CHAPTER THREE
NOISE ANALYSIS

This chapter presents background information on the properties of sound and government research and policy on noise. This chapter also presents the analysis conducted for this Part 150 Noise Compatibility Study Update for the Seattle-Tacoma International Airport (Sea-Tac Airport), including information and the methodology and results of the noise contour modeling. This chapter is divided into the following sections:

- Characteristics of Sound – Presents properties of sound that are important for technically describing noise in an airport setting.
- Factors Influencing Human Response to Sound – Presents acoustic factors in human subjective response to a sound that affects its perception.
- Health Effects of Noise – Summarizes the potential human disturbances and health effects of noise.
- Standard Noise Descriptors – Presents various sound rating scales and how they may be applied to addressing aircraft operations.
- Federal Laws, Policies, and Research Related to Noise – Presents a summary of current noise assessment policies used to assess aircraft noise impacts and the research supporting those policies.
- Baseline Noise Exposure – Presents the methodology and results of the measurement and modeling of noise impacts around Sea-Tac Airport.

3.1 CHARACTERISTICS OF SOUND

Sound is created by a 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, 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:

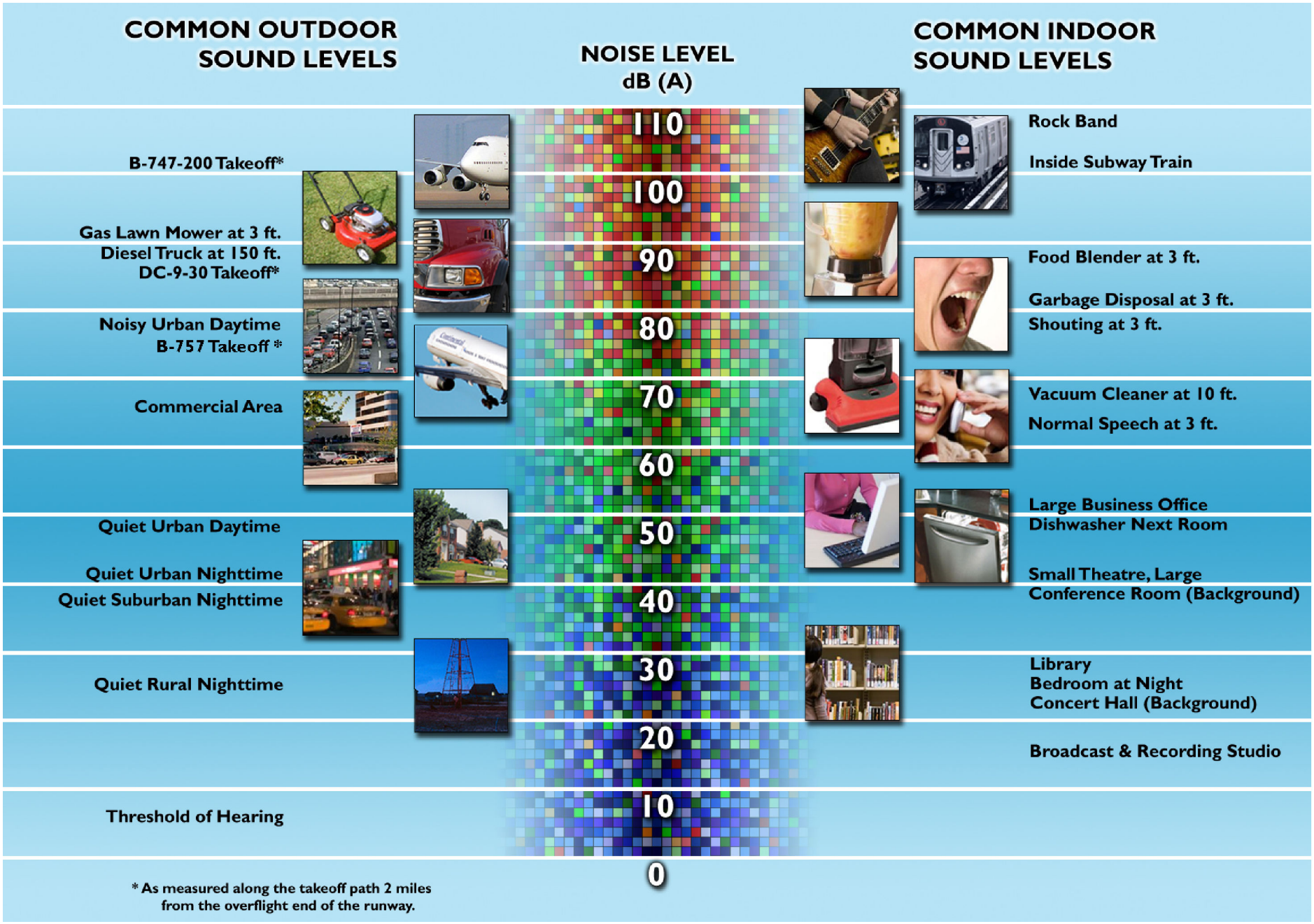
1. Level (amplitude)
2. Pitch (frequency)
3. Duration (time pattern)

3.1.1 SOUND LEVEL

The level or amplitude 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 more manageable numbers. 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 3-1, *Comparison of Sound***, 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.

