A	0.10	--	0.10	--	0.20
Subtotal		*3.26*	*0.00*	*3.18*	*0.08*	*6.52*
General Aviation Jets						
Bombardier Challenger 300	01P14HN011	0.05	0.00	0.05	--	0.10
Bombardier Challenger 300	11HN003	0.05	0.00	0.05	--	0.10
Bombardier Challenger 350	01P14HN011	0.18	0.01	0.19	0.00	0.39
Bombardier Challenger 600	01P05GE189	0.05	0.01	0.05	0.00	0.10
Bombardier Challenger 600	1GE034	0.03	0.00	0.03	0.00	0.07
Bombardier Global 5000	01P04BR013	0.04	--	0.04	0.00	0.08
Bombardier Global 5500	01P20BR015	0.00	--	0.00	--	0.01
Bombardier Learjet 35A/36A (C-21A)	1AS001	--	0.00	0.00	--	0.01
Bombardier Learjet 40	TFE731	0.01	--	0.01	--	0.01
Bombardier Learjet 45	1AS001	0.02	0.00	0.02	0.00	0.04
Bombardier Learjet 45	TFE731	0.04	0.01	0.04	0.01	0.10
Bombardier Learjet 60	7PW077	0.03		0.03	--	0.06
Bombardier Learjet 70	1AS002	0.00		0.00	--	0.01
Cessna 560 Citation Encore	PW530	0.01		0.01	--	0.03
Cessna 560 Citation Excel	PW530	0.05		0.05	--	0.10
Cessna 560 Citation Ultra	1PW038	0.01	0.00	0.01	0.00	0.02
Cessna 560 Citation XLS	PW530	0.08	--	0.08	0.00	0.16
Cessna 680 Citation Sovereign	03P14PW194	0.02	--	0.02	--	0.04
Cessna 680 Citation Sovereign	7PW078	0.04	--	0.04	--	0.09
Cessna 680-A Citation Latitude	7PW078	0.11	--	0.11	--	0.23
Cessna 700 Citation Longitude	01P18HN013	0.02	--	0.02	--	0.04
Cessna 750 Citation X	6AL024	0.11	0.00	0.11	0.00	0.23
Cessna CitationJet CJ2 (Cessna 525A)	1PW036	0.04	--	0.03	0.01	0.09
Cessna CitationJet CJ3 (Cessna 525B)	1PW038	0.09	0.00	0.09	0.00	0.18
Dassault Falcon 2000	CF700D	0.08	0.00	0.08	--	0.16
Dassault Falcon 50	1AS002	0.26	0.01	0.24	0.03	0.54
Embraer Legacy 450 (EMB-545)	01P14HN014	0.07		0.06	0.00	0.14
Embraer Phenom 300 (EMB-505)	PW530	0.11	0.01	0.11	0.00	0.22
Gulfstream G200	7PW077	0.03	--	0.03	0.00	0.07
Gulfstream G450	11RR048	0.04	0.00	0.03	0.01	0.08

TABLE 7-1: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – EXISTING (2022) CONDITION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Gulfstream G650	01P11BR016	0.03	0.00	0.03	0.00	0.06
Gulfstream G650ER	01P11BR016	0.01	0.01	0.02	--	0.04
Gulfstream IV-SP	11RR048	0.01	--	0.01	--	0.02
Gulfstream V-SP	01P06BR014	0.03	0.01	0.03	0.01	0.08
Honda HA-420 Hondajet	PW610F	0.02	0.00	0.03	--	0.05
Raytheon Beechjet 400	1PW037	0.03	0.00	0.03	--	0.06
Raytheon Hawker 800	1AS002	0.05	0.00	0.05	0.00	0.10
Subtotal		*1.87*	*0.09*	*1.86*	*0.09*	*3.92*
General Aviation Props						
Beechcraft Bonanza 35 (FAS)	TIO540	0.03	--	0.03	--	0.06
Cessna 150 Series	O200	0.02	--	0.02	0.00	0.05
Cessna 152 (FAS)	O200	0.10	--	0.09	0.01	0.19
Cessna 172 Skyhawk	IO320	0.47	0.16	0.59	0.04	1.27
Cessna 182	IO360	0.13	--	0.13	0.00	0.27
Cessna 206	TIO540	0.02	--	0.02	--	0.04
Cirrus SR22 Turbo (FAS)	TIO540	0.09	0.01	0.09	0.00	0.19
Mooney M20-K	TSIO36	0.02	--	0.02	--	0.05
Pilatus PC-12	PT6A67	0.07	0.01	0.07	0.01	0.15
Piper PA-28 Cherokee Series	IO320	0.08	--	0.08	0.00	0.16
Raytheon Beech Bonanza 36	TIO540	0.02	0.00	0.03	--	0.05
Subtotal		*1.06*	*0.18*	*1.18*	*0.06*	*2.48*
Grand Total:		**469.38**	**81.51**	**455.91**	**92.79**	**1099.59**

Notes: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
Sources: SEA EnvironmentalVue Monitoring System data, January 2022-December 2022; Landrum & Brown analysis, 2024.

Runway End Utilization

Average annual day runway end utilization was derived from EnvironmentalVue Monitoring System data from January 2022 through December 2022. **Table 7-2** summarizes the percentage of use by each aircraft category on each of the runways at the Airport during the daytime (7:00 a.m.–9:59 p.m.) and nighttime (10:00 p.m.–6:59 a.m.) periods for the Existing (2022) Condition.

SEA primarily operates in a south flow configuration due to the prevailing winds. When SEA operates in this configuration, aircraft arrive from the north, landing on Runways 16R, 16L, and 16C; and depart to the south, taking off from Runways 16C, 16L, and to a lesser extent Runway 16R. A review of EnvironmentalVue Monitoring System data from January 2022 through December 2022 shows that SEA operated in the south flow configuration 70.6 percent of the time.

When in a north flow configuration, aircraft arrive from the south, landing on Runways 34L, 34R, and 34C, and depart to the north, taking off on Runways 34R, 34C, and, to a lesser extent, 34L. A review of EnvironmentalVue Monitoring System data from January 2022 through December 2022, shows that SEA operated in north flow configuration approximately 29.4 percent of the time. Runway use percentages modeled for the Existing (2022) Condition noise contour reflect this average annual runway use pattern.

TABLE 7-2: RUNWAY END UTILIZATION SUMMARY – EXISTING (2022) CONDITION

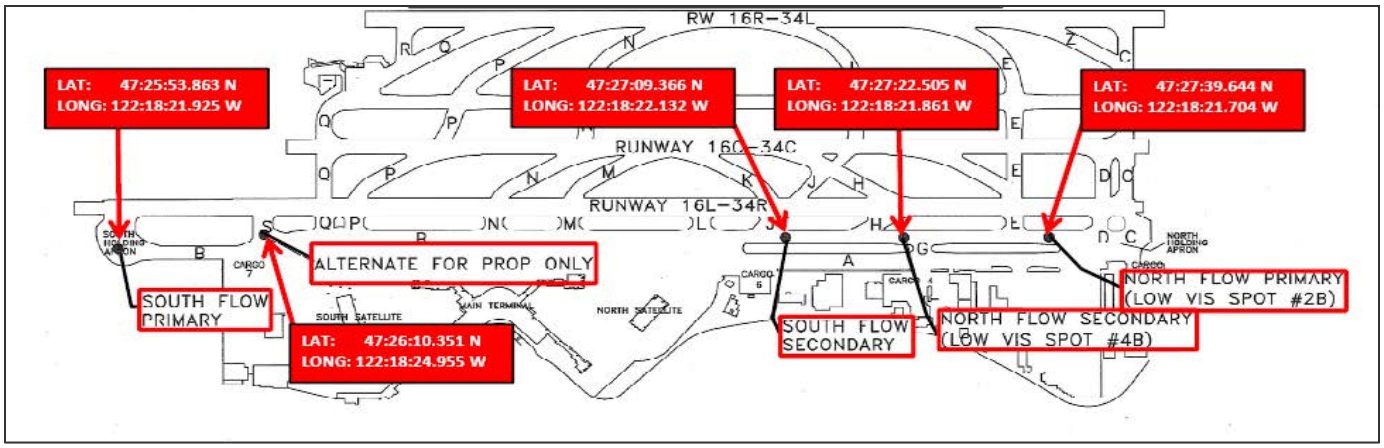
Aircraft Category	Runway End 16L	Runway End 16C	Runway End 16R	Runway End 34L	Runway End 34C	Runway End 34R
Daytime Arrivals						
Commercial Jets	4.57%	0.20%	65.32%	27.59%	0.14%	2.17%
Cargo Jets	45.97%	0.19%	25.35%	10.82%	0.03%	17.65%
Regional Jets	3.84%	0.00%	67.84%	28.32%	0.00%	0.00%
Turboprops	1.89%	0.19%	69.79%	27.30%	0.09%	0.74%
Cargo Props	9.40%	0.46%	59.75%	29.58%	0.46%	0.36%
GA Jets	1.45%	0.16%	64.70%	32.89%	0.00%	0.80%
GA Props	5.11%	4.04%	50.31%	20.28%	4.04%	16.21%
Missed Approaches*	--	--	77.33%	22.67%	--	--
Daytime Departures						
Commercial Jets	66.36%	4.43%	0.00%	0.00%	0.49%	28.71%
Cargo Jets	71.31%	0.73%	0.00%	0.00%	0.24%	27.72%
Regional Jets	63.05%	3.49%	0.00%	0.00%	0.00%	33.45%
Turboprops	62.53%	9.39%	0.00%	0.00%	1.95%	26.13%
Cargo Props	47.46%	31.06%	0.09%	0.00%	2.80%	18.59%
GA Jets	4.83%	64.47%	0.00%	0.11%	30.02%	0.58%
GA Props	9.06%	43.77%	8.48%	4.21%	34.48%	0.00%
Missed Approaches*	--	--	77.33%	22.67%	--	--
Nighttime Arrivals						
Commercial Jets	8.78%	5.55%	54.87%	24.67%	3.13%	2.99%
Cargo Jets	47.00%	9.06%	15.40%	5.28%	6.16%	17.10%
Regional Jet	26.10%	0.00%	73.90%	0.00%	0.00%	0.00%
Turboprops	1.78%	1.91%	71.24%	21.96%	2.20%	0.91%
Cargo Props	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
GA Jets	7.01%	10.09%	40.64%	31.94%	6.97%	3.34%
GA Props	17.97%	17.97%	46.08%	17.97%	0.00%	0.00%
Missed Approaches*	--	--	80.98%	19.02%	--	--
Nighttime Departures						
Commercial Jets	67.10%	3.09%	0.00%	0.00%	2.18%	27.62%
Cargo Jets	68.73%	5.32%	0.00%	0.00%	3.62%	22.32%
Regional Jets	88.46%	0.00%	0.00%	0.00%	0.00%	11.54%
Turboprops	66.21%	5.97%	0.00%	0.00%	0.79%	27.03%
Cargo Props	57.69%	3.85%	0.00%	0.00%	0.00%	38.46%
GA Jets	13.38%	56.77%	0.00%	0.00%	26.87%	2.98%
GA Props	56.56%	22.81%	0.84%	12.64%	7.16%	0.00%
Missed Approaches*	--	--	80.98%	19.02%	--	--

Notes: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
* Missed approaches count as two arrivals and one departure for modeling purposes.
Sources: SEA EnvironmentalVue Monitoring System, January 2022-December 2022; Landrum & Brown analysis, 2024.

Engine Run-Ups

Exhibit 7-1: *Existing Aircraft Run-up Locations*, shows the north flow and south flow primary and secondary aircraft run-up locations at SEA. Aircraft utilizing the north flow primary and secondary locations are oriented at 340 degrees (i.e., nose pointing toward the north-northwest), while aircraft utilizing the south flow primary location are oriented at 160 degrees (i.e., nose pointing toward the south-southeast). Aircraft may use the secondary run-up location only when the primary run-up location is being utilized or is unavailable due to construction or weather. Airport staff log run-up activity that occurs at SEA. These run-up activity logs were utilized to determine the number of run-up operations, location of the run-up, average duration, thrust settings (high power, medium power) and the associated airframe and engine. During 2022 run-ups were only conducted at the North Primary, South Primary and Tango X locations. A total of 477 run-up operations were reported in the run-up activity logs for SEA in 2022. Table 7-3 presents the number of run-up operations, average duration and thrust settings per airframe and engine type that occurred at each run-up location in 2022. The AEDT aircraft are representative of all run-up operations occurring at SEA. The annual run-up totals for the 23 aircraft types, were proportionately distributed across each aircraft.

EXHIBIT 7-1: EXISTING AIRCRAFT RUN-UP LOCATIONS



Source: Port of Seattle

TABLE 7-3: ANNUAL AIRCRAFT RUN-UP ACTIVITY – EXISTING (2022) CONDITION

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
North Flow Primary Location						
Airbus A319-100 Series	3IA006	1.0	3.0	--	--	22000
Airbus A320-200 Series	01P08CM105	17.0	15.8	1.0	2.0	25000
Airbus A320-200 Series	1CM009	2.0	69.5	--	--	25000
Airbus A320-200 Series	3CM026	2.0	15.5	--	--	25000
Airbus A321-200 Series	3CM025	3.0	36.7	--	--	30000
Airbus A321-NEO	01P20CM132	--	--	1.0	2.0	30000
Airbus A330-200 Series	9PW094	6.0	27.7	--	--	71100
Airbus A330-300 Series	4GE080	1.0	37.0	--	--	67500
Airbus A330-900N Series (Neo)	02P23RR141	1.0	26.0	--	--	71100
Boeing 737-700 Freighter	3CM031	5.0	16.8	--	--	24000
Boeing 737-700 Series	3CM031	4.0	26.8	--	--	24000
Boeing 737-700 Series	3CM032	5.0	56.4	--	--	24000
Boeing 737-800 Series	01P11CM122	1.0	10.0	--	--	26300
Boeing 737-800 Series	3CM032	14.0	27.6	--	--	26300
Boeing 737-800 Series	3CM034	1.0	9.0	--	--	26300
Boeing 737-800 Series	8CM051	2.0	40.5	--	--	26300

TABLE 7-3: ANNUAL AIRCRAFT RUN-UP ACTIVITY – EXISTING (2022) CONDITION (CONTINUED)

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
Boeing 737-800 Series	8CM066	3	33.0	--	--	26300
Boeing 737-9	01P20CM140	9.0	14.6	--	--	26400
Boeing 737-900 Series	8CM051	10.0	8.0	--	--	26300
Boeing 737-900-ER	01P11CM116	10.0	20.2	--	--	26300
Boeing 737-900-ER	01P11CM121	16.0	25.1	--	--	26300
Boeing 737-900-ER	01P11CM121	1.0	4.0	--	--	13150
Boeing MD-11 Freighter	1GE031	--	--	1.0	2.0	61500
Bombardier de Havilland Dash 8 Q400	PW150A	7.0	15.9	--	--	4918
Cessna 560 Citation Encore	PW530	1.0	15.0	--	--	3313
Embraer ERJ175-LR	01P08GE197	4.0	28.0	--	--	13800
Embraer ERJ175-LR	01P08GE197	1.0	6.0	--	--	6900
South Flow Primary Location						
Airbus A319-100 Series	3IA006	1.0	15.0	--	--	22000
Airbus A319-100 Series	3IA007	1.0	26.0	1.0	11.0	22000
Airbus A320-200 Series	01P08CM105	28.0	12.9	--	--	25000
Airbus A320-200 Series	01P08CM105	2.0	6.0	--	--	12500
Airbus A320-200 Series	1CM009	5.0	31.6	--	--	25000
Airbus A321-NEO	01P20CM132	2.0	12.5	--	--	30000
Airbus A330-200 Series	2RR023	1.0	6.0	--	--	71100
Airbus A330-200 Series	9PW094	8.0	14.9	--	--	71100
Airbus A330-200 Series	9PW094	1.0	26.0	--	--	35550
Airbus A330-300 Series	4GE080	3.0	10.7	--	--	67500
Airbus A330-900N Series (Neo)	02P23RR141	3.0	26.7	--	--	71100
Boeing 737-700 Freighter	3CM031	11.0	27.8	--	--	24000
Boeing 737-700 Freighter	3CM031	1.0	5.0	--	--	12000
Boeing 737-700 Series	3CM031	16.0	17.6	--	--	24000
Boeing 737-700 Series	3CM031	1.0	20.0	1.0	2.0	12000
Boeing 737-700 Series	3CM032	4.0	31.5	--	--	24000
Boeing 737-800 Series	3CM032	42.0	18.3	--	--	26300
Boeing 737-800 Series	3CM032	3.0	18.3	--	--	13150
Boeing 737-800 Series	8CM051	11.0	21.0	--	--	26300
Boeing 737-800 Series	8CM065	1.0	6.0	--	--	26300
Boeing 737-800 Series	8CM066	24.0	10.7	--	--	26300
Boeing 737-800 Series	8CM066	1.0	3.0	1.0	2.0	13150
Boeing 737-800BCF	3CM034	1.0	11.0	--	--	26300
Boeing 737-9	01P20CM140	21.0	10.4	--	--	26400
Boeing 737-9	01P20CM140	1.0	9.0	--	--	13200
Boeing 737-900 Series	01P11CM114	1.0	4.0	--	--	26300
Boeing 737-900 Series	8CM051	22.0	8.7	--	--	26300
Boeing 737-900 Series	8CM051	1.0	26.0	2.0	2.0	13150

TABLE 7-3: ANNUAL AIRCRAFT RUN-UP ACTIVITY – EXISTING (2022) CONDITION (CONTINUED)

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
Boeing 737-900-ER	01P11CM116	21.0	15.7	2.0	2.0	26300
Boeing 737-900-ER	01P11CM116	1.0	3.0	--	--	13150
Boeing 737-900-ER	01P11CM121	54.0	25.5	--	--	26300
Boeing 737-900-ER	01P11CM121	1.0	8.0	--	--	13150
Boeing 757-200 Series	4PW072	2.0	36.5	--	--	38300
Boeing 757-300 Series	XPW204	4.0	27.0	--	--	43100
Boeing 767-200 Series Freighter	1GE012	1.0	6.0	--	--	48000
Boeing 767-300 ER Freighter	1GE030	3.0	21.0	--	--	60000
Boeing MD-11 Freighter	1GE031	2.0	44.5	--	--	61500
Bombardier de Havilland Dash 8 Q400	PW150A	23.0	15.2	--	--	4918
Bombardier de Havilland Dash 8 Q400	PW150A	1.0	10.0	--	--	2459
Bombardier Learjet 60	7PW077	1.0	9.0	--	--	3500
Cessna 560 Citation Encore	PW530	1.0	4.0	--	--	3313
Embraer ERJ175-LR	01P08GE197	7.0	11.1	--	--	13800
Tango X Location						
Airbus A330-200 Series	9PW094	1.0	38.0	--	--	71100
Total		467.0		10.0		

Notes: Totals may not sum due to rounding.
Daytime = 7:00am – 9:59pm, Nighttime = 10:00pm – 6:59am.
Source: SEA Engine Run-up Log, 2022; Landrum & Brown analysis, 2024.

Flight Tracks

Arrival and departure flight tracks modeled for the Existing (2022) Condition are depicted on **Exhibit 7-2** through **Exhibit 7-7**. The first two exhibits show jet aircraft flight tracks and the last two show propeller aircraft flight tracks. These flight tracks are separated because the flight patterns of jet aircraft versus propeller aircraft can be notably different.

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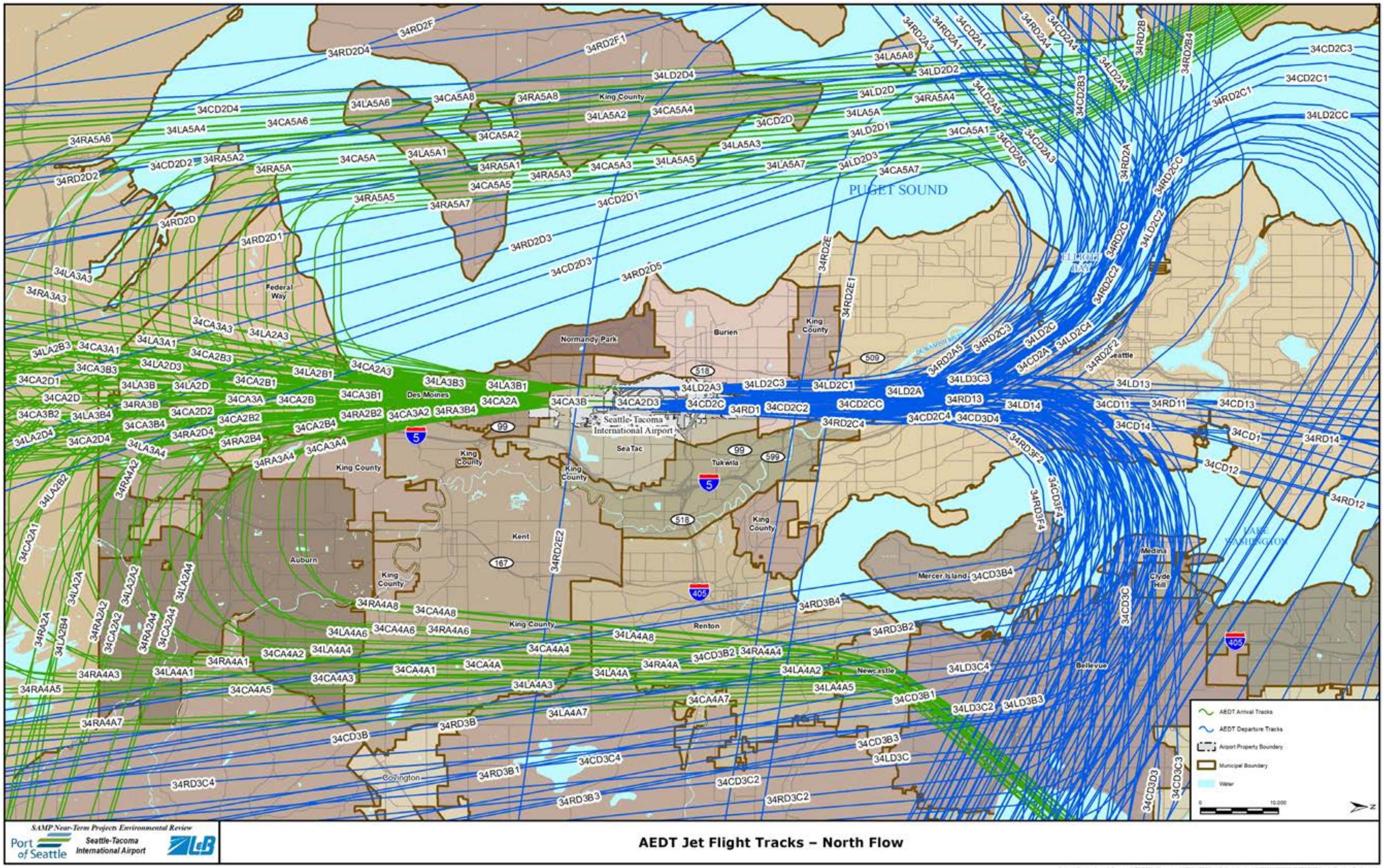
EXHIBIT 7-2: AEDT JET FLIGHT TRACKS – NORTH FLOW



Sources: SEA EnvironmentalVue Monitoring System data, January 2022-December 2022; Landrum & Brown analysis, 2024.