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 (See **Exhibit 3-2, *Example Addition of Two Decibels***). 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.



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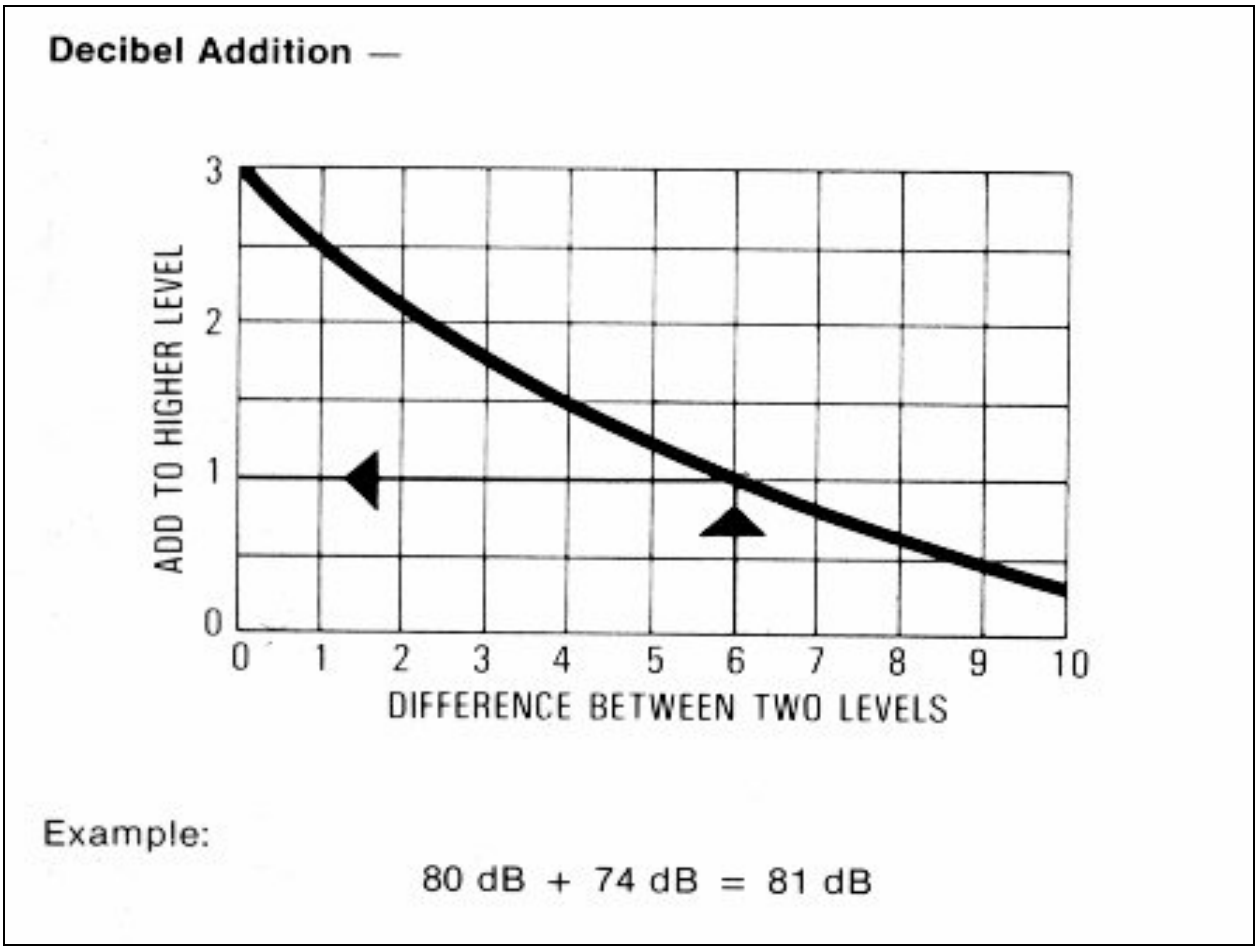
Comparison of Sound

Exhibit:
3-1

Exhibit 3-2
EXAMPLE OF ADDITION OF TWO DECIBEL LEVELS
Seattle-Tacoma International Airport



Source: *Information on Levels of Environmental Noise*. USEPA. March 1974.

Logarithmic averaging also yields results that are quite different from simple arithmetic averaging. Consider the example shown in **Exhibit 3-3, *Example of Sound Level Averaging***. Two sound levels of equal duration are averaged. One has a maximum sound level (Lmax) of 100 dB, the other 50 dB. Using conventional arithmetic, the average would be 75 dB. The true result, using logarithmic math, 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.)