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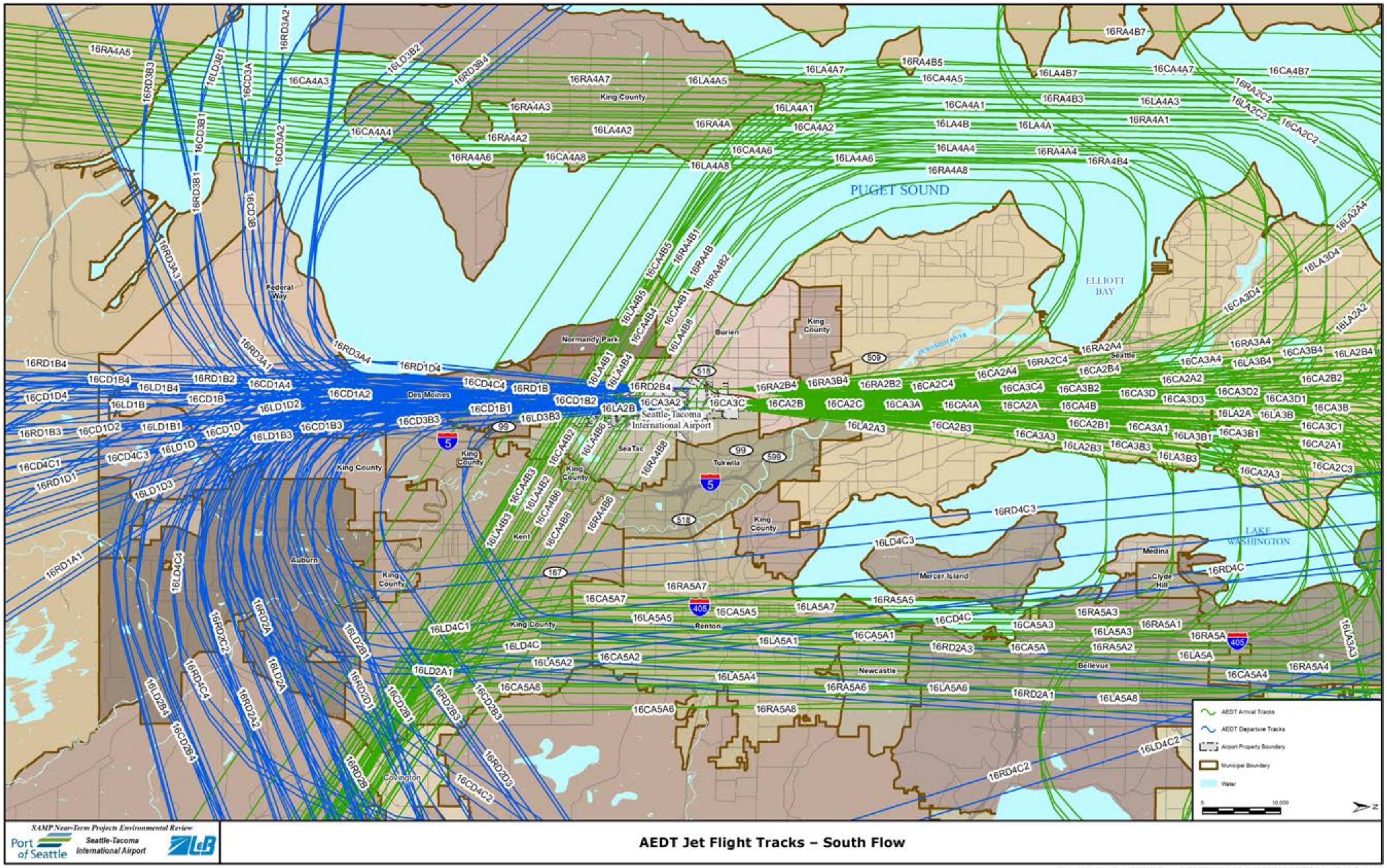
EXHIBIT 7-3: AEDT JET FLIGHT TRACKS – SOUTH FLOW



Sources: SEA EnvironmentalVue Monitoring System data, January 2022-December 2022; Landrum & Brown analysis, 2024.

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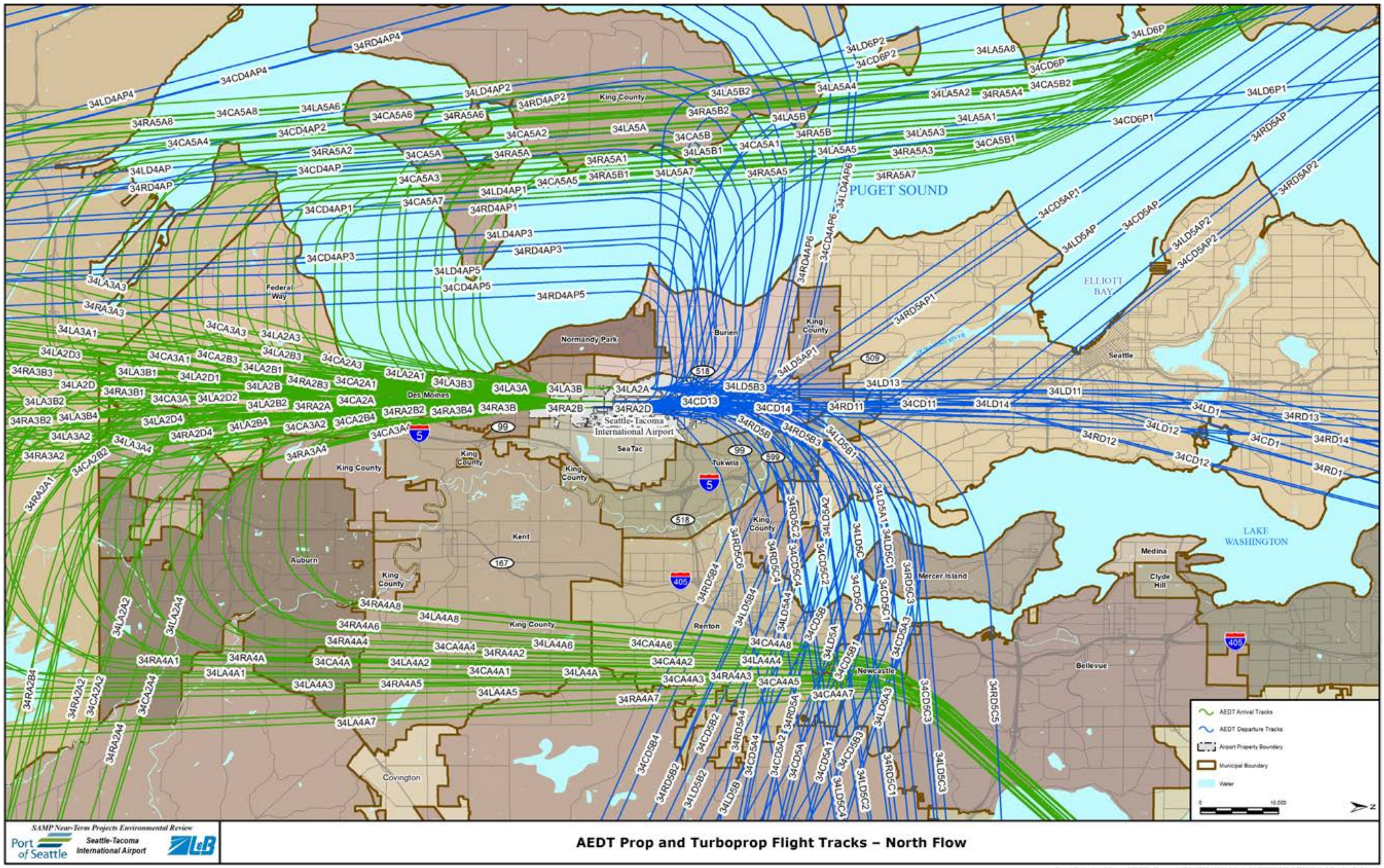
EXHIBIT 7-4: AEDT TURBOPROP AND PROP FLIGHT TRACKS – NORTH FLOW



Sources: SEA EnvironmentalVue Monitoring System data, January 2022-December 2022; Landrum & Brown analysis, 2024.

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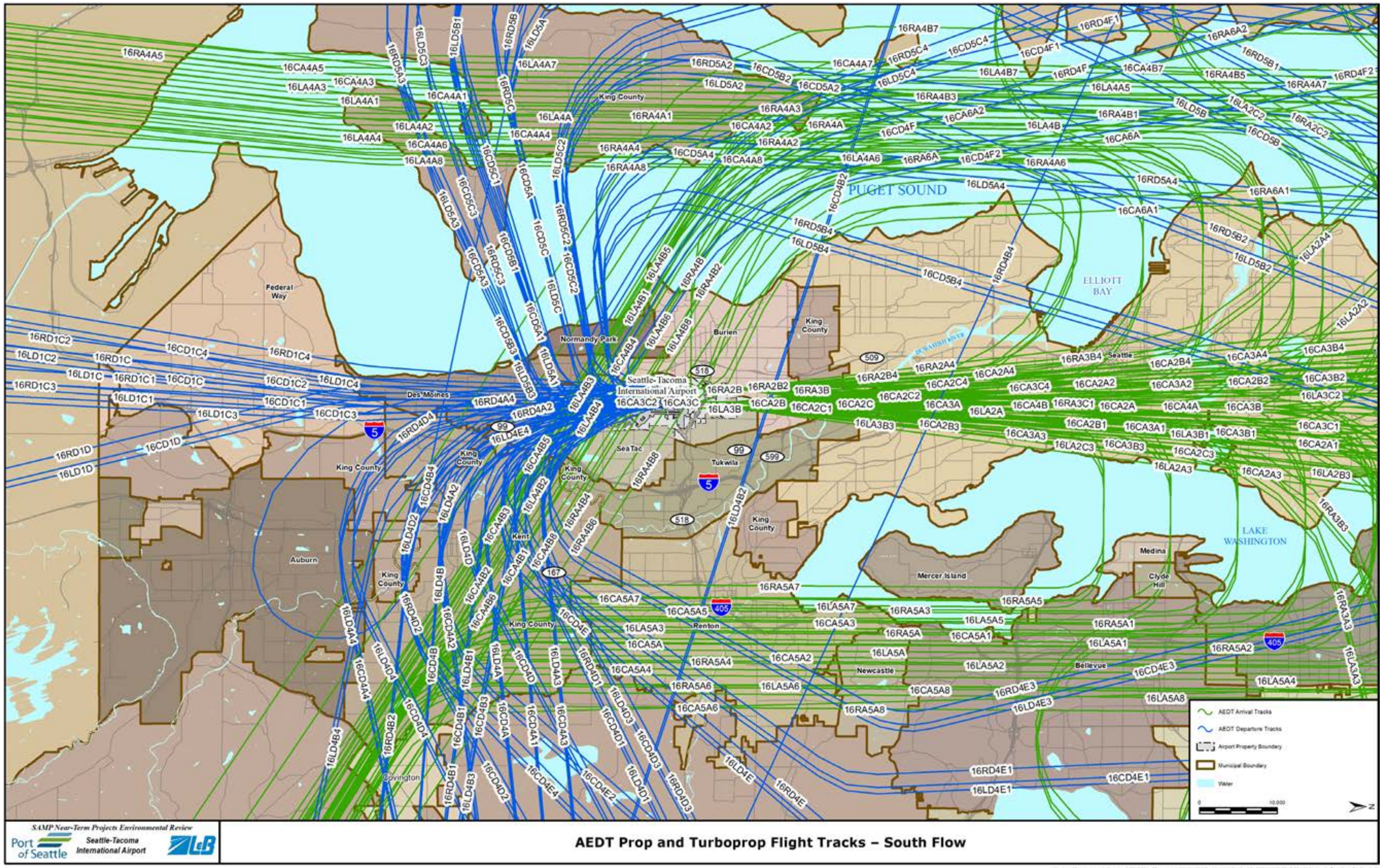
EXHIBIT 7-5: AEDT TURBOPROP AND PROP FLIGHT TRACKS – SOUTH FLOW



Sources: SEA EnvironmentalVue Monitoring System data, January 2022-December 2022; Landrum & Brown analysis, 2024

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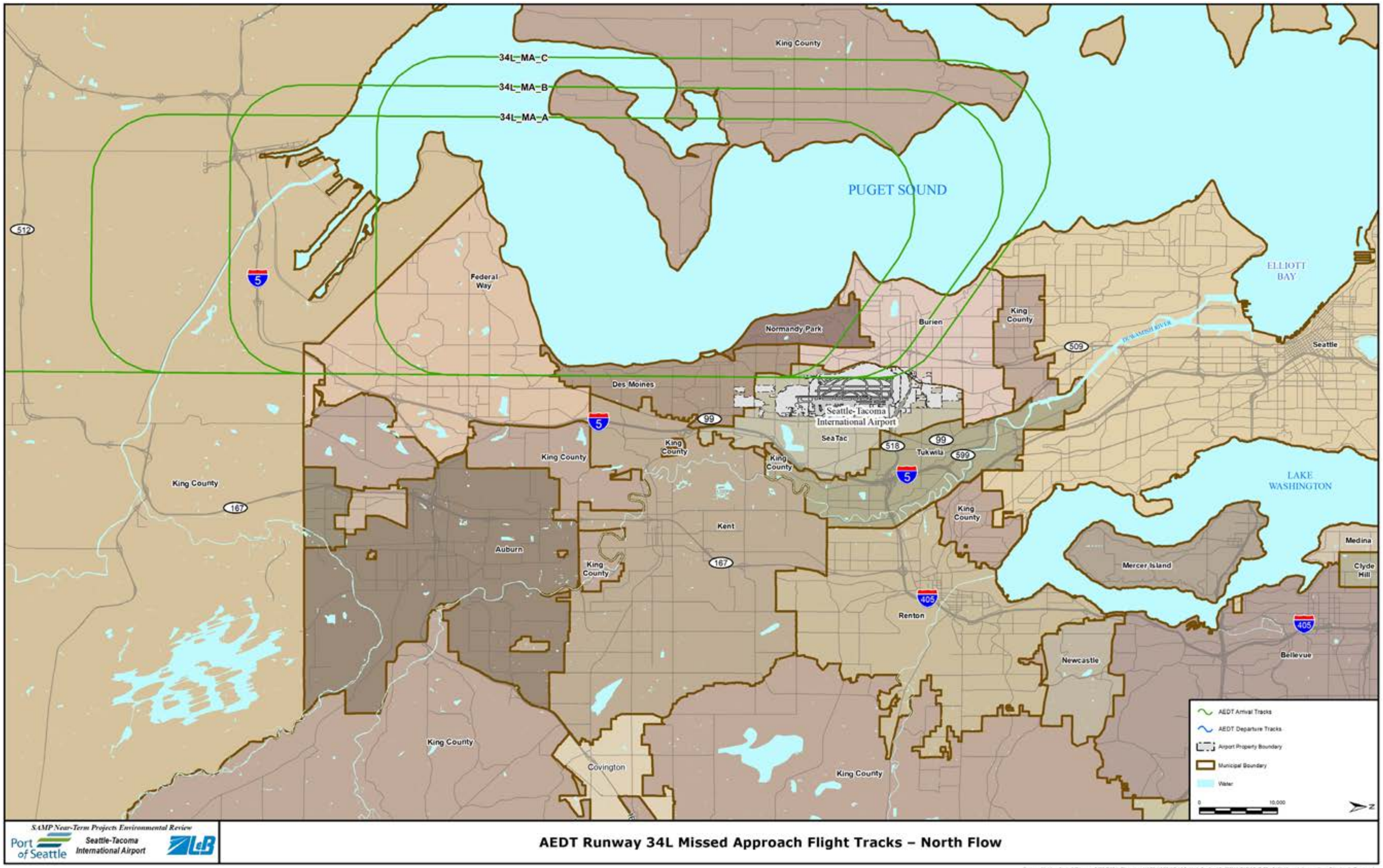
EXHIBIT 7-6: AEDT RUNWAY 34L MISSED APPROACH FLIGHT TRACKS – NORTH FLOW



Sources: SEA EnvironmentalVue Monitoring System data, January 2022-December 2022; Landrum & Brown analysis, 2024.

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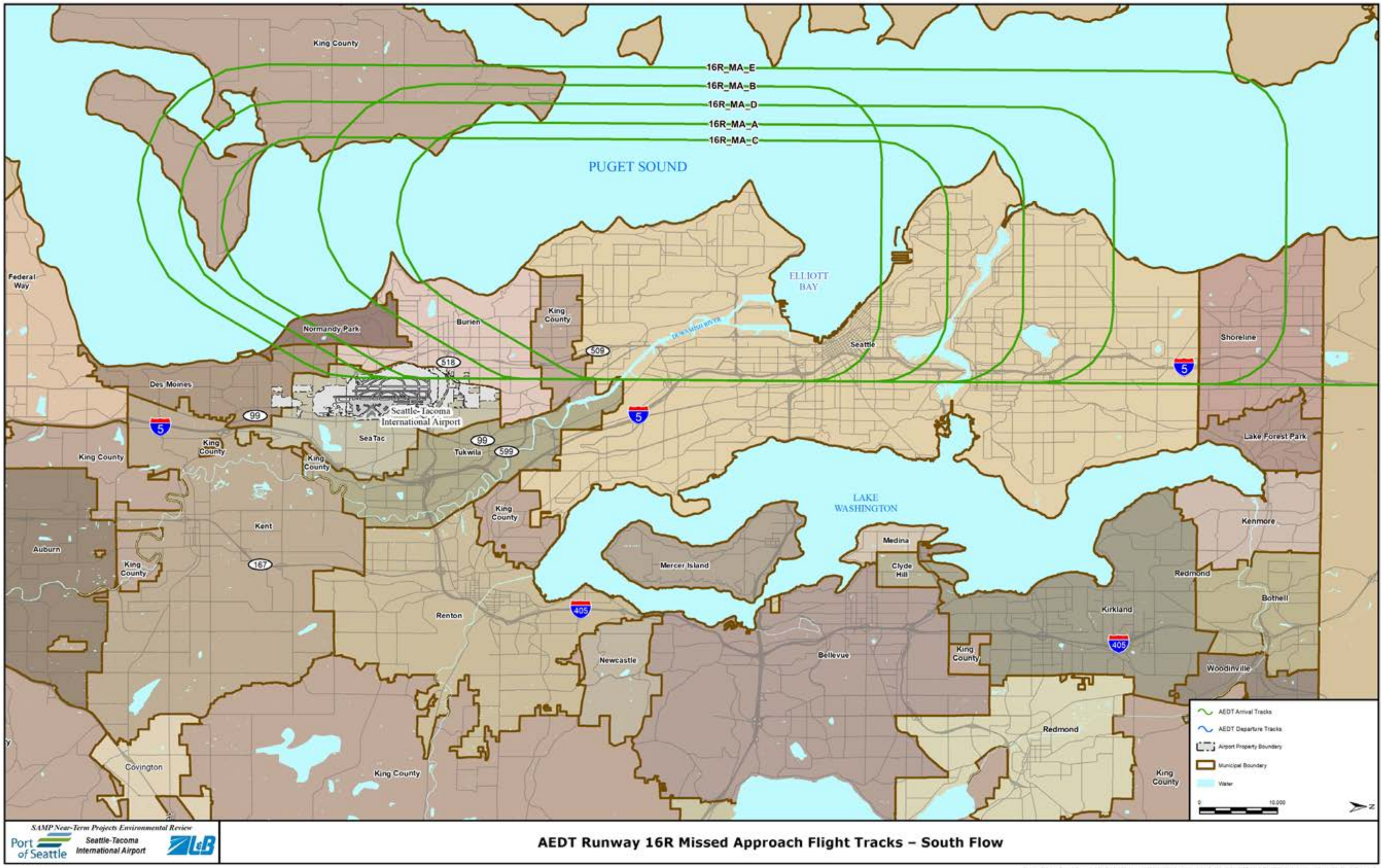
EXHIBIT 7-7: AEDT RUNWAY 16R MISSED APPROACH FLIGHT TRACKS – SORTH FLOW



Sources: SEA EnvironmentalVue Monitoring System data, January 2022-December 2022; Landrum & Brown analysis, 2024

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Aircraft Trip Length and Operational Profiles
Table 7-4 indicates the proportion of the 2022 departures that fell within each of the nine trip length categories for the Existing (2022) Condition.

TABLE 7-4: DEPARTURE STAGE LENGTH DISTRIBUTION – EXISTING (2022) CONDITION

Stage Length	Commercial Jets	Cargo Jets	Regional Jets	Turbo-Props	Cargo Props	GA Jets	GA Props	Total
1	17.0%	5.3%	3.9%	100%	100%	85.5%	100%	27.0%
2	40.0%	25.4%	96.1%	--	--	5.5%	--	34.6%
3	15.3%	12.6%	--	--	--	3.7%	--	13.3%
4	24.0%	41.6%	--	--	--	5.1%	--	21.6%
5	0.3%	0.0%	--	--	--	--	--	0.2%
6	2.3%	2.9%	--	--	--	0.3%	--	2.0%
7	0.7%	12.1%	--	--	--	0.5%	--	1.0%
8	0.1%	--	--	--	--	--	--	0.0%
9	0.2%	0.0%	--	--	--	--	--	0.2%
M	--	--	--	--	--	--	--	--

Sources: SEA EnvironmentalVue Monitoring System Data, January 2022-December 2022; Landrum & Brown analysis, 2024.

Typical destinations for Stage Length Category 1 (0-500 nautical miles) include Boise, Idaho; Portland, Oregon; and Vancouver, British Columbia. Typical destinations for Stage Length Category 2 distances (501-1,000 nautical miles) include Denver, Colorado; Las Vegas, Nevada; and Los Angeles, California. Typical destinations for Stage Length Category 3 distances (1,001-1,500 nautical miles) include Chicago, Illinois; Dallas, Texas; and Minneapolis-St. Paul, Minnesota. Typical destinations for Stage Length Category 4 distances (1,501-2,500 nautical miles) include Atlanta, Georgia; New York City, New York; and Toronto, Ontario. Typical destinations in the Stage Length Category 5 or greater (2,501 or more nautical miles) include destinations in Asia and Europe. The departure segment of the missed approaches are modeled as Stage Length Category 1.

7.1.1 Existing (2022) Condition Noise Contour

Exhibit 7-8: *Existing (2022) Condition Noise Contour*, graphically depicts the average annual noise contour for the Existing (2022) Condition. The 65 DNL noise contour of the Existing (2022) Condition encompasses 8.8 total square miles within the cities of Burien, Des Moines, and SeaTac, and unincorporated King County. The area in square miles of each DNL contour band is summarized in **Table 7-5**.

The 65 DNL contour extends approximately 3.4 miles to the north and 2.8 miles south of SEA. The area within the contour to the north and south is made up of a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

TABLE 7-5: AREA (SQUARE MILES) OF 65, 70, AND 75 DNL NOISE CONTOURS – EXISTING (2022)

Alternative	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 75+ dB	DNL 65+ dB
Existing (2022)	5.41	2.14	1.24	8.79

Source: Landrum & Brown analysis, 2024.

7.1.2 Non-Compatible Land Use

Summaries of the residential population and housing units exposed to noise levels exceeding 65 DNL for the Existing (2022) Condition noise contour are provided in **Table 7-6**. A total of 6,216 housing units are located within the 65+ DNL noise contour.

TABLE 7-6: NON-COMPATIBLE LAND USE HOUSING AND POPULATION – EXISTING (2022) CONDITION

Mitigation Status/Land Use	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 65+ dB
Sound Insulation Completed			
Single-Family	3,100	93	3,193
Multi-Family	349	0	349
Mobile Home	0	0	0
Subtotal	3,449	93	3,542
Not Sound Insulated			
Single-Family	649	13	662
Multi-Family	1,887	0	1,887
Mobile Home	119	6	125
Subtotal	2,655	19	2,674
Total Housing Units	**6,104**	**112**	**6,216**
Estimated Population			
Total Estimated Population	**13,754**	**307**	**14,061**

Notes: Multi-family includes total units in a complex and were verified using King County assessor data. Population numbers are estimates based on the 2020 United States Census average household size per number of housing units.
Source: Landrum & Brown analysis, 2024.

A list of noise sensitive facilities within the 65+ DNL Noise Contour for the Existing (2022) Condition are listed in **Table 7-7**. There are nine schools (five of which have been insulated and one additional school is in the process of being sound insulated), 19 places of worship, three nursing homes, and two libraries within the 65+ DNL noise contour.

TABLE 7-7: NOISE SENSITIVE FACILITIES IN THE EXISTING (2022) CONDITION 65+ DNL NOISE CONTOUR

Map ID	Name
Schools	
S-1	Puget Sound Skills Center
S-3	Midway Elementary School
S-4	Mount Rainier High School
S-5	Southern Heights Elementary School
S-6	Pacific Middle School
S-7	Beverly Park Elementary School
S-8	Our Lady of Lourdes School
S-9	St. Philomena Catholic School
S-10	Glacier Middle School
Places of Worship	
C-1	Saint Philomena Catholic Church
C-2	Prince of Peace Lutheran Church
C-3	Samoan Christian Fellowship
C-4	Normandy Christian Church
C-6	Hope Church
C-7	Gospel Russian Baptist Church
C-8	The Mountain Church
C-9	Riverton Heights Baptist Church
C-10	Boulevard Park Presbyterian
C-11	Midway Community Covenant Church
C-12	Apostolic Bible Church of Jesus Christ
C-13	Highline 7th Day Adventist Church
C-14	Glen Acres Church of Christ
C-15	Kingdom Hall of Jehovah's Witnesses
C-17	Our Lady of Lourdes Church
C-18	Pacific Northwest United Methodist
C-19	Wat Buddharam Buddhist Temple
C-20	Hanuman Nagri Temple
C-21	Way of Salvation Church
Libraries	
L-1	Des Moines Library
L-2	Boulevard Park Library
Nursing Homes	
N-2	Wesley Homes Terrace
N-3	Wesley Homes Health Center
N-4	Wesley Homes Gardens and Bungalows

Source: Landrum & Brown analysis, 2024.

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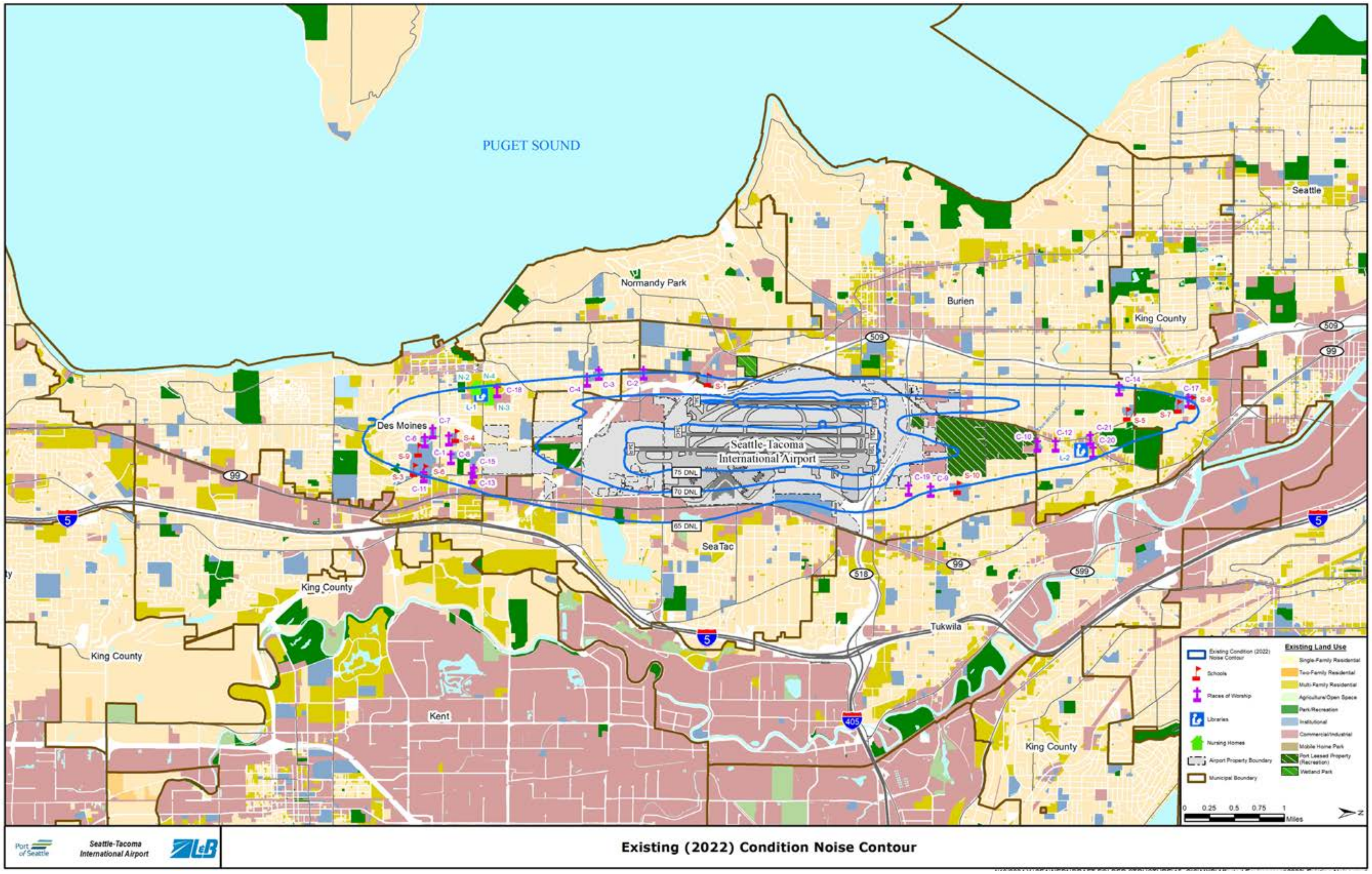
EXHIBIT 7-8: EXISTING (2022) CONDITION NOISE CONTOUR



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.

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7.2 Future Conditions

7.2.1 Future (2032) No Action

The following describes the input data and methodologies used in preparing the Future (2032) No Action noise contour, followed by the resulting noise exposure contours.

Aircraft Activity Levels and Fleet Mix

Table 7-8 shows the number of operations by detailed aircraft type and by time of day (daytime or nighttime). The Future (2032) No Action annual average day included 1,279 average annual day operations, 16 percent of which occurred during the nighttime hours of 10:00 p.m. to 6:59 a.m.

TABLE 7-8: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) NO ACTION

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Commercial Jets						
Airbus A220-100	16PW111	23.80	2.38	26.18	--	52.37
Airbus A220-300	16PW111	6.29	1.26	7.55	--	15.09
Airbus A220-300	16PW112	3.10	0.62	3.72	--	7.43
Airbus A319-100 Series	01P10IA020	--	0.01	0.00	0.00	0.01
Airbus A319-100 Series	3CM028	--	0.05	0.02	0.02	0.09
Airbus A319-100 Series	3IA006	--	1.04	0.52	0.52	2.08
Airbus A319-100 Series	3IA007	--	0.56	0.28	0.28	1.11
Airbus A319-100 Series	4CM035	--	0.04	0.02	0.02	0.08
Airbus A319-100 Series	8IA09	--	0.02	0.01	0.01	0.04
Airbus A320-200 Series	01P08CM105	6.14	1.84	4.91	3.07	15.96
Airbus A320-200 Series	01P10IA021	0.55	0.17	0.44	0.28	1.43
Airbus A320-200 Series	01P10IA022	0.12	0.04	0.10	0.06	0.31
Airbus A320-200 Series	1CM008	0.15	0.04	0.12	0.07	0.39
Airbus A320-200 Series	1CM009	0.61	0.18	0.49	0.30	1.58
Airbus A320-200 Series	1IA003	1.16	0.35	0.93	0.58	3.01
Airbus A320-200 Series	3CM026	0.66	0.20	0.53	0.33	1.72
Airbus A320-200 Series	8IA010	0.00	0.00	0.00	0.00	0.00
Airbus A320-NEO	01P20CM128	3.21	1.43	2.50	2.14	9.29
Airbus A320-NEO	01P22PW163	5.10	2.27	3.97	3.40	14.74
Airbus A321-200 Series	01P08CM104	1.03	0.39	0.86	0.55	2.84
Airbus A321-200 Series	01P10IA025	6.26	2.35	5.24	3.37	17.20
Airbus A321-200 Series	3CM025	1.06	0.40	0.89	0.57	2.93
Airbus A321-NEO	01P18PW157	4.57	2.54	6.09	1.01	14.21
Airbus A321-NEO	01P20CM132	13.54	7.52	18.06	3.01	42.14
Boeing 737-7	01P20CM136	1.19	0.30	1.19	0.30	2.99
Boeing 737-700 Series	3CM030	0.08	0.05	0.10	0.03	0.26
Boeing 737-700 Series	3CM031	2.81	1.56	3.37	1.01	8.75
Boeing 737-700 Series	3CM032	0.51	0.28	0.61	0.18	1.59
Boeing 737-700 Series	8CM051	0.00	0.00	0.00	0.00	0.01
Boeing 737-700 Series	8CM062	0.02	0.01	0.02	0.01	0.06
Boeing 737-700 Series	8CM063	0.48	0.27	0.57	0.17	1.48
Boeing 737-8	01P20CM135	0.31	0.08	0.31	0.08	0.77
Boeing 737-8	01P20CM136	10.02	2.51	10.02	2.51	25.05
Boeing 737-8	01P20CM140	9.24	2.31	9.24	2.31	23.11
Boeing 737-800 Series	01P11CM114	0.48	0.10	0.50	0.09	1.16

TABLE 7-8: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) NO ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 737-800 Series	01P11CM116	6.50	1.43	6.74	1.18	15.85
Boeing 737-800 Series	01P11CM122	3.55	0.78	3.68	0.64	8.65
Boeing 737-800 Series	01P11CM125	0.79	0.17	0.82	0.14	1.92
Boeing 737-800 Series	01P11CM126	0.07	0.02	0.08	0.01	0.18
Boeing 737-800 Series	3CM032	19.89	4.37	20.65	3.62	48.53
Boeing 737-800 Series	3CM034	1.92	0.42	1.99	0.35	4.69
Boeing 737-800 Series	8CM051	27.23	5.98	28.26	4.95	66.43
Boeing 737-800 Series	8CM064	0.20	0.04	0.21	0.04	0.48
Boeing 737-800 Series	8CM065	2.54	0.56	2.64	0.46	6.20
Boeing 737-800 Series	8CM066	11.94	2.62	12.39	2.17	29.13
Boeing 737-9	01P20CM136	0.52	0.09	0.40	0.20	1.21
Boeing 737-9	01P20CM140	20.41	3.40	15.87	7.94	47.62
Boeing 737-900-ER	01P11CM116	33.03	7.49	33.44	7.09	81.04
Boeing 737-900-ER	01P11CM121	94.44	21.41	95.59	20.26	231.70
Boeing 737-900-ER	01P11CM125	0.29	0.07	0.29	0.06	0.71
Boeing 737-900-ER	3CM034	1.33	0.30	1.35	0.29	3.26
Boeing 737-900-ER	8CM065	1.48	0.34	1.50	0.32	3.64
Boeing 737-900-ER_MA	01P11CM121_MA	3.19	0.11	1.60	0.06	4.95
Airbus A330-200 Series	2RR023	3.02	0.38	3.39	--	6.79
Airbus A330-200 Series	9PW094	0.04	0.01	0.05	--	0.10
Airbus A330-300 Series	2RR023	0.74	--	0.74	--	1.47
Airbus A330-300 Series	4GE080	0.75	--	0.75	--	1.49
Airbus A330-300 Series	7PW082	0.10	--	0.10	--	0.20
Airbus A330-300 Series	9PW094	2.11	--	2.11	--	4.21
Airbus A330-300 Series	9PW095	0.49	--	0.49	--	0.99
Airbus A330-900N Series (Neo)	02P23RR141	6.86	--	6.86	--	13.72
Airbus A350-900 series	01P18RR124	2.57	--	1.71	0.86	5.13
Boeing 767-400 ER	8GE101	0.49	--		0.49	0.98
Boeing 777-200-ER	10PW099	0.16	--	0.16	--	0.33
Boeing 777-200-ER	2RR027	0.58	--	0.58	--	1.16
Boeing 777-200-ER	3GE060	0.26	--	0.26	--	0.51
Boeing 777-200-ER	3GE064	0.00	--	0.00	--	0.01
Boeing 777-200-ER	8GE100	0.27	--	0.27	--	0.53
Boeing 777-300 ER	01P21GE217	1.73	--	1.15	0.58	3.45
Boeing 787-10 Dreamliner	01P17GE211	0.46	--	0.46	--	0.92
Boeing 787-10 Dreamliner	01P17GE213	0.99	--	0.99	--	1.98
Boeing 787-10 Dreamliner	02P23RR134	0.50	--	0.50	--	1.00
Boeing 787-8 Dreamliner	01P17GE206	1.45	--	1.45	--	2.89
Boeing 787-8 Dreamliner	01P17GE210	0.05	--	0.05	--	0.10
Boeing 787-8 Dreamliner	11GE137	2.28	--	2.28	--	4.57

TABLE 7-8: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) NO ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 787-8 Dreamliner	11GE138	5.61	--	5.61	--	11.22
Boeing 787-9 Dreamliner	01P17GE211	2.85	--	2.85	--	5.70
Boeing 787-9 Dreamliner	01P17GE214	0.02	--	0.02	--	0.04
Boeing 787-9 Dreamliner	02P23RR131	0.64	--	0.64	--	1.29
Boeing 787-9 Dreamliner	12RR067	2.94	--	2.94	--	5.89
Boeing 787-9 Dreamliner	12RR068	1.24	--	1.24	--	2.48
	Subtotal	371.03	83.12	374.51	77.99	906.65
Cargo Jets						
Airbus A300F4-600 Series	1GE020	0.01	--	0.01	--	0.01
Airbus A300F4-600 Series	1PW048	0.18	--	0.18	--	0.36
Airbus A300F4-600 Series	3GE056	0.33	--	0.33	--	0.66
Boeing 747-400 ERF	12PW102	0.27	0.54	0.54	0.27	1.62
Boeing 747-400BCF	01P03GE187	0.27	0.54	0.54	0.27	1.62
Boeing 747-8F	01P17GE215	0.40	--	0.40	--	0.79
Boeing 747-8F	13GE156	0.11	--	0.11	--	0.21
Boeing 747-8F	8GENX1	0.34	--	0.34	--	0.68
Boeing 767-200 Series Freighter	1GE010	1.31	2.62	2.62	1.31	7.85
Boeing 767-200 Series Freighter	1GE012	0.65	1.30	1.30	0.65	3.91
Boeing 767-200 Series Freighter	1PW026	0.12	0.23	0.23	0.12	0.70
Boeing 767-300 ER Freighter	1GE030	4.73	0.95	4.73	0.95	11.35
Boeing 767-300 ER Freighter	2GE055	0.47	0.09	0.47	0.09	1.12
Boeing 777 Freighter	01P21GE216	3.31	--	3.31	--	6.62
Boeing 777 Freighter	01P21GE217	0.08	--	0.08	--	0.16
Boeing MD-11 Freighter	12PW102	0.09	0.26	0.26	0.09	0.68
Boeing MD-11 Freighter	1GE031	0.43	1.29	1.29	0.43	3.43
Boeing MD-11 Freighter	1PW052	0.14	0.42	0.42	0.14	1.12
	Subtotal	13.21	8.23	17.14	4.31	42.89
Regional Jets						
Embraer ERJ175-LR	01P08GE197	138.94	17.08	142.35	13.67	312.04
Embraer ERJ175-LR_MA_Y2	01P08GE197_MA_Y2	1.59	0.20	0.79	0.10	2.68
	Subtotal	140.52	17.28	143.15	13.77	314.72
Cargo Props						
ATR 72-600 Freighter	PW127F	0.28	--	0.28	--	0.56
Cessna 208 Caravan	P6114A	1.59	--	1.59	--	3.19

TABLE 7-8: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) NO ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Cessna 208 Caravan	PT6A14	1.57	--	1.57	--	3.14
Cessna 408 SkyCourier	PT6A6B	0.28	--	0.28	--	0.56
Raytheon Beech 99	PT6A27	0.00	--	0.00	--	0.01
Raytheon Beech 99	PT6A36	0.25	--	0.25	--	0.50
	Subtotal	3.98	--	3.98	--	7.95
General Aviation						
Bombardier Challenger 350	01P14HN011	0.76	--	0.76	--	1.52
Cessna 172 Skyhawk	IO320	0.09	0.09	0.18	--	0.36
Dassault Falcon 50	1AS002	0.76	--	0.76	--	1.52
Embraer Phenom 300 (EMB-505)	PW530	0.17	--	0.17	--	0.35
Piper PA-31 Navajo	TIO540	0.02	--	0.02	--	0.05
Raytheon C-12 Huron	PT660A	0.08	--	0.08	--	0.17
	Subtotal	1.89	0.09	1.98	--	3.96
Other						
Boeing 737-900-ER_O1	01P11CM121_O1	0.49	0.11	0.49	0.10	1.20
Boeing 737-900-ER_O2	01P11CM125_O2	0.00	0.00	0.00	0.00	0.00
Boeing 737-900-ER_O3	3CM034_O3	0.01	0.00	0.01	0.00	0.02
Boeing 737-900-ER_O4	8CM065_O4	0.01	0.00	0.01	0.00	0.02
Boeing 737-900-ER_O7	01P11CM116_O7	0.17	0.04	0.17	0.04	0.41
Cessna 208 Caravan_O5	P6114A_O5	0.28	--	0.28	--	0.55
Cessna 208 Caravan_O6	PT6A14_O6	0.27	--	0.27	--	0.54
	Subtotal	1.22	0.15	1.23	0.14	2.74
Military						
Cessna 172 Skyhawk_M2	IO320_M2	0.00	--	0.00	--	0.01
Embraer Phenom 300 (EMB-505)_M1	PW530_M1	0.10	--	0.10	--	0.20
Raytheon C-12 Huron_M	PT660A_M	0.04	--	0.04	--	0.07
	Subtotal	0.14	--	0.14	--	0.27
	Grand Total	**531.98**	**108.88**	**542.11**	**96.21**	**1279.18**

Note: Totals may not sum due to rounding.
Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.

Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

Runway Definition

Under the Future (2032) No Action, none of the proposed airfield changes would occur and it is assumed that no changes to the runway locations would occur. Therefore, the runway definition discussed for the Existing (2022) Condition (see Section 7.1) would remain the same for the Future (2032) No Action.

Runway End Utilization

Under the Future (2032) No Action, the runway end utilization was estimated using operational output from the Total Airspace and Airport Modeler (TAAM) airfield simulation modeling.[12] The runway end utilization under the No Action condition would be influenced by airfield congestion and the total number of operations occurring at the Airport. **Table 7-9** presents the runway end utilization used for the modeling of the Future (2032) No Action.

TABLE 7-9: GENERALIZED RUNWAY END UTILIZATION SUMMARY – FUTURE (2032) NO ACTION

Aircraft Category	Runway End 16L	Runway End 16C	Runway End 16R	Runway End 34L	Runway End 34C	Runway End 34R
Daytime Arrivals						
Commercial Jets	10.33%	1.00%	59.67%	24.37%	0.50%	4.13%
Cargo Jets	55.00%	1.00%	15.00%	6.50%	0.50%	22.00%
Regional Jets	5.00%	1.00%	65.00%	26.50%	0.50%	2.00%
Cargo Props	23.05%	1.43%	46.52%	26.50%	0.93%	1.57%
General Aviation	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Other	14.45%	1.22%	55.33%	26.50%	0.72%	1.78%
Military	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Missed Approaches*	--	--	77.33%	22.67	--	--
Daytime Departures						
Commercial Jets	45.41%	25.59%	--	--	0.95%	28.05%
Cargo Jets	58.00%	13.00%	--	--	0.50%	28.50%
Regional Jets	44.00%	27.00%	--	--	1.00%	28.00%
Cargo Props	36.27%	32.16%	2.58%	1.72%	12.60%	14.68%
General Aviation	35.00%	33.00%	3.00%	2.00%	14.50%	12.50%
Other	39.98%	29.68%	1.34%	0.89%	7.03%	21.07%
Military	35.00%	33.00%	3.00%	2.00%	14.50%	12.50%
Missed Approaches*	--	--	77.33%	22.67	--	--
Nighttime Arrivals						
Commercial Jets	5.23%	1.00%	64.77%	26.41%	0.50%	2.09%
Cargo Jets	55.00%	1.00%	15.00%	6.50%	0.50%	22.00%
Regional Jets	5.00%	1.00%	65.00%	26.50%	0.50%	2.00%
Cargo Props	--	--	--	--	--	--
General Aviation	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Other	5.00%	1.00%	65.00%	26.50%	0.50%	2.00%
Military	--	--	--	--	--	--
Missed Approaches*	--	--	80.98%	19.02%	--	--

12 Environmental Review Airside Modeling, Seattle-Tacoma International Airport (LeighFisher, 2020)

TABLE 7-9: GENERALIZED RUNWAY END UTILIZATION SUMMARY – FUTURE (2032) NO ACTION (CONTINUED)

Aircraft Category	Runway End 16L	Runway End 16C	Runway End 16R	Runway End 34L	Runway End 34C	Runway End 34R
Nighttime Departures						
Commercial Jets	44.35%	26.65%	--	--	0.99%	28.01%
Cargo Jets	58.00%	13.00%	--	--	0.50%	28.50%
Regional Jets	44.00%	27.00%	--	--	1.00%	28.00%
Cargo Props	--	--	--	--	--	--
General Aviation	--	--	--	--	--	--
Other	44.00%	27.00%	--	--	1.00%	28.00%
Military	--	--	--	--	--	--
Missed Approaches*	--	--	80.98%	19.02%	--	--

Note: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
* Missed approaches count as two arrivals and one departure for modeling purposes.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Environmental Review Airside Modeling, Seattle-Tacoma International Airport, LeighFisher, 2020, Landrum & Brown analysis, 2024.

Engine Run-Ups

Under the Future (2032) No Action, no changes to run-up locations would occur. Therefore, the run-up locations discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2032) No Action. The number of engine run-up operations are estimated for Future (2032) No Action conditions based on scaling the engine run-ups from 2022 for the number of total operations, assuming the same distribution across aircraft type. The resulting number of engine run-ups are presented below in **Table 7-10**.

TABLE 7-10: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2032) NO ACTION

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
North Flow Primary Location						
Airbus A319-100 Series	3IA006	1.4	3.0	--	--	22,000 lbs.
Airbus A320-200 Series	01P08CM105	24.6	15.8	1.5	2	25,000 lbs.
Airbus A320-200 Series	1CM009	2.9	69.5	--	--	25,000 lbs.
Airbus A320-200 Series	3CM026	2.9	15.5	--	--	25,000 lbs.
Airbus A321-200 Series	3CM025	4.3	36.7	--	--	30,000 lbs.
Airbus A321-NEO	01P20CM132	--	--	1.5	2	30,000 lbs.
Airbus A330-200 Series	9PW094	8.7	27.7	--	--	71,100 lbs.
Airbus A330-300 Series	4GE080	1.4	37.0	--	--	67,500 lbs.
Airbus A330-900N Series (Neo)	02P23RR141	1.4	26.0	--	--	71,100 lbs.
Boeing 737-700 Series	3CM031	5.8	26.8	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	7.2	56.4	--	--	24,000 lbs.
Boeing 737-800 Series	01P11CM122	1.4	10.0	--	--	26,300 lbs.
Boeing 737-800 Series	3CM032	20.3	27.6	--	--	26,300 lbs.

TABLE 7-10: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2032) NO ACTION (CONTINUED)

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
Boeing 737-800 Series	3CM034	1.4	9.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM051	2.9	40.5	--	--	26,300 lbs.
Boeing 737-800 Series	8CM066	4.3	33.0	--	--	26,300 lbs.
Boeing 737-9	01P20CM140	13.0	14.6	--	--	26,400 lbs.
Boeing 737-900-ER	01P11CM116	14.5	20.2	--	--	26,300 lbs.
Boeing 737-900-ER	01P11CM121	1.4	4.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM121	23.2	25.1	--	--	26,300 lbs.
Boeing MD-11 Freighter	1GE031	--	--	1.5	2	61,500 lbs.
Embraer ERJ175-LR	01P08GE197	1.4	6.0	--	--	6,900 lbs.
Embraer ERJ175-LR	01P08GE197	5.8	28.0	--	--	13,800 lbs.
South Flow Primary Location						
Airbus A319-100 Series	3IA006	1.4	15.0	--	--	22,000 lbs.
Airbus A319-100 Series	3IA007	1.4	26.0	1.5	11	22,000 lbs.
Airbus A320-200 Series	01P08CM105	2.9	6.0	--	--	12,500 lbs.
Airbus A320-200 Series	01P08CM105	40.6	12.9	--	--	25,000 lbs.
Airbus A320-200 Series	1CM009	7.2	31.6	--	--	25,000 lbs.
Airbus A321-NEO	01P20CM132	2.9	12.5	--	--	30,000 lbs.
Airbus A330-200 Series	2RR023	1.4	6.0	--	--	71,100 lbs.
Airbus A330-200 Series	9PW094	1.4	26.0	--	--	35,550 lbs.
Airbus A330-200 Series	9PW094	11.6	14.9	--	--	71,100 lbs.
Airbus A330-300 Series	4GE080	4.3	10.7	--	--	67,500 lbs.
Airbus A330-900N Series (Neo)	02P23RR141	4.3	26.7	--	--	71,100 lbs.
Boeing 737-700 Series	3CM031	1.4	20.0	1.5	2	12,000 lbs.
Boeing 737-700 Series	3CM031	23.2	17.6	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	5.8	31.5	--	--	24,000 lbs.
Boeing 737-800 Series	3CM032	4.3	18.3	--	--	13,150 lbs.
Boeing 737-800 Series	3CM032	60.8	18.3	--	--	26,300 lbs.
Boeing 737-800 Series	8CM051	15.9	21.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM065	1.4	6.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM066	1.4	3.0	1.5	2	13,150 lbs.
Boeing 737-800 Series	8CM066	34.8	10.7	--	--	26,300 lbs.
Boeing 737-9	01P20CM140	1.4	9.0	--	--	13,200 lbs.
Boeing 737-9	01P20CM140	30.4	10.4	--	--	26,400 lbs.
Boeing 737-900-ER	01P11CM116	1.4	3.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM116	30.4	15.7	2.9	2	26,300 lbs.
Boeing 737-900-ER	01P11CM121	1.4	8.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM121	78.2	25.5	--	--	26,300 lbs.
Boeing 767-200 Series Freighter	1GE012	1.4	6.0	--	--	48,000 lbs.
Boeing 767-300 ER Freighter	1GE030	4.3	21.0	--	--	60,000 lbs.
Boeing MD-11 Freighter	1GE031	2.9	44.5	--	--	61,500 lbs.

TABLE 7-10: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2032) NO ACTION (CONTINUED)

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
Embraer ERJ175-LR	01P08GE197	10.1	11.2	--	--	13,800 lbs.
Tango X Location						
Airbus A330-200 Series	9PW094	1.4	38.0	--	--	71,100 lbs.
Total		543.3	--	11.6	--	--

Notes: Totals may not sum due to rounding.
Daytime = 7:00am – 9:59pm, Nighttime = 10:00pm – 6:59am.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

Flight Tracks

Flight track locations for the Future (2032) No Action would not change. As such, the flight tracks for the Future (2032) No Action are expected to be the same as the Existing (2022) Condition. The flight track information discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2032) No Action.

Aircraft Trip Length and Operational Profiles

Table 7-11 presents the departure stage length distribution for the Future (2032) No Action. The departure segment of the missed approaches is modeled as Stage Length Category 1.

TABLE 7-11: DEPARTURE STAGE LENGTH DISTRIBUTION – FUTURE (2032) NO ACTION

Stage Length	Commercial Jets	Cargo Jets	Regional Jets	Cargo Props	General Aviation	Other	Military	Total
1	3.61%	0.00%	73.72%	100.0%	100.0%	41.97%	100.0%	21.70%
2	45.95%	18.20%	22.63%	--	--	30.16%	--	38.81%
3	17.09%	26.73%	3.65%	--	--	14.75%	--	13.95%
4	25.38%	30.31%	--	--	--	13.11%	--	19.05%
5	--	--	--	--	--	--	--	--
6	3.20%	15.80%	--	--	--	--	--	2.80%
7	4.77%	8.95%	--	--	--	--	--	3.68%
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--

Note: Totals may not sum due to rounding.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

7.2.1.2 Future 2032 No Action Noise Contours

Exhibit 7-9: *Future (2032) No Action Noise Contour* depicts the 65, 70, and 75 DNL noise contours for the Future (2032) No Action. The area in square miles of each DNL contour band is summarized in **Table 7-12**.

The 65 DNL contour extends approximately 3.7 miles to the north and 3.3 miles south of SEA. The area within the contour to the north and south is made up of a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

TABLE 7-12: AREA (SQUARE MILES) OF 65, 70, AND 75 DNL NOISE CONTOURS – FUTURE (2032) NO ACTION

Alternative	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 75+ dB	DNL 65+ dB
Existing (2022)	5.41	2.14	1.24	8.79
Future (2032) No Action	6.23	2.42	1.45	10.10
Change	0.82	0.28	0.21	1.31

Source: Landrum & Brown analysis, 2024.

7.2.1.3 Non-Compatible Land Use

Summaries of the residential population and housing units exposed to noise levels exceeding 65+ DNL for the Future (2032) No Action noise contour are provided in **Table 7-13**. A total of 9,518 housing units would be located within the 65+ DNL noise contour (an increase of 3,402 from the 2022 Existing Condition). The increase in housing units and population from the Existing Condition is due to the increase in aircraft operations and the increase in size of the 65+ DNL contour. For the "sound insulation completed" category, the additional areas within the 65+ DNL contour includes homes treated prior phases of the Port's Part 150 Noise Remedy Program, which extends back to 1985 (when the noise contours were much larger). Therefore, the increases in the numbers are solely due to the changes in the noise contour.

TABLE 7-13 NON-COMPATIBLE LAND USE HOUSING AND POPULATION – FUTURE (2032) NO ACTION

Mitigation Status/Land Use	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 65+ dB
Sound Insulation Completed			
Single-Family	3,720	426	4,146
Multi-Family	384	4	388
Mobile Home	0	0	0
Subtotal	4,104	430	4,534
Not Sound Insulated			
Single-Family	959	87	1,046
Multi-Family	3,772	10	3,782
Mobile Home	139	17	156
Subtotal	4,870	114	4,984
Total Housing Units	**8,974**	**544**	**9,518**
Estimated Population			
Total Estimated Population	**20,571**	**1,404**	**21,975**

Notes: Multi-family includes total units in a complex and were verified using King County assessor data. Population numbers are estimates based on the 2020 United States Census average household size per number of housing units.
Source: Landrum & Brown analysis, 2024.

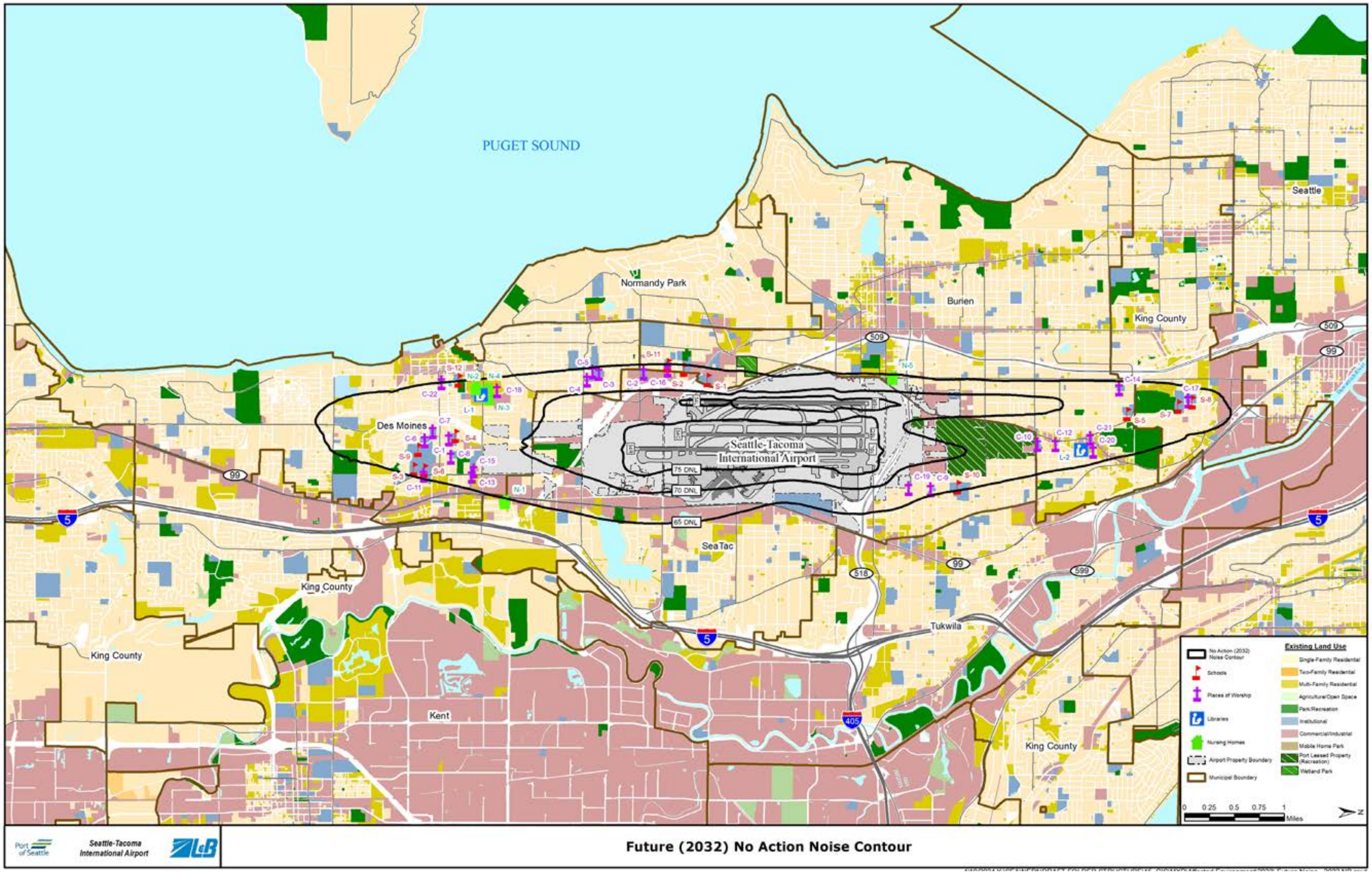
A list of noise sensitive within the 65+ DNL Noise Contour for the Future (2032) No Action are listed in **Table 7-14**. There would be 12 schools, 22 places of worship, five nursing homes, and two libraries within the 65 DNL noise contour. There are no noise sensitive facilities within the 70 or 75 DNL noise contours for the Future (2032) No Action.

TABLE 7-14: NOISE SENSITIVE FACILITIES IN THE FUTURE (2032) NO ACTION 65+ DNL NOISE CONTOUR

Map ID	Name
Schools	
S-1	Puget Sound Skills Center
S-2	Choice Academy – Homeschool Center
S-3	Midway Elementary School
S-4	Mount Rainier High School
S-5	Southern Heights Elementary School
S-6	Pacific Middle School
S-7	Beverly Park Elementary School
S-8	Our Lady of Lourdes School
S-9	St. Philomena Catholic School
S-10	Glacier Middle School
S-11	Community Chapel Christian School
S-12	Des Moines Elementary School
Places of Worship	
C-1	Saint Philomena Catholic Church
C-2	Prince of Peace Lutheran Church
C-3	Samoan Christian Fellowship
C-4	Normandy Christian Church
C-5	Southminster Presbyterian Church
C-6	Hope Church
C-7	Gospel Russian Baptist Church
C-8	The Mountain Church
C-9	Riverton Heights Baptist Church
C-10	Boulevard Park Presbyterian
C-11	Midway Community Covenant Church
C-12	Apostolic Bible Church of Jesus Christ
C-13	Highline 7th Day Adventist Church
C-14	Glen Acres Church of Christ
C-15	Kingdom Hall of Jehovah's Witnesses
C-16	New Testament Christian Church
C-17	Our Lady of Lourdes Church
C-18	Pacific Northwest United Methodist
C-19	Wat Buddharam Buddhist Temple
C-20	Hanuman Nagri Temple
C-21	Way of Salvation Church
C-22	Des Moines United Methodist Church
Libraries	
L-1	Des Moines Library
L-2	Boulevard Park Library
Nursing Homes	
N-1	Falcon Ridge Assisted Living
N-2	Wesley Homes Terrace
N-3	Wesley Homes Health Center
N-4	Wesley Homes Gardens and Bungalows
N-5	High West Residence

Source: Landrum & Brown analysis, 2024.

EXHIBIT 7-9: FUTURE (2032) NO ACTION NOISE CONTOUR



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.

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7.2.2 Future (2032) Proposed Action

The following describes the input data and methodologies used in preparing the Future (2032) Proposed Action noise contour, followed by the resulting noise exposure contours.

Aircraft Activity Levels and Fleet Mix

Table 7-15 shows the total number of operations by detailed aircraft type and by time of day (daytime or nighttime). The Future (2032) Proposed Action annual average day included 1,303 average-annual day operations, 16 percent of which occurred during the nighttime hours of 10:00 p.m. to 6:59 a.m. This is an increase of 24 average-annual day operations over the Future (2032) No Action condition.

TABLE 7-15: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) PROPOSED ACTION

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Commercial Jets						
Airbus A220-100	16PW111	24.27	2.43	26.70	--	53.40
Airbus A220-300	16PW111	6.41	1.28	7.69	--	15.39
Airbus A220-300	16PW112	3.16	0.63	3.79	--	7.58
Airbus A319-100 Series	01P10IA020	0.00	0.00	0.00	0.00	0.01
Airbus A319-100 Series	3CM028	0.02	0.03	0.02	0.02	0.09
Airbus A319-100 Series	3IA006	0.35	0.71	0.53	0.53	2.12
Airbus A319-100 Series	3IA007	0.19	0.38	0.28	0.28	1.14
Airbus A319-100 Series	4CM035	0.01	0.03	0.02	0.02	0.08
Airbus A319-100 Series	8IA09	0.01	0.01	0.01	0.01	0.04
Airbus A320-200 Series	01P08CM105	6.26	1.88	5.32	2.82	16.28
Airbus A320-200 Series	01P10IA021	0.56	0.17	0.48	0.25	1.46
Airbus A320-200 Series	01P10IA022	0.12	0.04	0.10	0.05	0.32
Airbus A320-200 Series	1CM008	0.15	0.05	0.13	0.07	0.40
Airbus A320-200 Series	1CM009	0.62	0.19	0.53	0.28	1.61
Airbus A320-200 Series	1IA003	1.18	0.35	1.00	0.53	3.07
Airbus A320-200 Series	3CM026	0.67	0.20	0.57	0.30	1.75
Airbus A320-200 Series	8IA010	0.00	0.00	0.00	0.00	0.00
Airbus A320-NEO	01P20CM128	2.91	1.82	2.55	2.19	9.47
Airbus A320-NEO	01P22PW163	4.62	2.89	4.05	3.47	15.03
Airbus A321-200 Series	01P08CM104	1.05	0.39	0.88	0.57	2.89
Airbus A321-200 Series	01P10IA025	6.38	2.39	5.34	3.43	17.54
Airbus A321-200 Series	3CM025	1.09	0.41	0.91	0.58	2.99
Airbus A321-NEO	01P18PW157	4.66	2.59	6.21	1.03	14.48
Airbus A321-NEO	01P20CM132	13.81	7.67	18.41	3.07	42.96
Airbus A330-200 Series	2RR023	3.15	0.31	3.46	--	6.92
Airbus A330-200 Series	9PW094	0.05	0.00	0.05	--	0.10
Airbus A330-300 Series	2RR023	0.75	--	0.75	--	1.50
Airbus A330-300 Series	4GE080	0.76	--	0.76	--	1.52
Airbus A330-300 Series	7PW082	0.10	--	0.10	--	0.21
Airbus A330-300 Series	9PW094	2.15	--	2.15	--	4.30
Airbus A330-300 Series	9PW095	0.50	--	0.50	--	1.01
Airbus A330-900N Series (Neo)	02P23RR141	6.99	--	6.99	--	13.99

TABLE 7-15: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Airbus A350-900 series	01P18RR124	2.62	--	1.75	0.87	5.24
Boeing 737-7	01P20CM136	1.27	0.25	1.27	0.25	3.04
Boeing 737-700 Series	3CM030	0.07	0.07	0.10	0.03	0.26
Boeing 737-700 Series	3CM031	2.23	2.23	3.47	0.99	8.93
Boeing 737-700 Series	3CM032	0.41	0.41	0.63	0.18	1.62
Boeing 737-700 Series	8CM051	0.00	0.00	0.00	0.00	0.01
Boeing 737-700 Series	8CM062	0.02	0.02	0.03	0.01	0.06
Boeing 737-700 Series	8CM063	0.38	0.38	0.59	0.17	1.51
Boeing 737-8	01P20CM135	0.33	0.07	0.33	0.07	0.79
Boeing 737-8	01P20CM136	10.64	2.13	10.64	2.13	25.54
Boeing 737-8	01P20CM140	9.82	1.96	9.82	1.96	23.56
Boeing 737-800 Series	01P11CM114	0.49	0.10	0.50	0.10	1.19
Boeing 737-800 Series	01P11CM116	6.68	1.40	6.78	1.30	16.16
Boeing 737-800 Series	01P11CM122	3.64	0.77	3.70	0.71	8.82
Boeing 737-800 Series	01P11CM125	0.81	0.17	0.82	0.16	1.96
Boeing 737-800 Series	01P11CM126	0.08	0.02	0.08	0.01	0.19
Boeing 737-800 Series	3CM032	20.45	4.29	20.75	3.99	49.48
Boeing 737-800 Series	3CM034	1.97	0.41	2.00	0.39	4.78
Boeing 737-800 Series	8CM051	27.99	5.88	28.40	5.46	67.73
Boeing 737-800 Series	8CM064	0.20	0.04	0.21	0.04	0.49
Boeing 737-800 Series	8CM065	2.61	0.55	2.65	0.51	6.32
Boeing 737-800 Series	8CM066	12.27	2.58	12.46	2.40	29.70
Boeing 737-9	01P20CM136	0.53	0.08	0.39	0.22	1.23
Boeing 737-9	01P20CM140	20.97	3.31	15.45	8.83	48.56
Boeing 737-900-ER	01P11CM116	33.94	7.38	34.54	6.78	82.63
Boeing 737-900-ER	01P11CM121	97.03	21.09	98.74	19.39	236.26
Boeing 737-900-ER	01P11CM125	0.30	0.06	0.30	0.06	0.72
Boeing 737-900-ER	3CM034	1.37	0.30	1.39	0.27	3.33
Boeing 737-900-ER	8CM065	1.52	0.33	1.55	0.30	3.71
Boeing 737-900-ER_MA	01P11CM121_MA	3.25	0.11	1.63	0.06	5.05
Boeing 767-400 ER	8GE101	0.50	--	--	0.50	1.00
Boeing 777-200-ER	10PW099	0.17	--	0.17	--	0.34
Boeing 777-200-ER	2RR027	0.59	--	0.59	--	1.18
Boeing 777-200-ER	3GE060	0.26	--	0.26	--	0.52
Boeing 777-200-ER	3GE064	0.00	--	0.00	--	0.01
Boeing 777-200-ER	8GE100	0.27	--	0.27	--	0.54
Boeing 777-300 ER	01P21GE217	1.76	--	1.17	0.59	3.52
Boeing 787-10 Dreamliner	01P17GE211	0.47	--	0.47	--	0.93
Boeing 787-10 Dreamliner	01P17GE213	1.01	--	1.01	--	2.02
Boeing 787-10 Dreamliner	02P23RR134	0.51	--	0.51	--	1.02

TABLE 7-15: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 787-8 Dreamliner	01P17GE206	1.47	--	1.47	--	2.95
Boeing 787-8 Dreamliner	01P17GE210	0.05	--	0.05	--	0.10
Boeing 787-8 Dreamliner	11GE137	2.33	--	2.33	--	4.66
Boeing 787-8 Dreamliner	11GE138	5.72	--	5.72	--	11.44
Boeing 787-9 Dreamliner	01P17GE211	2.91	--	2.91	--	5.81
Boeing 787-9 Dreamliner	01P17GE214	0.02	--	0.02	--	0.04
Boeing 787-9 Dreamliner	02P23RR131	0.66	--	0.66	--	1.31
Boeing 787-9 Dreamliner	12RR067	3.00	--	3.00	--	6.01
Boeing 787-9 Dreamliner	12RR068	1.27	--	1.27	--	2.53
Subtotal		*379.82*	*83.25*	*383.14*	*78.24*	*924.45*
Cargo Jets						
Airbus A300F4-600 Series	1GE020	0.01	--	0.01	--	0.01
Airbus A300F4-600 Series	1PW048	0.18	--	0.18	--	0.36
Airbus A300F4-600 Series	3GE056	0.33	--	0.33	--	0.66
Boeing 747-400 ERF	12PW102	0.27	0.54	0.54	0.27	1.62
Boeing 747-400BCF	01P03GE187	0.27	0.54	0.54	0.27	1.62
Boeing 747-8F	01P17GE215	0.40	--	0.40	--	0.79
Boeing 747-8F	13GE156	0.11	--	0.11	--	0.21
Boeing 747-8F	8GENX1	0.34	--	0.34	--	0.68
Boeing 767-200 Series Freighter	1GE010	1.31	2.62	2.62	1.31	7.85
Boeing 767-200 Series Freighter	1GE012	0.65	1.30	1.30	0.65	3.91
Boeing 767-200 Series Freighter	1PW026	0.12	0.23	0.23	0.12	0.70
Boeing 767-300 ER Freighter	1GE030	4.73	0.95	4.73	0.95	11.35
Boeing 767-300 ER Freighter	2GE055	0.47	0.09	0.47	0.09	1.12
Boeing 777 Freighter	01P21GE216	3.31	--	3.31	--	6.62
Boeing 777 Freighter	01P21GE217	0.08	--	0.08	--	0.16
Boeing MD-11 Freighter	12PW102	0.09	0.26	0.26	0.09	0.68
Boeing MD-11 Freighter	1GE031	0.43	1.29	1.29	0.43	3.43

TABLE 7-15: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing MD-11 Freighter	1PW052	0.14	0.42	0.42	0.14	1.12
Subtotal		*13.21*	*8.23*	*17.14*	*4.31*	*42.89*
Regional Jets						
Embraer ERJ175-LR	01P08GE197	142.69	16.39	141.62	17.46	318.17
Embraer ERJ175-LR_MA_Y2	01P08GE197_MA_Y2	1.62	0.20	0.81	0.10	2.73
Subtotal		*144.31*	*16.59*	*142.43*	*17.56*	*320.90*
Cargo Props						
ATR 72-600 Freighter	PW127F	0.28	--	0.28	--	0.56
Cessna 208 Caravan	P6114A	1.59	--	1.59	--	3.19
Cessna 208 Caravan	PT6A14	1.57	--	1.57	--	3.14
Cessna 408 SkyCourier	PT6A6B	0.28	--	0.28	--	0.56
Raytheon Beech 99	PT6A27	0.00	--	0.00	--	0.01
Raytheon Beech 99	PT6A36	0.25	--	0.25	--	0.50
Subtotal		*3.98*	--	*3.98*	--	*7.95*
General Aviation						
Bombardier Challenger 350	01P14HN011	0.76	--	0.76	--	1.52
Cessna 172 Skyhawk	IO320	0.09	0.09	0.18	--	0.36
Dassault Falcon 50	1AS002	0.76	--	0.76	--	1.52
Embraer Phenom 300 (EMB-505)	PW530	0.17	--	0.17	--	0.35
Piper PA-31 Navajo	TIO540	0.02	--	0.02	--	0.05
Raytheon C-12 Huron	PT660A	0.08	--	0.08	--	0.17
Subtotal		*1.89*	*0.09*	*1.98*	--	*3.96*
Other						
Boeing 737-900-ER_O1	01P11CM121_O1	0.49	0.11	0.50	0.10	1.20
Boeing 737-900-ER_O2	01P11CM125_O2	0.00	0.00	0.00	0.00	0.00
Boeing 737-900-ER_O3	3CM034_O3	0.01	0.00	0.01	0.00	0.02
Boeing 737-900-ER_O4	8CM065_O4	0.01	0.00	0.01	0.00	0.02
Boeing 737-900-ER_O7	01P11CM116_O7	0.17	0.04	0.17	0.03	0.41
Cessna 208 Caravan_O5	P6114A_O5	0.28	--	0.28	--	0.55
Cessna 208 Caravan_O6	PT6A14_O6	0.27	--	0.27	--	0.54
Subtotal		*1.22*	*0.15*	*1.23*	*0.13*	*2.74*
Military						
Cessna 172 Skyhawk_M2	IO320_M2	0.00	--	0.00	--	0.01
Embraer Phenom 300 (EMB-505)_M1	PW530_M1	0.10	--	0.10	--	0.20

TABLE 7-15: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2032) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Raytheon C-12 Huron_M	PT660A_M	0.04	--	0.04	--	0.07
Subtotal		*0.14*	--	*0.14*	--	*0.27*
Total		**544.56**	**108.31**	**550.04**	**100.25**	**1303.16**

Note: Totals may not sum due to rounding.
Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

Runway Definition

Under the Future (2032) Proposed Action, no changes to the runway location or definition would occur. Therefore, the runway definition discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2032) Proposed Action.

Runway End Utilization

Under the Future (2032) Proposed Action, the runway end utilization would be influenced by airfield congestion and the total number of operations occurring at the Airport, as well as the addition of several proposed taxiway improvements designed to enhance efficiency of the airfield. **Table 7-16** presents the runway end utilization for the Future (2032) Proposed Action.

TABLE 7-16: GENERALIZED RUNWAY END UTILIZATION SUMMARY – FUTURE (2032) PROPOSED ACTION

Aircraft Category	Runway End 16L	Runway End 16C	Runway End 16R	Runway End 34L	Runway End 34C	Runway End 34R
Daytime Arrivals						
Commercial Jets	10.18%	0.99%	58.92%	23.78%	0.99%	3.86%
Cargo Jets	55.00%	1.00%	15.00%	8.00%	1.00%	20.00%
Regional Jets	4.92%	0.98%	63.91%	25.57%	0.98%	1.97%
Cargo Props	23.05%	1.43%	46.52%	26.43%	1.00%	1.57%
General Aviation	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Other	14.41%	1.22%	55.37%	26.22%	1.00%	1.78%
Military	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Missed Approaches*	--	--	77.33%	22.67%	--	--
Daytime Departures						
Commercial Jets	45.41%	25.59%	--	--	0.95%	28.05%
Cargo Jets	58.00%	13.00%	--	--	0.50%	28.50%
Regional Jets	44.00%	27.00%	--	--	1.00%	28.00%
Cargo Props	35.84%	32.59%	2.58%	1.72%	12.60%	14.68%
General Aviation	34.50%	33.50%	3.00%	2.00%	14.50%	12.50%
Other	39.78%	29.88%	1.33%	0.89%	6.99%	21.12%
Military	34.50%	33.50%	3.00%	2.00%	14.50%	12.50%
Missed Approaches*	--	--	77.33%	22.67%	--	--

TABLE 7-16: GENERALIZED RUNWAY END UTILIZATION SUMMARY – FUTURE (2032) PROPOSED ACTION (CONTINUED)

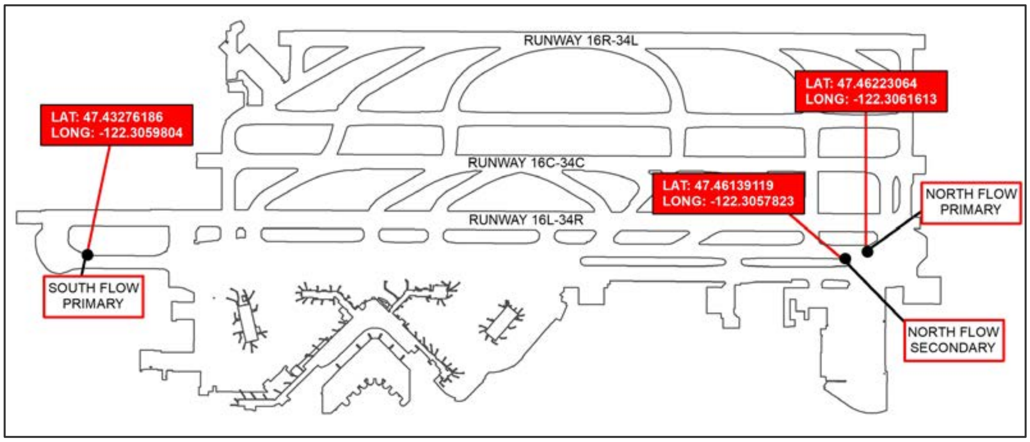
Aircraft Category	Runway End 16L	Runway End 16C	Runway End 16R	Runway End 34L	Runway End 34C	Runway End 34R
Nighttime Arrivals						
Commercial Jets	5.18%	1.00%	64.68%	25.88%	1.00%	2.06%
Cargo Jets	55.00%	1.00%	15.00%	8.00%	1.00%	20.00%
Regional Jets	4.91%	0.98%	63.82%	25.53%	0.98%	1.96%
Cargo Props	--	--	--	--	--	--
General Aviation	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Other	5.00%	1.00%	65.00%	26.00%	1.00%	2.00%
Military	--	--	--	--	--	--
Missed Approaches*	--	--	80.98%	19.02%	--	--
Nighttime Departures						
Commercial Jets	44.35%	26.65%	--	--	0.99%	28.01%
Cargo Jets	58.00%	13.00%	--	--	0.50%	28.50%
Regional Jets	44.00%	27.00%	--	--	1.00%	28.00%
Cargo Props	--	--	--	--	--	--
General Aviation	--	--	--	--	--	--
Other	44.00%	27.00%	--	--	1.00%	28.00%
Military	--	--	--	--	--	--
Missed Approaches*	--	--	80.98%	19.02%	--	--

Note: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
* Missed approaches count as two arrivals and one departure for modeling purposes.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Environmental Review Airside Modeling, Seattle-Tacoma International Airport, LeighFisher, 2020, Landrum & Brown analysis, 2024.

Engine Run-Ups

Under the Future (2032) Proposed Action, changes to run-up locations would occur due to changes in the taxiways and new passenger terminal facilities. As a result, there would be fewer run-up locations and the locations would be on the north and south ends of the airfield. **Exhibit 7-10: *Proposed Action Run-up Locations*** shows the future location of the run-ups. The number and type of engine run-up operations for the Future (2032) Proposed Action are presented below in **Table 7-17**. The number of engine run-up operations were scaled up from 2022 levels assuming the same distribution across aircraft types.

EXHIBIT 7-10: PROPOSED ACTION RUN-UP LOCATIONS



Source: Port of Seattle

TABLE 7-17: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2032) PROPOSED ACTION

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
North Flow Primary Location						
Airbus A319-100 Series	3IA006	1.5	3.0	--	--	22,000 lbs.
Airbus A320-200 Series	01P08CM105	25.1	15.8	1.5	2.0	25,000 lbs.
Airbus A320-200 Series	1CM009	3.0	69.5	--	--	25,000 lbs.
Airbus A320-200 Series	3CM026	3.0	15.5	--	--	25,000 lbs.
Airbus A321-200 Series	3CM025	4.4	36.7	--	--	30,000 lbs.
Airbus A321-NEO	01P20CM132			1.5	2.0	30,000 lbs.
Airbus A330-200 Series	9PW094	8.9	27.7	--	--	71,100 lbs.
Airbus A330-300 Series	4GE080	1.5	37.0	--	--	67,500 lbs.
Airbus A330-900N Series (Neo)	02P23RR141	1.5	26.0	--	--	71,100 lbs.
Boeing 737-700 Series	3CM031	5.9	26.8	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	7.4	56.4	--	--	24,000 lbs.
Boeing 737-800 Series	01P11CM122	1.5	10.0	--	--	26,300 lbs.
Boeing 737-800 Series	3CM032	20.7	27.6	--	--	26,300 lbs.
Boeing 737-800 Series	3CM034	1.5	9.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM051	3.0	40.5	--	--	26,300 lbs.
Boeing 737-800 Series	8CM066	4.4	33.0	--	--	26,300 lbs.
Boeing 737-9	01P20CM140	13.3	14.6	--	--	26,400 lbs.
Boeing 737-900-ER	01P11CM116	14.8	20.2	--	--	26,300 lbs.
Boeing 737-900-ER	01P11CM121	1.5	4.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM121	23.6	25.1	--	--	26,300 lbs.
Boeing MD-11 Freighter	1GE031	--	--	1.5	2.0	61,500 lbs.
Embraer ERJ175-LR	01P08GE197	1.5	6.0	--	--	6,900 lbs.
Embraer ERJ175-LR	01P08GE197	5.9	28.0	--	--	13,800 lbs.
South Flow Primary Location						
Airbus A319-100 Series	3IA006	1.5	15.0	--	--	22,000 lbs.

TABLE 7-17: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2032) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
Airbus A319-100 Series	3IA007	1.5	26.0	1.5	11.0	22,000 lbs.
Airbus A320-200 Series	01P08CM105	3.0	6.0	--	--	12,500 lbs.
Airbus A320-200 Series	01P08CM105	41.3	12.9	--	--	25,000 lbs.
Airbus A320-200 Series	1CM009	7.4	31.6	--	--	25,000 lbs.
Airbus A321-NEO	01P20CM132	3.0	12.5	--	--	30,000 lbs.
Airbus A330-200 Series	2RR023	1.5	6.0	--	--	71,100 lbs.
Airbus A330-200 Series	9PW094	1.5	26.0	--	--	35,550 lbs.
Airbus A330-200 Series	9PW094	11.8	14.9	--	--	71,100 lbs.
Airbus A330-300 Series	4GE080	4.4	10.7	--	--	67,500 lbs.
Airbus A330-900N Series (Neo)	02P23RR141	4.4	26.7	--	--	71,100 lbs.
Boeing 737-700 Series	3CM031	1.5	20.0	1.5	2.0	12,000 lbs.
Boeing 737-700 Series	3CM031	23.6	17.6	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	5.9	31.5	--	--	24,000 lbs.
Boeing 737-800 Series	3CM032	4.4	18.3	--	--	13,150 lbs.
Boeing 737-800 Series	3CM032	62.0	18.3	--	--	26,300 lbs.
Boeing 737-800 Series	8CM051	16.2	21.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM065	1.5	6.0			26,300 lbs.
Boeing 737-800 Series	8CM066	1.5	3.0	1.5	2.0	13,150 lbs.
Boeing 737-800 Series	8CM066	35.4	10.7	--	--	26,300 lbs.
Boeing 737-9	01P20CM140	1.5	9.0	--	--	13,200 lbs.
Boeing 737-9	01P20CM140	31.0	10.4	--	--	26,400 lbs.
Boeing 737-900-ER	01P11CM116	1.5	3.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM116	31.0	15.7	3.0	2.0	26,300 lbs.
Boeing 737-900-ER	01P11CM121	1.5	8.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM121	79.7	25.5	--	--	26,300 lbs.
Boeing 767-200 Series Freighter	1GE012	1.5	6.0	--	--	48,000 lbs.
Boeing 767-300 ER Freighter	1GE030	4.4	21.0	--	--	60,000 lbs.
Boeing MD-11 Freighter	1GE031	3.0	44.5	--	--	61,500 lbs.
Embraer ERJ175-LR	01P08GE197	10.3	11.2	--	--	13,800 lbs.
North Flow Secondary Location						
Airbus A330-200 Series	9PW094	1.5	38.0	--	--	71,100 lbs.
Total		**553.46**	**--**	**11.85**	**--**	**--**

Notes: Totals may not sum due to rounding.
Daytime = 7:00am – 9:59pm, Nighttime = 10:00pm – 6:59am.

Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

Flight Tracks

Flight track locations for the Future (2032) Proposed Action are expected to be the same as the Existing (2022) Condition, because there are no changes to the runway locations and flight track proposed.[13] Therefore, the flight track location information discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2032) Proposed Action.

Aircraft Departure Stage Length and Operational Profiles

Table 7-18 presents the departure stage length distribution for the Future (2032) Proposed Action. The departure segment of the missed approaches is modeled as Stage Length Category 1.

TABLE 7-18: DEPARTURE STAGE LENGTH DISTRIBUTION – FUTURE (2032) PROPOSED ACTION

Stage Length	Commercial Jets	Cargo Jets	Regional Jets	Cargo Props	General Aviation	Other	Military	Total
1	3.57%	--	74.09%	100.00%	100.00%	41.92%	100.00%	21.76%
2	44.89%	18.20%	22.43%	--	--	28.98%	--	38.03%
3	17.51%	26.73%	3.48%	--	--	15.37%	--	14.20%
4	25.96%	30.31%	--	--	--	13.74%	--	19.45%
5	--	--	--	--	--	--	--	--
6	3.38%	15.80%	--	--	--	--	--	2.92%
7	4.69%	8.95%	--	--	--	--	--	3.63%
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--

Note: Totals may not sum due to rounding.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

7.2.2.2 Future (2032) Proposed Action Noise Contours

Exhibit 7-11: *Future (2032) Proposed Action Noise Contour* depicts the 65, 70, and 75 DNL noise contour for the Future (2032) Proposed Action. The area in square miles of each DNL contour band is summarized in **Table 7-19**.

The 65+ DNL contour extends approximately 3.7 miles to the north and 3.3 miles south of SEA. The area within the contour to the north and south is made up of a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

TABLE 7-19: AREA (SQUARE MILES) OF 65, 70, AND 75 DNL NOISE CONTOURS – FUTURE (2032) PROPOSED ACTION

Alternative	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 75+ dB	DNL 65+ dB
Future (2032) No Action	6.23	2.42	1.45	10.10
Future (2032) Proposed Action	6.33	2.45	1.47	10.25
Change	0.10	0.03	0.02	0.15

Source: Landrum & Brown analysis, 2024.

13 It is expected that the Runway 34R arrival profile will be slightly higher due to the relocation of the glide slope. This higher Runway 34R arrival profile was not specifically included in this analysis because AEDT does not provide a function to reflect this minor change. Furthermore, by not including the change in Runway 34R arrival profile this analysis represents a conservative evaluation of noise impacts.

7.2.2.3 Non-Compatible Land Use

Summaries of the residential population and housing units exposed to noise levels exceeding 65 DNL for the Future (2032) Proposed Action noise contour are provided in **Table 7-20**. A total of 9,855 housing units (an increase of 337 from the Future (2032) No Action) would be located within the Future (2032) Proposed Action 65+ DNL noise contour. The increase in housing units and population from the Future (2032) No Action is due to the increase in aircraft operations and the increase in size of the 65+ DNL contour. For the “sound insulation completed” category, the additional areas within the 65+ DNL contour includes homes treated during prior phases of the Port’s Part 150 Noise Remedy Program, which extends back to 1985 (when the noise contours were much larger). Therefore, the increases in the numbers are solely due to the changes in the noise contour.

TABLE 7-20: NON-COMPATIBLE LAND USE HOUSING AND POPULATION – FUTURE (2032) PROPOSED ACTION

Mitigation Status/Land Use	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 65+ dB
Sound Insulation Completed			
Single-Family	3,819	439	4,258
Multi-Family	432	4	436
Mobile Home	0	0	0
Subtotal	4,251	443	4,694
Not Sound Insulated			
Single-Family	1,000	89	1,089
Multi-Family	3,885	10	3,895
Mobile Home	160	17	177
Subtotal	5,045	116	5,161
Total Housing Units	**9,296**	**559**	**9,855**
Estimated Population			
Total Estimated Population	**21,354**	**1,445**	**22,799**

Notes: Multi-family includes total units in a complex and were verified using King County assessor data. Population numbers are estimates based on the 2020 United States Census average household size per number of housing units.
Source: Landrum & Brown analysis, 2024.

A list of noise sensitive facilities within the 65+ DNL Noise Contour for the Future (2032) Proposed Action are listed in **Table 7-21**. The number of noise sensitive facilities within the 65+ DNL would be the same as the Future (2032) No Action, for a total of 12 schools, 22 places of worship, five nursing homes, and two libraries within the 65 DNL noise contour. There are no noise sensitive facilities within the 70 or 75 DNL noise contours for the Future (2032) Proposed Action.

TABLE 7-21: NOISE SENSITIVE FACILITIES IN THE FUTURE (2032) PROPOSED ACTION 65+ DNL NOISE CONTOUR

Map ID	Name
Schools	
S-1	Puget Sound Skills Center
S-2	Choice Academy – Homeschool Center
S-3	Midway Elementary School
S-4	Mount Rainier High School
S-5	Southern Heights Elementary School
S-6	Pacific Middle School
S-7	Beverly Park Elementary School
S-8	Our Lady of Lourdes School
S-9	St. Philomena Catholic School
S-10	Glacier Middle School
S-11	Community Chapel Christian School
S-12	Des Moines Elementary School
Places of Worship	
C-1	Saint Philomena Catholic Church
C-2	Prince of Peace Lutheran Church
C-3	Samoan Christian Fellowship
C-4	Normandy Christian Church
C-5	Southminster Presbyterian Church
C-6	Hope Church
C-7	Gospel Russian Baptist Church
C-8	The Mountain Church
C-9	Riverton Heights Baptist Church
C-10	Boulevard Park Presbyterian
C-11	Midway Community Covenant Church
C-12	Apostolic Bible Church of Jesus Christ
C-13	Highline 7th Day Adventist Church
C-14	Glen Acres Church of Christ
C-15	Kingdom Hall of Jehovah's Witnesses
C-16	New Testament Christian Church
C-17	Our Lady of Lourdes Church
C-18	Pacific Northwest United Methodist
C-19	Wat Buddharam Buddhist Temple
C-20	Hanuman Nagri Temple
C-21	Way of Salvation Church
C-22	Des Moines United Methodist Church
Libraries	
L-1	Des Moines Library
L-2	Boulevard Park Library
Nursing Homes	
N-1	Falcon Ridge Assisted Living
N-2	Wesley Homes Terrace
N-3	Wesley Homes Health Center
N-4	Wesley Homes Gardens and Bungalows
N-5	High West Residence

Source: Landrum & Brown analysis, 2024.

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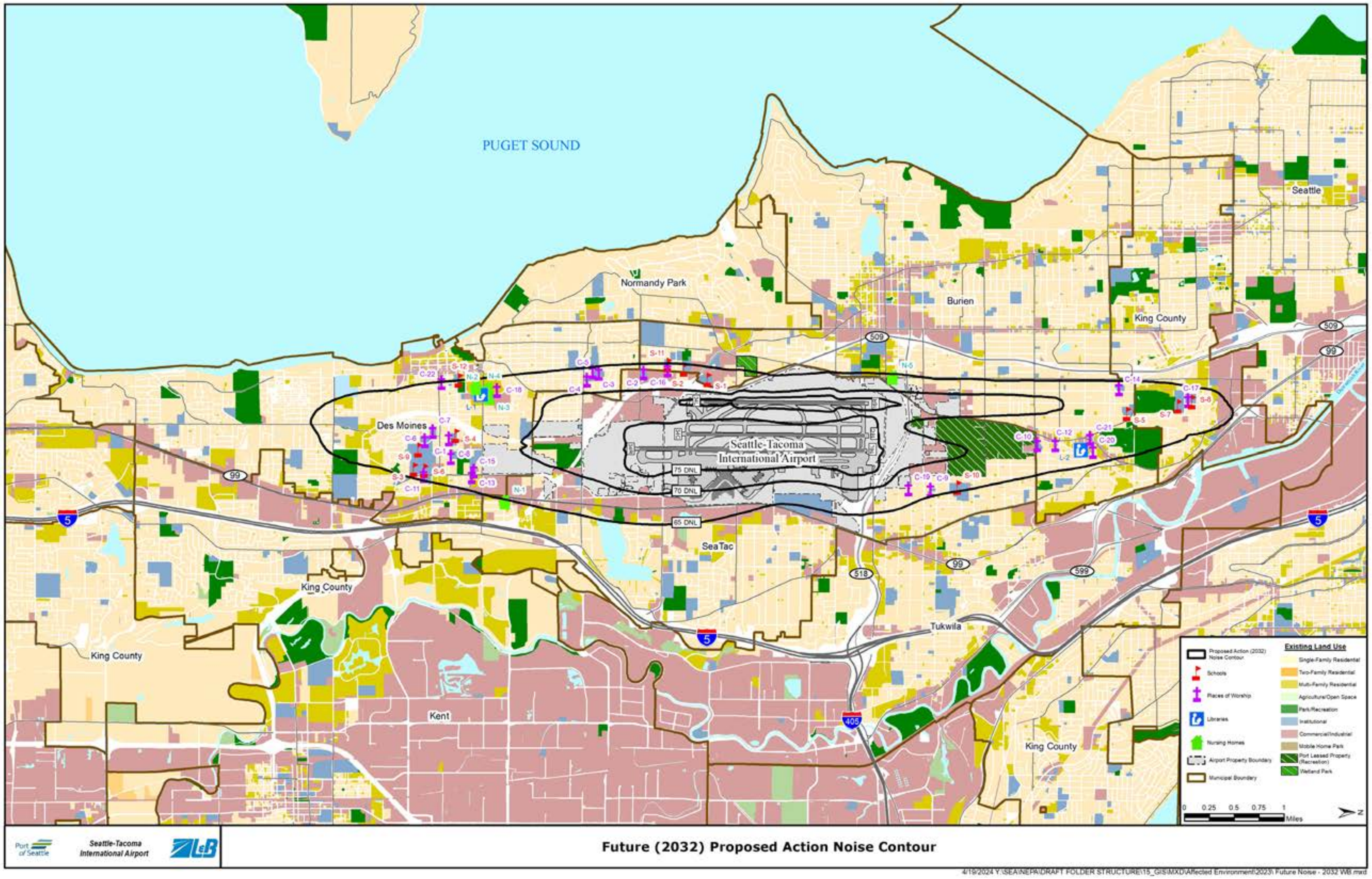
EXHIBIT 7-11: FUTURE (2032) PROPOSED ACTION NOISE CONTOUR



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.

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7.2.3 Future (2037) No Action

The following describes the input data and methodologies used in preparing the Future (2037) No Action noise contour, followed by the resulting noise exposure contours.

Aircraft Activity Levels and Fleet Mix

Table 7-22 shows the total number of operations by detailed aircraft type and by time of day (daytime or nighttime). The Future (2037) No Action annual average day included 1,301 average annual day operations, 15.4 percent of which occurred during the nighttime hours of 10:00 p.m. to 6:59 a.m.

TABLE 7-22: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2037) NO ACTION

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Commercial Jets						
Airbus A220-100	16PW111	31.48	3.15	34.63	--	69.26
Airbus A220-300	16PW111	11.98	--	11.98	--	23.95
Airbus A220-300	16PW112	5.90	--	5.90	--	11.80
Airbus A320-200 Series	01P08CM105	2.12	0.63	1.69	1.06	5.50
Airbus A320-200 Series	01P10IA021	0.19	0.06	0.15	0.10	0.49
Airbus A320-200 Series	01P10IA022	0.04	0.01	0.03	0.02	0.11
Airbus A320-200 Series	1CM008	0.05	0.02	0.04	0.03	0.13
Airbus A320-200 Series	1CM009	0.21	0.06	0.17	0.10	0.55
Airbus A320-200 Series	1IA003	0.40	0.12	0.32	0.20	1.04
Airbus A320-200 Series	3CM026	0.23	0.07	0.18	0.11	0.59
Airbus A320-200 Series	8IA010	0.00	0.00	0.00	0.00	0.00
Airbus A320-NEO	01P20CM128	5.45	2.42	4.24	3.63	15.74
Airbus A320-NEO	01P22PW163	8.65	3.84	6.72	5.76	24.97
Airbus A321-200 Series	01P08CM104	0.32	0.12	0.27	0.17	0.89
Airbus A321-200 Series	01P10IA025	1.96	0.74	1.64	1.05	5.39
Airbus A321-200 Series	3CM025	0.33	0.13	0.28	0.18	0.92
Airbus A321-NEO	01P18PW157	6.24	3.46	8.32	1.39	19.40
Airbus A321-NEO	01P20CM132	18.50	10.28	24.67	4.11	57.55
Airbus A330-200 Series	2RR023	3.06	0.38	3.44	--	6.89
Airbus A330-200 Series	9PW094	0.04	0.01	0.05	--	0.10
Airbus A330-300 Series	2RR023	0.75	--	0.75	--	1.49
Airbus A330-300 Series	4GE080	0.76	--	0.76	--	1.51
Airbus A330-300 Series	7PW082	0.10	--	0.10	--	0.20
Airbus A330-300 Series	9PW094	2.14	--	2.14	--	4.27
Airbus A330-300 Series	9PW095	0.50	--	0.50	--	1.00
Airbus A330-900N Series (Neo)	02P23RR141	7.54	--	7.54	--	15.08
Airbus A350-900 series	01P18RR124	4.45		2.97	1.48	8.90
Boeing 737-7	01P20CM136	1.85	0.46	1.85	0.46	4.63
Boeing 737-700 Series	3CM030	0.01	0.01	0.02	0.01	0.05
Boeing 737-700 Series	3CM031	0.45	0.45	0.59	0.30	1.78
Boeing 737-700 Series	3CM032	0.08	0.08	0.11	0.05	0.32
Boeing 737-700 Series	8CM051	0.00	0.00	0.00	0.00	0.00
Boeing 737-700 Series	8CM062	0.00	0.00	0.00	0.00	0.01
Boeing 737-700 Series	8CM063	0.08	0.08	0.10	0.05	0.30
Boeing 737-8	01P20CM135	0.70	0.18	0.70	0.18	1.76
Boeing 737-8	01P20CM136	22.83	5.71	22.83	5.71	57.08
Boeing 737-8	01P20CM140	21.06	5.27	21.06	5.27	52.65

TABLE 7-22: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2037) NO ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 737-800 Series	01P11CM114	0.33	0.06	0.33	0.06	0.78
Boeing 737-800 Series	01P11CM116	4.45	0.84	4.52	0.77	10.58
Boeing 737-800 Series	01P11CM122	2.43	0.46	2.46	0.42	5.77
Boeing 737-800 Series	01P11CM125	0.54	0.10	0.55	0.09	1.28
Boeing 737-800 Series	01P11CM126	0.05	0.01	0.05	0.01	0.12
Boeing 737-800 Series	3CM032	13.63	2.56	13.82	2.37	32.38
Boeing 737-800 Series	3CM034	1.32	0.25	1.33	0.23	3.13
Boeing 737-800 Series	8CM051	18.66	3.51	18.92	3.24	44.33
Boeing 737-800 Series	8CM064	0.14	0.03	0.14	0.02	0.32
Boeing 737-800 Series	8CM065	1.74	0.33	1.77	0.30	4.14
Boeing 737-800 Series	8CM066	8.18	1.54	8.30	1.42	19.44
Boeing 737-9	01P20CM136	1.13	0.19	0.88	0.44	2.63
Boeing 737-9	01P20CM140	44.38	7.40	34.52	17.26	103.55
Boeing 737-900-ER	01P11CM116	28.64	5.80	28.79	5.65	68.88
Boeing 737-900-ER	01P11CM121	81.53	16.52	81.98	16.07	196.11
Boeing 737-900-ER	01P11CM125	0.25	0.05	0.25	0.05	0.60
Boeing 737-900-ER	3CM034	1.15	0.23	1.16	0.23	2.77
Boeing 737-900-ER	8CM065	1.29	0.26	1.29	0.25	3.09
Boeing 737-900-ER_MA	01P11CM121_MA	3.25	0.11	1.62	0.06	5.04
Boeing 787-10 Dreamliner	01P17GE211	0.61	--	0.61	--	1.22
Boeing 787-10 Dreamliner	01P17GE213	1.32	--	1.32	--	2.64
Boeing 787-10 Dreamliner	02P23RR134	0.67	--	0.67	--	1.33
Boeing 787-8 Dreamliner	01P17GE206	1.94	--	1.94	--	3.89
Boeing 787-8 Dreamliner	01P17GE210	0.07	--	0.07	--	0.13
Boeing 787-8 Dreamliner	11GE137	3.07	--	3.07	--	6.14
Boeing 787-8 Dreamliner	11GE138	7.54	--	7.54	--	15.08
Boeing 787-9 Dreamliner	01P17GE211	4.73	--	4.73	--	9.45
Boeing 787-9 Dreamliner	01P17GE214	0.03	--	0.03	--	0.06
Boeing 787-9 Dreamliner	02P23RR131	1.07	--	1.07	--	2.13
Boeing 787-9 Dreamliner	12RR067	4.88	--	4.88	--	9.76
Boeing 787-9 Dreamliner	12RR068	2.06	--	2.06	--	4.11
Subtotal		*401.49*	*77.97*	*397.40*	*80.38*	*957.23*
Cargo Jets						
Boeing 747-400 ERF	12PW102	0.26	0.53	0.53	0.26	1.58
Boeing 747-400BCF	01P03GE187	0.26	0.53	0.53	0.26	1.58
Boeing 747-8F	01P17GE215	0.43	--	0.43	--	0.86
Boeing 747-8F	13GE156	0.11	--	0.11	--	0.23
Boeing 747-8F	8GENX1	0.37	--	0.37	--	0.75
Boeing 767-200 Series Freighter	1GE010	1.70	3.40	3.40	1.70	10.19
Boeing 767-200 Series Freighter	1GE012	0.85	1.69	1.69	0.85	5.07
Boeing 767-200 Series Freighter	1PW026	0.15	0.30	0.30	0.15	0.91
Boeing 767-300 ER Freighter	1GE030	5.72	1.43	5.72	1.43	14.31
Boeing 767-300 ER Freighter	2GE055	0.56	0.14	0.56	0.14	1.41
Boeing 777 Freighter	01P21GE216	5.05	--	5.05	--	10.11

TABLE 7-22: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2037) NO ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 777 Freighter	01P21GE217	0.12	--	0.12	--	0.24
Subtotal		*15.60*	*8.02*	*18.83*	*4.79*	*47.24*
Regional Jets						
Embraer ERJ175-LR	01P08GE197	125.85	13.20	124.09	14.96	278.10
Embraer ERJ175-LR_MA_Y2	01P08GE197_MA_Y2	1.61	0.20	0.81	0.10	2.72
Subtotal		127.46	13.40	124.89	15.06	280.82
Cargo Props						
ATR 72-600 Freighter	PW127F	0.44	--	0.44	--	0.88
Cessna 208 Caravan	P6114A	1.57	--	1.57	--	3.14
Cessna 208 Caravan	PT6A14	1.55	--	1.55	--	3.10
Cessna 408 SkyCourier	PT6A6B	0.44	--	0.44	--	0.88
Raytheon Beech 99	PT6A27	0.01	--	0.01	--	0.01
Raytheon Beech 99	PT6A36	0.32	--	0.32	--	0.64
Subtotal		*4.33*	--	*4.33*	--	*8.67*
General Aviation						
Bombardier Challenger 350	01P14HN011	0.78	--	0.78	--	1.57
Cessna 172 Skyhawk	IO320	0.08	0.08	0.16	--	0.33
Dassault Falcon 50	1AS002	0.78	--	0.78	--	1.57
Embraer Phenom 300 (EMB-505)	PW530	0.19	--	0.19	--	0.37
Piper PA-31 Navajo	TIO540	0.02	--	0.02	--	0.04
Raytheon C-12 Huron	PT660A	0.09	--	0.09	--	0.18
Subtotal		*1.95*	*0.08*	*2.03*	--	*4.06*
Other						
Boeing 737-900-ER_O1	01P11CM121_O1	0.50	0.10	0.50	0.10	1.20
Boeing 737-900-ER_O2	01P11CM125_O2	0.00	0.00	0.00	0.00	0.00
Boeing 737-900-ER_O3	3CM034_O3	0.01	0.00	0.01	0.00	0.02
Boeing 737-900-ER_O4	8CM065_O4	0.01	0.00	0.01	0.00	0.02
Boeing 737-900-ER_O7	01P11CM116_O7	0.17	0.03	0.17	0.03	0.41
Cessna 208 Caravan_O5	P6114A_O5	0.28	--	0.28	--	0.55
Cessna 208 Caravan_O6	PT6A14_O6	0.27	--	0.27	--	0.54
Subtotal	*Subtotal*	*1.23*	*0.14*	*1.24*	*0.13*	*2.74*
Military						
Cessna 172 Skyhawk_M2	IO320_M2	0.00	--	0.00	--	0.01
Embraer Phenom 300 (EMB-505)_M1	PW530_M1	0.10	--	0.10	--	0.20
Raytheon C-12 Huron_M	PT660A_M	0.04	--	0.04	--	0.07
Subtotal		*0.14*	--	*0.14*	--	*0.27*
Total		**552.22**	**99.62**	**548.85**	**100.34**	**1300.96**

Note: Totals may not sum due to rounding.
Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.

Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

Runway Definition

Under the Future (2037) No Action, none of the proposed airfield changes would occur and it is assumed that no changes to the runway locations would occur. Therefore, the runway definition discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2037) No Action.

Runway End Utilization

Table 7-23 presents the runway end utilization used for the modeling of the Future (2037) No Action.

TABLE 7-23: GENERALIZED RUNWAY END UTILIZATION SUMMARY – FUTURE (2037) NO ACTION

Aircraft Category	Runway End 16L	Runway End 16C	Runway End 16R	Runway End 34L	Runway End 34C	Runway End 34R
Daytime Arrivals						
Commercial Jets	10.94%	1.00%	59.06%	24.12%	0.50%	4.38%
Cargo Jets	55.00%	1.00%	15.00%	6.50%	0.50%	22.00%
Regional Jets	5.00%	1.00%	65.00%	26.50%	0.50%	2.00%
Cargo Props	21.71%	1.40%	47.89%	26.50%	0.90%	1.60%
General Aviation	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Other	14.34%	1.22%	55.43%	26.50%	0.72%	1.78%
Military	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Missed Approaches*	--	--	77.33%	22.67%	--	--
Daytime Departures						
Commercial Jets	45.63%	25.37%	--	--	0.94%	28.06%
Cargo Jets	58.00%	13.00%	--	--	0.50%	28.50%
Regional Jets	44.00%	27.00%	--	--	1.00%	28.00%
Cargo Props	44.00%	24.61%	2.39%	1.59%	11.74%	15.67%
General Aviation	44.00%	24.00%	3.00%	2.00%	14.50%	12.50%
Other	44.00%	25.67%	1.33%	0.89%	6.99%	21.12%
Military	44.00%	24.00%	3.00%	2.00%	14.50%	12.50%
Missed Approaches*	--	--	77.33%	22.67%	--	--
Nighttime Arrivals						
Commercial Jets	5.25%	1.00%	64.75%	26.40%	0.50%	2.10%
Cargo Jets	55.00%	1.00%	15.00%	6.50%	0.50%	22.00%
Regional Jets	5.00%	1.00%	65.00%	26.50%	0.50%	2.00%
Cargo Props	--	--	--	--	--	--
General Aviation	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Other	5.00%	1.00%	65.00%	26.50%	0.50%	2.00%
Military	--	--	--	--	--	--
Missed Approaches*	--	--	80.98%%	19.02%	--	--
Nighttime Departures						
Commercial Jets	44.26%	26.74%	--	--	0.99%	28.01%
Cargo Jets	58.00%	13.00%	--	--	0.50%	28.50%
Regional Jets	44.00%	27.00%	--	--	1.00%	28.00%
Cargo Props	--	--	--	--	--	--
General Aviation	--	--	--	--	--	--
Other	44.00%	27.00%	--	--	1.00%	28.00%
Military	--	--	--	--	--	--
Missed Approaches*	--	--	80.98%%	19.02%	--	--

Note: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
* Missed approaches count as two arrivals and one departure for modeling purposes.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Environmental Review Airside Modeling, Seattle-Tacoma International Airport, LeighFisher, 2020, Landrum & Brown analysis, 2024.

Engine Run-Ups

Under the Future (2037) No Action, no changes to run-up locations would occur. Therefore, the run-up locations discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2037) No Action. The numbers of engine run-up operations are estimated for Future (2037) No Action conditions based on scaling the engine run-ups from 2022 for the number of total operations, assuming the same distribution across aircraft type. The resulting numbers of engine run-ups are presented below in **Table 7-24**.

TABLE 7-24: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2037) NO ACTION

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
North Flow Primary Location						
Airbus A320-200 Series	01P08CM105	25.4	15.8	2.0	2.0	25,000 lbs.
Airbus A320-200 Series	1CM009	3.0	69.5	--	--	25,000 lbs.
Airbus A320-200 Series	3CM026	3.0	15.5	--	--	25,000 lbs.
Airbus A321-200 Series	3CM025	4.5	36.7	--	--	30,000 lbs.
Airbus A321-NEO	01P20CM132	--	--	2.0	2.0	30,000 lbs.
Airbus A330-200 Series	9PW094	9.0	27.7	--	--	71,100 lbs.
Airbus A330-300 Series	4GE080	1.5	37.0	--	--	67,500 lbs.
Airbus A330-900N Series (Neo)	02P23RR141	1.5	26.0	--	--	71,100 lbs.
Boeing 737-700 Series	3CM031	6.0	26.8	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	7.5	56.4	--	--	24,000 lbs.
Boeing 737-800 Series	01P11CM122	1.5	10.0	--	--	26,300 lbs.
Boeing 737-800 Series	3CM032	20.9	27.6	--	--	26,300 lbs.
Boeing 737-800 Series	3CM034	1.5	9.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM051	3.0	40.5	--	--	26,300 lbs.
Boeing 737-800 Series	8CM066	4.5	33.0	--	--	26,300 lbs.
Boeing 737-9	01P20CM140	13.4	14.6	--	--	26,400 lbs.
Boeing 737-900-ER	01P11CM116	14.9	20.2	--	--	26,300 lbs.
Boeing 737-900-ER	01P11CM121	23.9	25.1	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM121	1.5	4.0	--	--	26,300 lbs.
Embraer ERJ175-LR	01P08GE197	1.5	6.0	--	--	6,900 lbs.
Embraer ERJ175-LR	01P08GE197	6.0	28.0	--	--	13,800 lbs.
South Flow Primary Location						
Airbus A320-200 Series	01P08CM105	3.0	6.0	--	--	12,500 lbs.
Airbus A320-200 Series	01P08CM105	41.8	12.9	--	--	25,000 lbs.
Airbus A320-200 Series	1CM009	7.5	31.6	--	--	25,000 lbs.
Airbus A321-NEO	01P20CM132	3.0	12.5	--	--	30,000 lbs.

TABLE 7-24: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2037) NO ACTION (CONTINUED)

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
Airbus A330-200 Series	2RR023	1.5	6.0	--	--	71,100 lbs.
Airbus A330-200 Series	9PW094	1.5	26.0	--	--	35,550 lbs.
Airbus A330-200 Series	9PW094	11.9	14.9	--	--	71,100 lbs.
Airbus A330-300 Series	4GE080	4.5	10.7	--	--	67,500 lbs.
Airbus A330-900N Series (Neo)	02P23RR141	4.5	26.7	--	--	71,100 lbs.
Boeing 737-700 Series	3CM031	1.5	20.0	2.0	2.0	12,000 lbs.
Boeing 737-700 Series	3CM031	23.9	17.6	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	6.0	31.5	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	62.7	18.3	--	--	26,300 lbs.
Boeing 737-800 Series	3CM032	4.5	18.3	--	--	13,150 lbs.
Boeing 737-800 Series	8CM051	16.4	21.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM065	1.5	6.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM066	1.5	3.0	2.0	2.0	13,150 lbs.
Boeing 737-800 Series	8CM066	35.8	10.7	--	--	26,300 lbs.
Boeing 737-9	01P20CM140	1.5	9.0	--	--	13,200 lbs.
Boeing 737-9	01P20CM140	31.4	10.4	--	--	26,400 lbs.
Boeing 737-900-ER	01P11CM116	1.5	3.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM116	31.4	15.7	3.9	2.0	26,300 lbs.
Boeing 737-900-ER	01P11CM121	1.5	8.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM121	80.6	25.5	--	--	26,300 lbs.
Boeing 767-200 Series Freighter	1GE012	1.5	6.0	--	--	48,000 lbs.
Boeing 767-300 ER Freighter	1GE030	4.5	21.0	--	--	60,000 lbs.
Embraer ERJ175-LR	01P08GE197	10.5	11.1	--	--	13,800 lbs.
Tango X Location						
Airbus A330-200 Series	9PW094	1.5	38.0	--	--	71,100 lbs.
	Total	552.6	--	11.8	--	

Notes: Totals may not sum due to rounding.
Daytime = 7:00am – 9:59pm, Nighttime = 10:00pm – 6:59am.

Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

Flight Tracks

Flight track locations for the Future (2037) No Action would not change. As such, the flight tracks for the Future (2037) No Action are expected to be the same as the Existing (2022) Condition. The flight track information discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2037) No Action.

Aircraft Trip Length and Operational Profiles

Table 7-25 presents the departure stage length distribution for the Future (2037) No Action. The departure segment of the missed approaches is modeled as Stage Length Category 1.

TABLE 7-25: DEPARTURE STAGE LENGTH DISTRIBUTION – FUTURE (2037) NO ACTION

Stage Length	Commercial Jets	Cargo Jets	Regional Jets	Cargo Props	General Aviation	Other	Military	Total
1	3.33%	--	75.95%	100.00%	100.00%	41.97%	100.00%	19.88%
2	44.28%	13.31%	20.25%	--	--	29.18%	--	37.51%
3	14.56%	26.95%	3.80%	--	--	14.75%	--	12.55%
4	28.77%	29.48%	--	--	--	14.10%	--	22.29%
5	--	--	--	--	--	--	--	--
6	3.66%	21.91%	--	--	--	--	--	3.49%
7	5.39%	8.35%	--	--	--	--	--	4.28%
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--

Note: Totals may not sum due to rounding.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

7.2.3.2 Future 2037 No Action Noise Contours

Exhibit 7-12: *Future (2037) No Action Noise Contour* depicts the 65, 70, and 75 DNL noise contour for the Future (2037) No Action. The area in square miles of each DNL contour band is summarized in **Table 7-26**. The 65+ DNL of the Future (2037) No Action is smaller than the 65+ DNL of the Future (2032) No Action Alternative due to the increase in the number of Boeing 737-7/8/9 MAX aircraft in the fleet. The MAX aircraft have a substantially smaller noise footprint than the aircraft they are replacing (Boeing 737-700/800/900 aircraft).

The 65+ DNL contour extends approximately 3.6 miles to the north and 3.0 miles south of SEA. The area within the contour to the north and south is made up of a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

TABLE 7-26: AREA (SQUARE MILES) OF 65, 70, AND 75 DNL NOISE CONTOURS – FUTURE (2037) NO ACTION

Alternative	DNL 65 – 70 dB	DNL 70 – 75 dB	DNL 75+ dB	DNL 65+ dB
Future (2032) No Action	6.23	2.42	1.45	10.10
Future (2037) No Action	5.67	2.17	1.32	9.16
Change	-0.56	-0.25	-0.13	-0.94

Source: Landrum & Brown, 2024.

7.2.3.3 Non-Compatible Land Use

Summaries of the residential population and housing units exposed to noise levels exceeding 65+ DNL for the Future (2037) No Action noise contour are provided in **Table 7-27**. A total of 7,166 housing units would be located within the 65+ DNL noise contour. The decrease in housing units and population from the Future (2032) No Action is due to the previously mentioned increase of Boeing 737 MAX aircraft in 2037, resulting in a decrease in size of the 65+ DNL contour. For the “sound insulation completed,” the additional areas within the 65 DNL contour include homes treated during prior phases of the Port’s Part 150 Noise Remedy Program, which extends back to 1985 (when the noise contours were much larger). Therefore, the increases in the numbers are solely due to the changes in the noise contour.

TABLE 7-27: NON-COMPATIBLE LAND USE HOUSING AND POPULATION – FUTURE (2037) NO ACTION

Mitigation Status/Land Use	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 65+ dB
Sound Insulation Completed			
Single-Family	3,247	299	3,546
Multi-Family	321	4	325
Mobile Home	0	0	0
Subtotal	3,568	303	3,871
Not Sound Insulated			
Single-Family	783	54	837
Multi-Family	2,356	0	2,356
Mobile Home	91	11	102
Subtotal	3,230	65	3,295
Total Housing Units	**6,798**	**368**	**7,166**
Estimated Population			
Total Estimated Population	**15,331**	**966**	**16,297**

Notes: Multi-family includes total units in a complex and were verified using King County assessor data. Population numbers are estimates based on the 2020 United States Census average household size per number of housing units.
Source: Landrum & Brown analysis, 2024.

A list of noise sensitive facilities within the 65+ DNL noise contour for the Future (2037) No Action are listed in **Table 7-28**. There would be 10 schools, 21 places of worship, four nursing homes, and two libraries within the 65+ DNL noise contour. There are no noise sensitive facilities within the 70 or 75 DNL noise contours for the Future (2037) No Action.

TABLE 7-28: NOISE SENSITIVE FACILITIES IN THE FUTURE (2037) NO ACTION 65+ DNL NOISE CONTOUR

Map ID	Name
Schools	
S-1	Puget Sound Skills Center
S-2	Choice Academy – Homeschool Center
S-3	Midway Elementary School
S-4	Mount Rainier High School
S-5	Southern Heights Elementary School
S-6	Pacific Middle School
S-7	Beverly Park Elementary School
S-8	Our Lady of Lourdes School
S-9	St. Philomena Catholic School
S-10	Glacier Middle School
Places of Worship	
C-1	Saint Philomena Catholic Church
C-2	Prince of Peace Lutheran Church
C-3	Samoan Christian Fellowship
C-4	Normandy Christian Church
C-5	Southminster Presbyterian Church
C-6	Hope Church
C-7	Gospel Russian Baptist Church
C-8	The Mountain Church
C-9	Riverton Heights Baptist Church
C-10	Boulevard Park Presbyterian
C-11	Midway Community Covenant Church
C-12	Apostolic Bible Church of Jesus Christ
C-13	Highline 7th Day Adventist Church
C-14	Glen Acres Church of Christ
C-15	Kingdom Hall of Jehovah's Witnesses
C-16	New Testament Christian Church
C-17	Our Lady of Lourdes Church
C-18	Pacific Northwest United Methodist
C-19	Wat Buddharam Buddhist Temple
C-20	Hanuman Nagri Temple
C-21	Way of Salvation Church
Libraries	
L-1	Des Moines Library
L-2	Boulevard Park Library
Nursing Homes	
N-2	Wesley Homes Terrace
N-3	Wesley Homes Health Center
N-4	Wesley Homes Gardens and Bungalows
N-5	High West Residence

Source: Landrum & Brown analysis, 2024.

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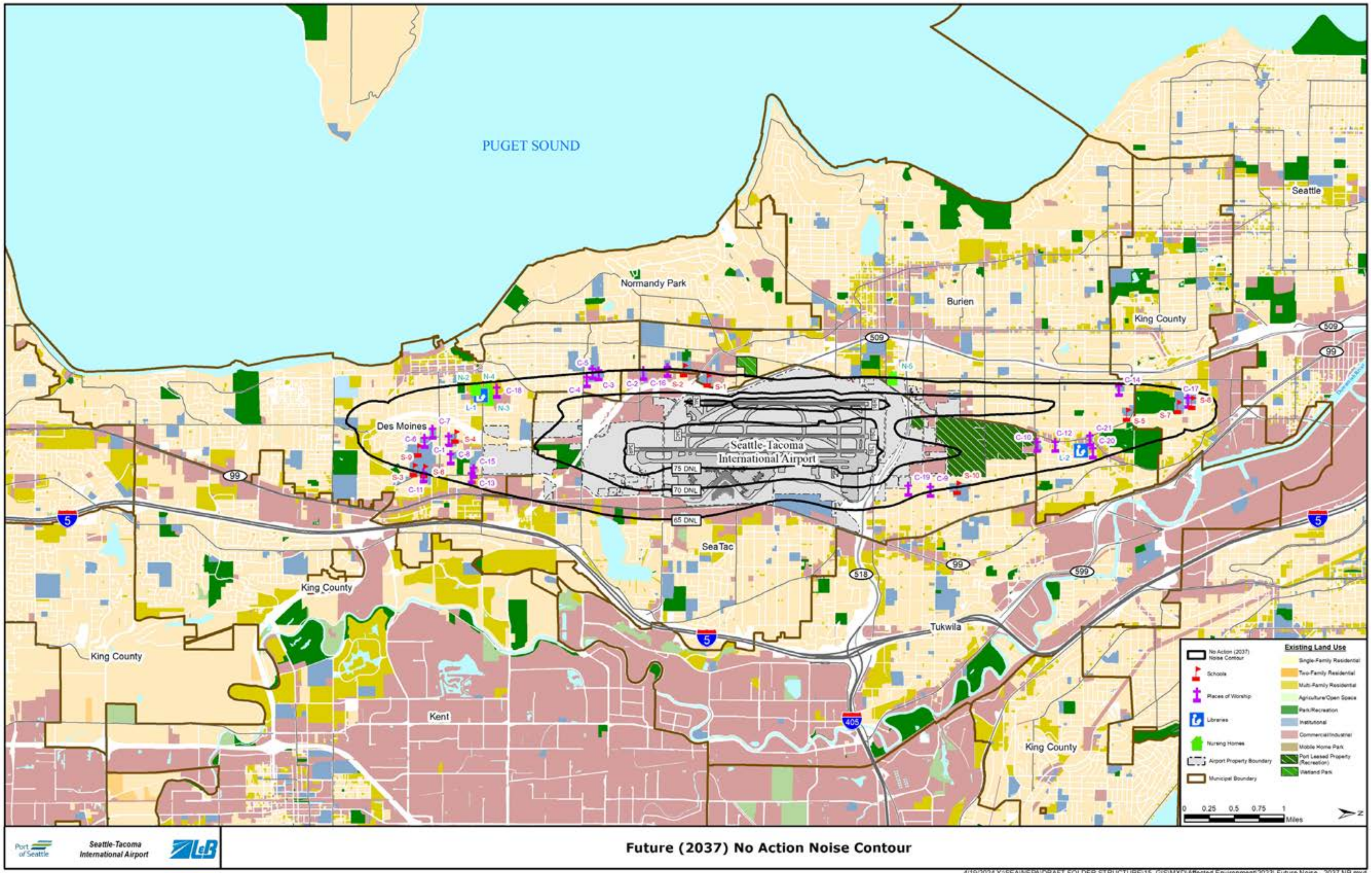
EXHIBIT 7-12: FUTURE (2037) NO ACTION NOISE CONTOUR



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.

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7.2.4 Future (2037) Proposed Action

The following describes the input data and methodologies used in preparing the Future (2037) Proposed Action noise contour, followed by the resulting noise exposure contours.

Aircraft Activity Levels and Fleet Mix

Table 7-29 shows the total number of operations by detailed aircraft type and by time of day (daytime or nighttime). The Future (2037) Proposed Action annual average day included 1,397 average annual day operations, 15.8 percent of which occurred during the nighttime hours of 10:00 p.m. to 6:59 a.m. This is an increase of 96 average annual day operations over the Future (2037) No Action condition.

TABLE 7-29: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2037) PROPOSED ACTION

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Commercial Jets						
Airbus A220-100	16PW111	33.92	3.39	37.31		74.62
Airbus A220-300	16PW111	10.75	2.15	12.91		25.81
Airbus A220-300	16PW112	5.30	1.06	6.36		12.71
Airbus A320-200 Series	01P08CM105	2.28	0.68	1.94	1.03	5.93
Airbus A320-200 Series	01P10IA021	0.20	0.06	0.17	0.09	0.53
Airbus A320-200 Series	01P10IA022	0.04	0.01	0.04	0.02	0.11
Airbus A320-200 Series	1CM008	0.06	0.02	0.05	0.03	0.14
Airbus A320-200 Series	1CM009	0.23	0.07	0.19	0.10	0.59
Airbus A320-200 Series	1IA003	0.43	0.13	0.37	0.19	1.12
Airbus A320-200 Series	3CM026	0.25	0.07	0.21	0.11	0.64
Airbus A320-200 Series	8IA010	0.00	0.00	0.00	0.00	0.00
Airbus A320-NEO	01P20CM128	5.22	3.26	4.57	3.91	16.96
Airbus A320-NEO	01P22PW163	8.28	5.17	7.24	6.21	26.91
Airbus A321-200 Series	01P08CM104	0.35	0.13	0.29	0.19	0.96
Airbus A321-200 Series	01P10IA025	2.11	0.79	1.77	1.14	5.81
Airbus A321-200 Series	3CM025	0.36	0.13	0.30	0.19	0.99
Airbus A321-NEO	01P18PW157	6.72	3.73	8.96	1.49	20.91
Airbus A321-NEO	01P20CM132	19.93	11.07	26.58	4.43	62.01
Airbus A330-200 Series	2RR023	3.37	0.34	3.71		7.42
Airbus A330-200 Series	9PW094	0.05	0.00	0.05		0.11
Airbus A330-300 Series	2RR023	0.80		0.80		1.61
Airbus A330-300 Series	4GE080	0.82		0.82		1.63
Airbus A330-300 Series	7PW082	0.11		0.11		0.22
Airbus A330-300 Series	9PW094	2.30		2.30		4.61
Airbus A330-300 Series	9PW095	0.54		0.54		1.08
Airbus A330-900N Series (Neo)	02P23RR141	8.12		8.12		16.25
Airbus A350-900 series	01P18RR124	4.79		3.20	1.60	9.59
Boeing 737-7	01P20CM136	2.08	0.42	2.08	0.42	4.99
Boeing 737-700 Series	3CM030	0.01	0.01	0.02	0.01	0.06
Boeing 737-700 Series	3CM031	0.48	0.48	0.75	0.21	1.92
Boeing 737-700 Series	3CM032	0.09	0.09	0.14	0.04	0.35
Boeing 737-700 Series	8CM051	0.00	0.00	0.00	0.00	0.00

TABLE 7-29: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2037) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 737-700 Series	8CM062	0.00	0.00	0.01	0.00	0.01
Boeing 737-700 Series	8CM063	0.08	0.08	0.13	0.04	0.33
Boeing 737-8	01P20CM135	0.79	0.16	0.79	0.16	1.90
Boeing 737-8	01P20CM136	25.63	5.13	25.63	5.13	61.50
Boeing 737-8	01P20CM140	23.64	4.73	23.64	4.73	56.73
Boeing 737-800 Series	01P11CM114	0.35	0.07	0.35	0.07	0.84
Boeing 737-800 Series	01P11CM116	4.71	0.99	4.78	0.92	11.40
Boeing 737-800 Series	01P11CM122	2.57	0.54	2.61	0.50	6.22
Boeing 737-800 Series	01P11CM125	0.57	0.12	0.58	0.11	1.38
Boeing 737-800 Series	01P11CM126	0.05	0.01	0.05	0.01	0.13
Boeing 737-800 Series	3CM032	14.42	3.03	14.63	2.81	34.89
Boeing 737-800 Series	3CM034	1.39	0.29	1.41	0.27	3.37
Boeing 737-800 Series	8CM051	19.74	4.14	20.03	3.85	47.76
Boeing 737-800 Series	8CM064	0.14	0.03	0.15	0.03	0.35
Boeing 737-800 Series	8CM065	1.84	0.39	1.87	0.36	4.46
Boeing 737-800 Series	8CM066	8.66	1.82	8.78	1.69	20.95
Boeing 737-9	01P20CM136	1.22	0.19	0.90	0.51	2.83
Boeing 737-9	01P20CM140	48.18	7.61	35.50	20.29	111.57
Boeing 737-900-ER	01P11CM116	30.48	6.63	31.02	6.09	74.22
Boeing 737-900-ER	01P11CM121	86.79	18.87	88.32	17.34	211.32
Boeing 737-900-ER	01P11CM125	0.27	0.06	0.27	0.05	0.65
Boeing 737-900-ER	3CM034	1.23	0.27	1.25	0.25	2.99
Boeing 737-900-ER	8CM065	1.37	0.30	1.39	0.27	3.33
Boeing 737-900-ER_MA	01P11CM121_MA	3.49	0.12	1.74	0.06	5.41
Boeing 787-10 Dreamliner	01P17GE211	0.66		0.66		1.31
Boeing 787-10 Dreamliner	01P17GE213	1.42		1.42		2.84
Boeing 787-10 Dreamliner	02P23RR134	0.72		0.72		1.43
Boeing 787-8 Dreamliner	01P17GE206	2.09		2.09		4.19
Boeing 787-8 Dreamliner	01P17GE210	0.07		0.07		0.14
Boeing 787-8 Dreamliner	11GE137	3.31		3.31		6.61
Boeing 787-8 Dreamliner	11GE138	8.13		8.13		16.25
Boeing 787-9 Dreamliner	01P17GE211	5.09		5.09		10.18
Boeing 787-9 Dreamliner	01P17GE214	0.03		0.03		0.07
Boeing 787-9 Dreamliner	02P23RR131	1.15		1.15		2.30
Boeing 787-9 Dreamliner	12RR067	5.26		5.26		10.52
Boeing 787-9 Dreamliner	12RR068	2.22		2.22		4.43
Subtotal		*427.75*	*88.86*	*427.86*	*86.94*	*1031.41*
Cargo Jets						
Boeing 747-400 ERF	12PW102	0.26	0.53	0.53	0.26	1.58
Boeing 747-400BCF	01P03GE187	0.26	0.53	0.53	0.26	1.58

TABLE 7-29: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2037) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 747-8F	01P17GE215	0.43		0.43		0.86
Boeing 747-8F	13GE156	0.11		0.11		0.23
Boeing 747-8F	8GENX1	0.37		0.37		0.75
Boeing 767-200 Series Freighter	1GE010	1.70	3.40	3.40	1.70	10.19
Boeing 767-200 Series Freighter	1GE012	0.85	1.69	1.69	0.85	5.07
Boeing 767-200 Series Freighter	1PW026	0.15	0.30	0.30	0.15	0.91
Boeing 767-300 ER Freighter	1GE030	5.96	1.19	5.96	1.19	14.31
Boeing 767-300 ER Freighter	2GE055	0.59	0.12	0.59	0.12	1.41
Boeing 777 Freighter	01P21GE216	5.05		5.05		10.11
Boeing 777 Freighter	01P21GE217	0.12		0.12		0.24
	Subtotal	15.86	7.75	19.09	4.53	47.24
Regional Jets						
Embraer ERJ175-LR	01P08GE197	134.39	15.44	133.38	16.44	299.66
Embraer ERJ175-LR_MA_Y2	01P08GE197_MA_Y2	1.73	0.22	0.87	0.11	2.92
Subtotal		*136.12*	*15.65*	*134.25*	*16.55*	*302.58*
Cargo Props						
ATR 72-600 Freighter	PW127F	0.44		0.44		0.88
Cessna 208 Caravan	P6114A	1.57		1.57		3.14
Cessna 208 Caravan	PT6A14	1.55		1.55		3.10
Cessna 408 SkyCourier	PT6A6B	0.44		0.44		0.88
Raytheon Beech 99	PT6A27	0.01		0.01		0.01
Raytheon Beech 99	PT6A36	0.32		0.32		0.64
Subtotal		*4.33*	--	*4.33*	--	*8.67*
General Aviation						
Bombardier Challenger 350	01P14HN011	0.78	--	0.78	--	1.57
Cessna 172 Skyhawk	IO320	0.08	0.08	0.16	--	0.33
Dassault Falcon 50	1AS002	0.78	--	0.78	--	1.57
Embraer Phenom 300 (EMB-505)	PW530	0.19	--	0.19	--	0.37
Piper PA-31 Navajo	TIO540	0.02	--	0.02	--	0.04
Raytheon C-12 Huron	PT660A	0.09	--	0.09	--	0.18
Subtotal		*1.95*	*0.08*	*2.03*	--	*4.06*
Other						
Boeing 737-900-ER_O1	01P11CM121_O1	0.49	0.11	0.50	0.10	1.20
Boeing 737-900-ER_O2	01P11CM125_O2	0.00	0.00	0.00	0.00	0.00

TABLE 7-29: AVERAGE DAILY OPERATIONS BY AEDT AIRFRAME AND ENGINE CODE – FUTURE (2037) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Boeing 737-900-ER_O3	3CM034_O3	0.01	0.00	0.01	0.00	0.02
Boeing 737-900-ER_O4	8CM065_O4	0.01	0.00	0.01	0.00	0.02
Boeing 737-900-ER_O7	01P11CM116_O7	0.17	0.04	0.17	0.03	0.41
Cessna 208 Caravan_O5	P6114A_O5	0.28	--	0.28	--	0.55
Cessna 208 Caravan_O6	PT6A14_O6	0.27	--	0.27	--	0.54
Subtotal		*1.22*	*0.15*	*1.23*	*0.13*	*2.74*
Military						
Cessna 172 Skyhawk_M2	IO320_M2	0.00	--	0.00	--	0.01
Embraer Phenom 300 (EMB-505)_M1	PW530_M1	0.10	--	0.10	--	0.20
Raytheon C-12 Huron_M	PT660A_M	0.04	--	0.04	--	0.07
Subtotal		*0.14*	--	*0.14*	--	*0.27*
Total		**587.38**	**112.49**	**588.93**	**108.16**	**1396.96**

Note: Totals may not sum due to rounding.
Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.

Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

Runway Definition

Under the Future (2037) Proposed Action, no changes to the runway location or definition would occur. Therefore, the runway definition discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2037) Proposed Action.

Runway End Utilization

Table 7-30 presents the runway end utilization for the Future (2037) Proposed Action.

TABLE 7-30: GENERALIZED RUNWAY END UTILIZATION SUMMARY – FUTURE (2037) PROPOSED ACTION

Aircraft Category	Runway End 16L	Runway End 16C	Runway End 16R	Runway End 34L	Runway End 34C	Runway End 34R
Daytime Arrivals						
Commercial Jet	11.02%	1.00%	58.98%	23.71%	1.00%	4.29%
Cargo Jet	55.00%	1.00%	15.00%	7.00%	1.00%	21.00%
Regional Jets	5.00%	1.00%	65.00%	26.00%	1.00%	2.00%
Cargo Props	23.86%	1.45%	45.70%	26.45%	1.00%	1.55%
General Aviation	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Other	14.41%	1.22%	55.37%	26.22%	1.00%	1.78%
Military	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Missed Approaches*	--	--	77.33%	22.67%	--	--
Daytime Departures						
Commercial Jets	45.64%	25.36%	--	--	0.94%	28.06%
Cargo Jets	58.00%	13.00%	--	--	0.50%	28.50%
Regional Jets	44.00%	27.00%	--	--	1.00%	28.00%
Cargo Props	35.47%	32.84%	2.69%	1.80%	13.12%	14.08%
General Aviation	34.50%	33.50%	3.00%	2.00%	14.50%	12.50%
Other	39.78%	29.88%	1.33%	0.89%	6.99%	21.12%
Military	34.50%	33.50%	3.00%	2.00%	14.50%	12.50%
Missed Approaches*	--	--	77.33%	22.67%	--	--
Nighttime Arrivals						
Commercial Jets	5.19%	1.00%	64.81%	25.93%	1.00%	2.07%
Cargo Jets	55.00%	1.00%	15.00%	7.00%	1.00%	21.00%
Regional Jets	5.00%	1.00%	65.00%	26.00%	1.00%	2.00%
Cargo Props	--	--	--	--	--	--
General Aviation	26.00%	1.50%	43.50%	26.50%	1.00%	1.50%
Other	5.00%	1.00%	65.00%	26.00%	1.00%	2.00%
Military	--	--	--	--	--	--
Missed Approaches*	--	--	80.98%	19.02%	--	--
Nighttime Departures						
Commercial Jets	44.26%	26.74%	--	--	0.99%	28.01%
Cargo Jets	58.00%	13.00%	--	--	0.50%	28.50%
Regional Jets	44.00%	27.00%	--	--	1.00%	28.00%
Cargo Props	--	--	--	--	--	--
General Aviation	--	--	--	--	--	--
Other	44.00%	27.00%	--	--	1.00%	28.00%
Military	--	--	--	--	--	--
Missed Approaches*	--	--	80.98%	19.02%	--	--

Note: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
* Missed approaches count as two arrivals and one departure for modeling purposes.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Environmental Review Airside Modeling, Seattle-Tacoma International Airport, LeighFisher, 2020, Landrum & Brown analysis, 2024.

Engine Run-Ups

Under the Future (2037) Proposed Action, changes to run-up locations would occur due to changes in the taxiways and new passenger terminal facilities. The result is that there would be fewer total run-up locations and the locations would be on the north and south ends of the airfield, in the same location as the Future (2032) Proposed Action. Exhibit 7-10 shows the location of the run-ups for this condition. The number and type of engine run-up operations for the Future (2037) Proposed Action are presented below in **Table 7-31**. The number of engine run-up operations were scaled up from 2022 levels assuming the same distribution across aircraft types.

TABLE 7-31: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2037) PROPOSED ACTION

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
North Flow Primary Location						
Airbus A320-200 Series	01P08CM105	27.3	15.8	2.1	2.0	25,000 lbs.
Airbus A320-200 Series	1CM009	3.2	69.5	--	--	25,000 lbs.
Airbus A320-200 Series	3CM026	3.2	15.5	--	--	25,000 lbs.
Airbus A321-200 Series	3CM025	4.8	36.7	--	--	30,000 lbs.
Airbus A321-NEO	01P20CM132			2.1	2.0	30,000 lbs.
Airbus A330-200 Series	9PW094	9.6	27.7	--	--	71,100 lbs.
Airbus A330-300 Series	4GE080	1.6	37.0	--	--	67,500 lbs.
Airbus A330-900N Series (Neo)	02P23RR141	1.6	26.0	--	--	71,100 lbs.
Boeing 737-700 Series	3CM031	6.4	26.8	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	8.0	56.4	--	--	24,000 lbs.
Boeing 737-800 Series	01P11CM122	1.6	10.0	--	--	26,300 lbs.
Boeing 737-800 Series	3CM032	22.4	27.6	--	--	26,300 lbs.
Boeing 737-800 Series	3CM034	1.6	9.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM051	3.2	40.5	--	--	26,300 lbs.
Boeing 737-800 Series	8CM066	4.8	33.0	--	--	26,300 lbs.
Boeing 737-9	01P20CM140	14.4	14.6	--	--	26,400 lbs.
Boeing 737-900-ER	01P11CM116	16.0	20.2	--	--	26,300 lbs.
Boeing 737-900-ER	01P11CM121	1.6	4.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM121	25.7	25.1	--	--	26,300 lbs.
Embraer ERJ175-LR	01P08GE197	1.6	6.0	--	--	6,900 lbs.
Embraer ERJ175-LR	01P08GE197	6.4	28.0	--	--	13,800 lbs.
South Flow Primary Location						
Airbus A320-200 Series	01P08CM105	3.2	6.0	--	--	12,500 lbs.
Airbus A320-200 Series	01P08CM105	44.9	12.9	--	--	25,000 lbs.
Airbus A320-200 Series	1CM009	8.0	31.6	--	--	25,000 lbs.
Airbus A321-NEO	01P20CM132	3.2	12.5	--	--	30,000 lbs.
Airbus A330-200 Series	2RR023	1.6	6.0	--	--	71,100 lbs.
Airbus A330-200 Series	9PW094	1.6	26.0	--	--	35,550 lbs.
Airbus A330-200 Series	9PW094	12.8	14.9	--	--	71,100 lbs.
Airbus A330-300 Series	4GE080	4.8	10.7	--	--	67,500 lbs.
Airbus A330-900N Series (Neo)	02P23RR141	4.8	26.7	--	--	71,100 lbs.
Boeing 737-700 Series	3CM031	1.6	20.0	2.1	2.0	12,000 lbs.
Boeing 737-700 Series	3CM031	25.7	17.6	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	6.4	31.5	--	--	24,000 lbs.
Boeing 737-700 Series	3CM032	67.3	18.3	--	--	26,300 lbs.

TABLE 7-31: ANNUAL AIRCRAFT RUN-UP ACTIVITY – FUTURE (2037) PROPOSED ACTION (CONTINUED)

Airframe	Engine Code	Annual Daytime Operations	Average Duration Daytime (minutes)	Annual Nighttime Operations	Average Duration Nighttime (minutes)	Thrust Settings
Boeing 737-800 Series	3CM032	4.8	18.3	--	--	13,150 lbs.
Boeing 737-800 Series	8CM051	17.6	21.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM065	1.6	6.0	--	--	26,300 lbs.
Boeing 737-800 Series	8CM066	1.6	3.0	2.1	2.0	13,150 lbs.
Boeing 737-800 Series	8CM066	38.5	10.7	--	--	26,300 lbs.
Boeing 737-9	01P20CM140	1.6	9.0	--	--	13,200 lbs.
Boeing 737-9	01P20CM140	33.7	10.4	--	--	26,400 lbs.
Boeing 737-900-ER	01P11CM116	1.6	3.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM116	33.7	15.7	4.2	2.0	26,300 lbs.
Boeing 737-900-ER	01P11CM121	1.6	8.0	--	--	13,150 lbs.
Boeing 737-900-ER	01P11CM121	86.6	25.5	--	--	26,300 lbs.
Boeing 767-200 Series Freighter	1GE012	1.6	6.0	--	--	48,000 lbs.
Boeing 767-300 ER Freighter	1GE030	4.8	21.0	--	--	60,000 lbs.
Embraer ERJ175-LR	01P08GE197	11.2	11.2	--	--	13,800 lbs.
North Flow Secondary Location						
Airbus A330-200 Series	9PW094	1.6	38.0	--	--	71,100 lbs.
Total		593.3	--	12.7	--	--

Notes: Totals may not sum due to rounding.
Daytime = 7:00am – 9:59pm, Nighttime = 10:00pm – 6:59am.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

Flight Tracks

Flight track locations for the Future (2037) Proposed Action are expected to be the same as the Existing (2022) conditions because there are no changes to the runway locations and no flight track changes are being proposed.[14] Therefore, the flight track location information discussed for the Existing (2022) Condition in Section 7.1 would remain the same for the Future (2037) Proposed Action.

Aircraft Departure Stage Length and Operational Profiles

Table 7-32 presents the departure stage length distribution for the Future (2037) Proposed Action. The departure segment of the missed approaches is modeled as Stage Length Category 1.

[14] It is expected that the Runway 34R arrival profile will be slightly higher due to the relocation of the glide slope. This higher Runway 34R arrival profile was not specifically included in this analysis because AEDT does not provide a function to reflect this minor change. Furthermore, by not including the change in Runway 34R arrival profile this analysis represents a conservative evaluation of noise impacts.

TABLE 7-32: DEPARTURE STAGE LENGTH DISTRIBUTION – FUTURE (2037) PROPOSED ACTION

Stage Length	Commercial Jets	Cargo Jets	Regional Jets	Cargo Props	General Aviation	Other	Military	Total
1	3.41%	--	76.22%	100.00%	100.00%	42.15%	100.00%	19.99%
2	44.77%	11.09%	20.12%	--	--	28.92%	--	37.85%
3	14.81%	30.28%	3.66%	--	--	15.08%	--	12.79%
4	27.84%	28.37%	--	--	--	13.85%	--	21.56%
5	--	--	--	--	--	--	--	--
6	4.00%	21.91%	--	--	--	--	--	3.70%
7	5.17%	8.35%	--	--	--	--	--	4.11%
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--

Note: Totals may not sum due to rounding.
Sources: Aviation Forecast Update, prepared by Port of Seattle/LeighFisher, 2023, Sustainable Airport Master Plan Near-Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, September 2023, Landrum & Brown analysis, 2024.

7.2.4.2 Future 2037 Proposed Action Noise Contours

Exhibit 7-13 ***Future (2037) Proposed Action Noise Contour*** depicts the 65, 70, and 75 DNL noise contour for the Future (2037) Proposed Action. The area in square miles of each DNL contour band is summarized in **Table 7-33**.

The 65+ DNL contour extends approximately 3.7 miles to the north and 3.2 miles south of SEA. The area within the contour to the north and south is made up of a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

TABLE 7-33: AREA (SQUARE MILES) OF 65, 70, AND 75 DNL NOISE CONTOURS – FUTURE (2037) PROPOSED ACTION

Alternative	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 75+ dB	DNL 65+ dB
Future (2037) No Action	5.67	2.17	1.32	9.16
Future (2037) Proposed Action	6.08	2.34	1.39	9.82
Change	0.41	0.17	0.07	0.66

Source: Landrum & Brown, 2024.

7.2.4.3 Non-Compatible Land Use

Summaries of the residential population and housing units exposed to noise levels exceeding 65+ DNL for the Future (2037) Proposed Action noise contour are provided in **Table 7-34**. A total of 9,017 housing units (an increase of 1,851 from the Future (2037) No Action) would be located within the Future (2037) Proposed Action 65+ DNL noise contour. The increase in housing units and population from the No Action is due to the increased aircraft operations forecast for the Future (2037) Proposed Action and the increase in size of the 65+ DNL noise contour. For the “sound insulation completed,” the additional areas within the 65+ DNL contour include homes treated during prior phases of the Port’s Part 150 Noise Remedy Program, which extends back to 1985 (when the noise contours were much larger). Therefore, the increases in the numbers are solely due to the changes in the noise contour.

TABLE 7-34: NON-COMPATIBLE LAND USE HOUSING AND POPULATION – FUTURE (2037) PROPOSED ACTION

Mitigation Status/Land Use	DNL 65 - 70 dB	DNL 70 - 75 dB	DNL 65+ dB
Sound Insulation Completed			
Single-Family	3,570	389	3,959
Multi-Family	362	4	366
Mobile Home	0	0	0
Subtotal	3,932	393	4,325
Not Sound Insulated			
Single-Family	917	72	989
Multi-Family	3,572	0	3,572
Mobile Home	114	17	131
Subtotal	4,603	89	4,692
Total Housing Units	**8,535**	**482**	**9,017**
Estimated Population			
Total Estimated Population	**19,468**	**1,268**	**20,736**

Notes: Multi-family includes total units in a complex and were verified using King County assessor data. Population numbers are estimates based on the 2020 United States Census average household size per number of housing units.
Source: Landrum & Brown analysis, 2024.

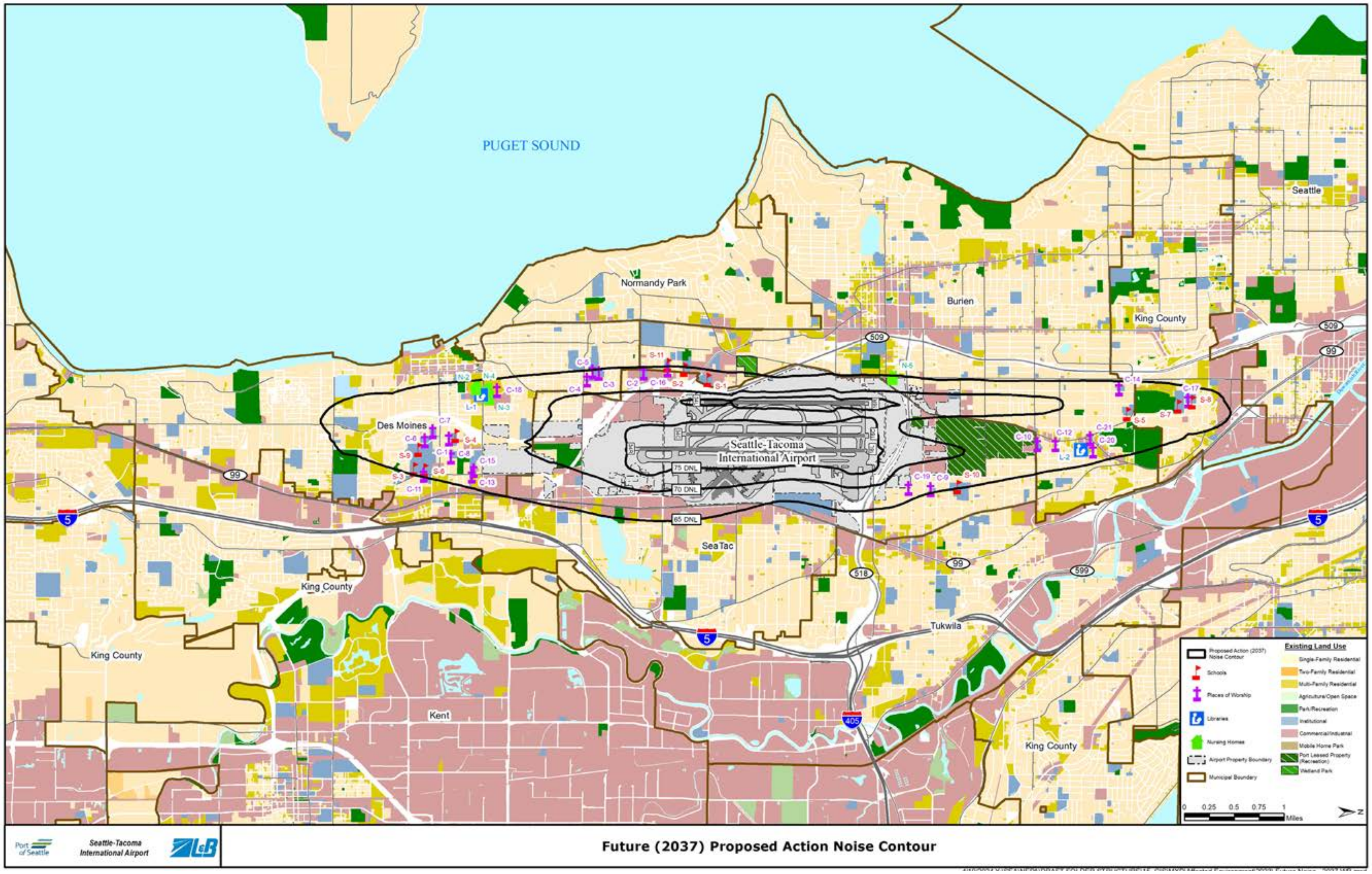
A list of noise sensitive facilities within the 65+ DNL noise contour for the Future (2037) Proposed Action are listed in **Table 7-35**. There would be 11 schools, 21 places of worship, four nursing homes, and two libraries within the 65 DNL noise contour. There are no noise sensitive facilities within the 70 or 75 DNL noise contours for the Future (2037) Proposed Action.

TABLE 7-35: NOISE SENSITIVE FACILITIES IN THE FUTURE (2037) PROPOSED ACTION 65+ DNL NOISE CONTOUR

Map ID	Name
Schools	
S-1	Puget Sound Skills Center
S-2	Choice Academy – Homeschool Center
S-3	Midway Elementary School
S-4	Mount Rainier High School
S-5	Southern Heights Elementary School
S-6	Pacific Middle School
S-7	Beverly Park Elementary School
S-8	Our Lady of Lourdes School
S-9	St. Philomena Catholic School
S-10	Glacier Middle School
S-11	Community Chapel Christian School
Places of Worship	
C-1	Saint Philomena Catholic Church
C-2	Prince of Peace Lutheran Church
C-3	Samoan Christian Fellowship
C-4	Normandy Christian Church
C-5	Southminster Presbyterian Church
C-6	Hope Church
C-7	Gospel Russian Baptist Church
C-8	The Mountain Church
C-9	Riverton Heights Baptist Church
C-10	Boulevard Park Presbyterian
C-11	Midway Community Covenant Church
C-12	Apostolic Bible Church of Jesus Christ
C-13	Highline 7th Day Adventist Church
C-14	Glen Acres Church of Christ
C-15	Kingdom Hall of Jehovah's Witnesses
C-16	New Testament Christian Church
C-17	Our Lady of Lourdes Church
C-18	Pacific Northwest United Methodist
C-19	Wat Buddharam Buddhist Temple
C-20	Hanuman Nagri Temple
C-21	Way of Salvation Church
Libraries	
L-1	Des Moines Library
L-2	Boulevard Park Library
Nursing Homes	
N-2	Wesley Homes Terrace
N-3	Wesley Homes Health Center
N-4	Wesley Homes Gardens and Bungalows
N-5	High West Residence

Source: Landrum & Brown analysis, 2024.

EXHIBIT 7-13: FUTURE (2037) PROPOSED ACTION NOISE CONTOUR



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.

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8. Significant Impact Conclusion

The Future (2032) Proposed Action noise contour would be larger than the Future (2032) No Action by 0.15 square miles due primarily to the 24 additional average annual day operations (see **Exhibit 9-1, *Comparison of Future (2032) Proposed Action/Hybrid Terminal Option and Future (2032) No Action Noise Contours***). Within the area of increased noise exposure associated with the Future (2032) Proposed Alternative there would be 337 additional housing units and 824 additional people within the 65+ DNL. The Future (2032) Proposed Action would not increase noise by 1.5 DNL or more for a noise sensitive area at or above the 65 DNL (the range of increase was between 0.0 DNL and 0.6 DNL) or that would be exposed at or above the 65 DNL level due to a 1.5 dB or greater increase, when compared to the Future (2032) No Action, as shown in **Exhibit 9-2, *Area of 1.5 dB Increase Within the 65+ DNL of the 2032 Proposed Action Noise Contour***. Therefore, no significant noise impact would occur as a result of implementing the Future (2032) Proposed Action. The results would be the same for the Hybrid Terminal Option.

The Future (2037) Proposed Action noise contour would be larger than the Future (2037) No Action by 0.66 square miles due primarily to the 96 additional average annual day operations (see **Exhibit 9-3, *Comparison of Future (2037) Proposed Action/Hybrid Terminal Option and Future (2037) No Action Noise Contours)***. Within the area of increased noise exposure associated with the Future (2037) Proposed Alternative there would be 1,851 additional housing units and 4,439 additional population within the 65+ DNL. The Future (2037) Proposed Action would not increase noise by 1.5 DNL or more for a noise sensitive area at or above the 65 DNL (the range of increase was between 0.0 DNL and 0.6 DNL) or that would be exposed at or above the 65 DNL level due to a 1.5 dB or greater increase, when compared to the Future (2037) No Action, as shown in **Exhibit 9-4, *Area of 1.5 dB Increase Within the 65+ DNL of the 2037 Proposed Action Noise Contour***. Therefore, no significant noise impact would occur as a result of implementing the Future (2037) Proposed Action. The results would be the same for the Hybrid Terminal Option.

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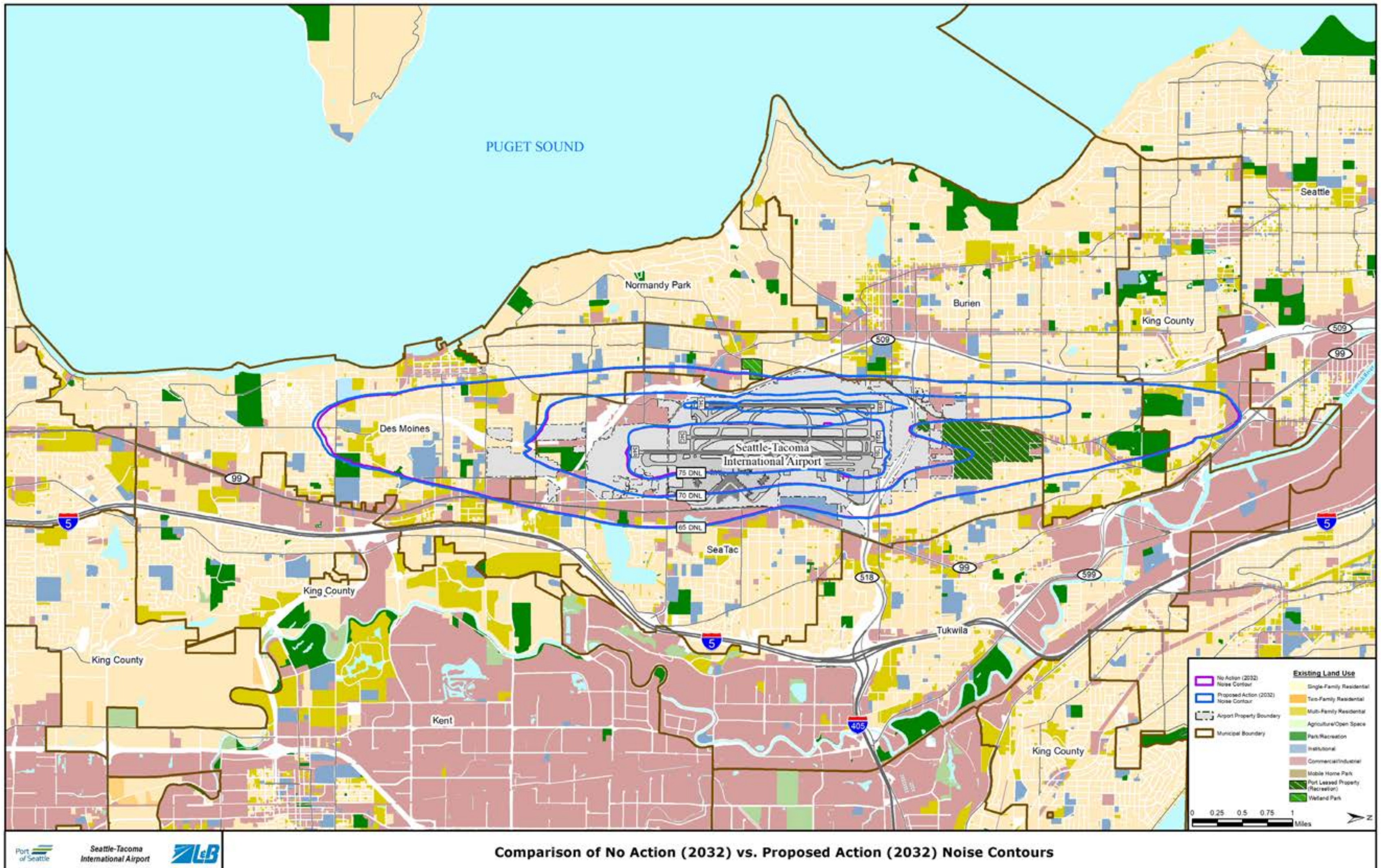
EXHIBIT 9-1: COMPARISON OF FUTURE (2032) PROPOSED ACTION/HYBRID TERMINAL OPTION AND FUTURE (2032) NO ACTION NOISE CONTOURS



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.

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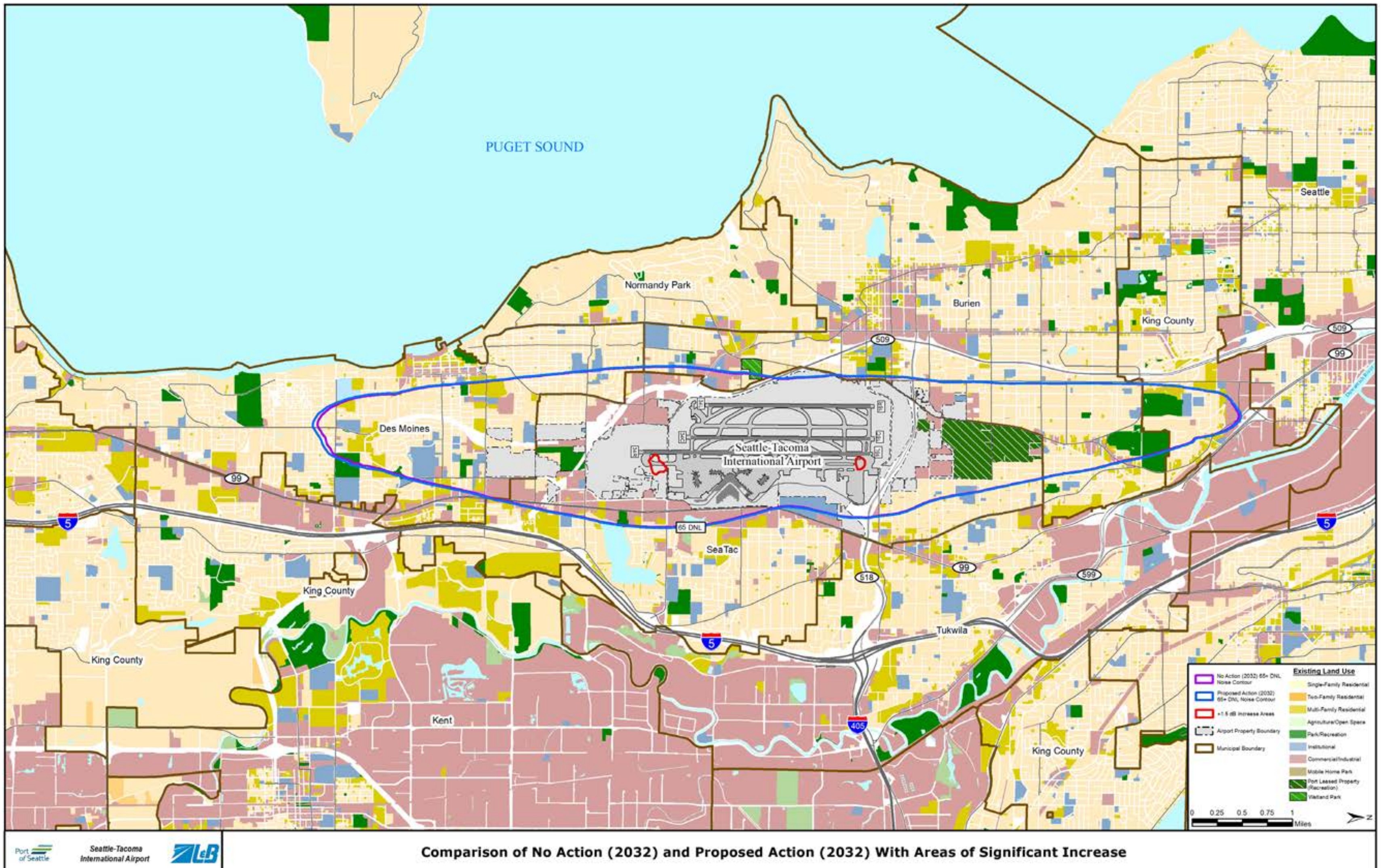
EXHIBIT 9-2: AREA OF 1.5 DB INCREASE WITHIN THE 65+ DNL OF THE 2032 PROPOSED ACTION NOISE CONTOUR



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.

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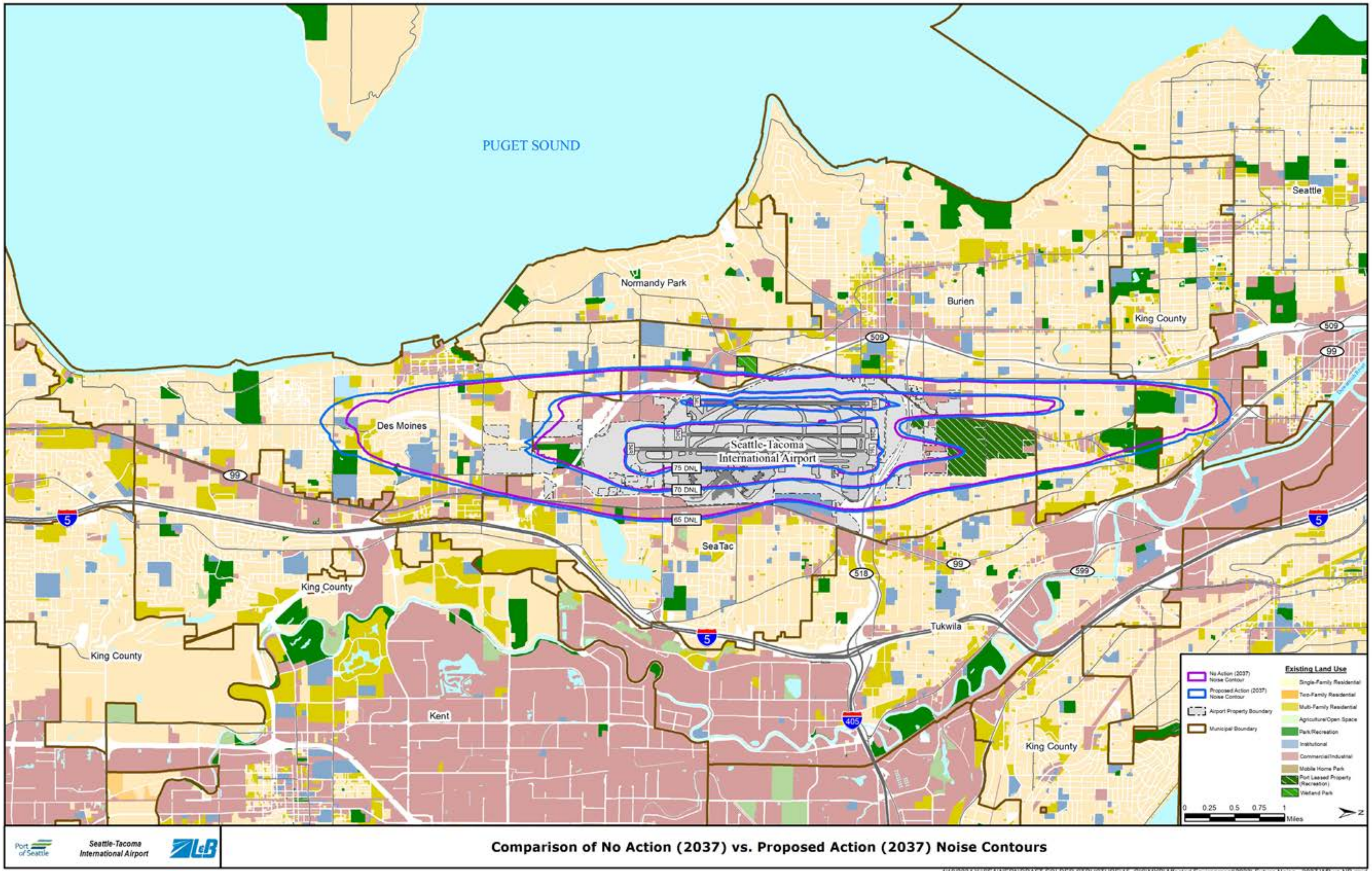
EXHIBIT 9-3: COMPARISON OF FUTURE (2037) PROPOSED ACTION/HYBRID TERMINAL OPTION AND FUTURE (2037) NO ACTION NOISE CONTOURS



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.

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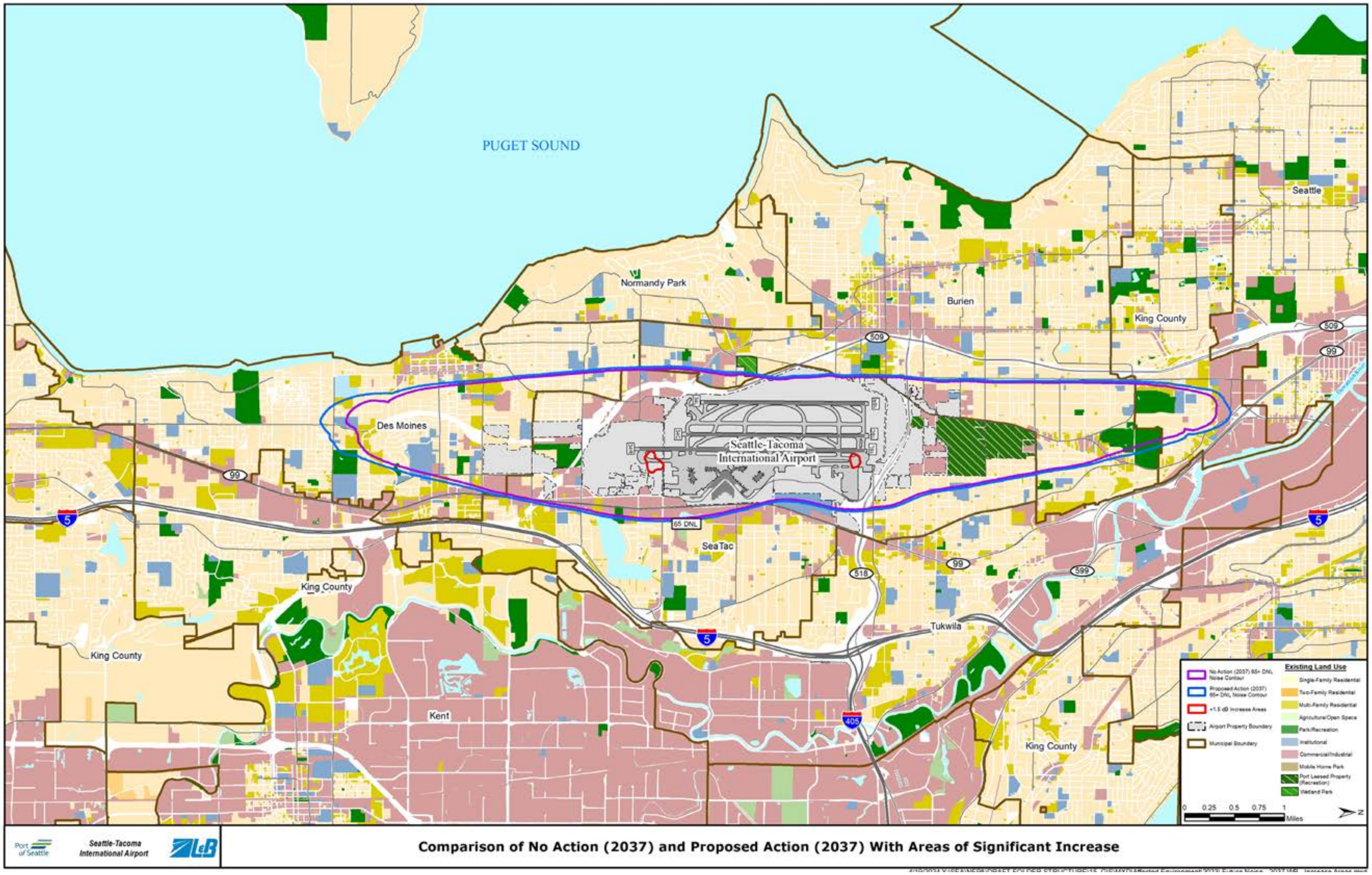
EXHIBIT 9-4: AREA OF 1.5 DB INCREASE WITHIN THE 65+ DNL OF THE 2037 PROPOSED ACTION NOISE CONTOUR



Sources: AEDT Version 3f; Landrum & Brown analysis, 2024.