3.1.2 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 was developed to correlate 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 3-4, *Sound Frequency Weighting Curves***, 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 required by the Federal Aviation Administration (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.

3.1.3 DURATION OF SOUNDS

The duration of sounds – their patterns of loudness and pitch over time – can vary greatly. Sounds can be classified as *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.

3.1.4 PERCEIVED NOISE LEVEL

Perceived noisiness is another method of rating sound that was originally 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.

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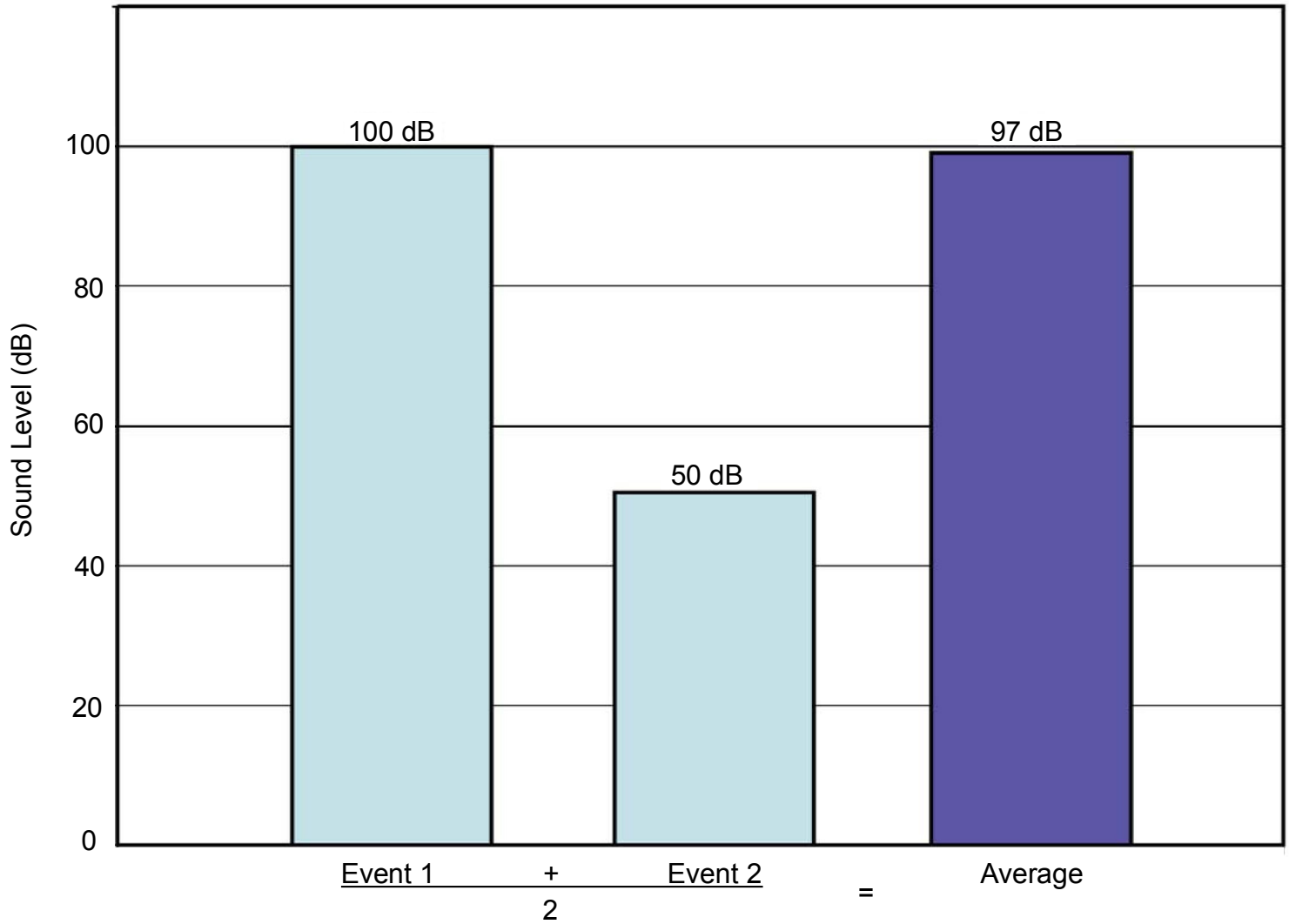
1 Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety. U.S. Environmental Protection Agency, Office of Noise Abatement and Control. 1974, P. A-10.

2 "Airport Noise Compatibility Planning." 14 CFR Part 150, Sec. A150.3.

Assume two sound levels of equal duration...
What is the average level?



(100dB + 50dB) / 2 = 97dB

The decibel (dB) scale is logarithmic -
100 dB is 100,000 times more energy than 50 dB!

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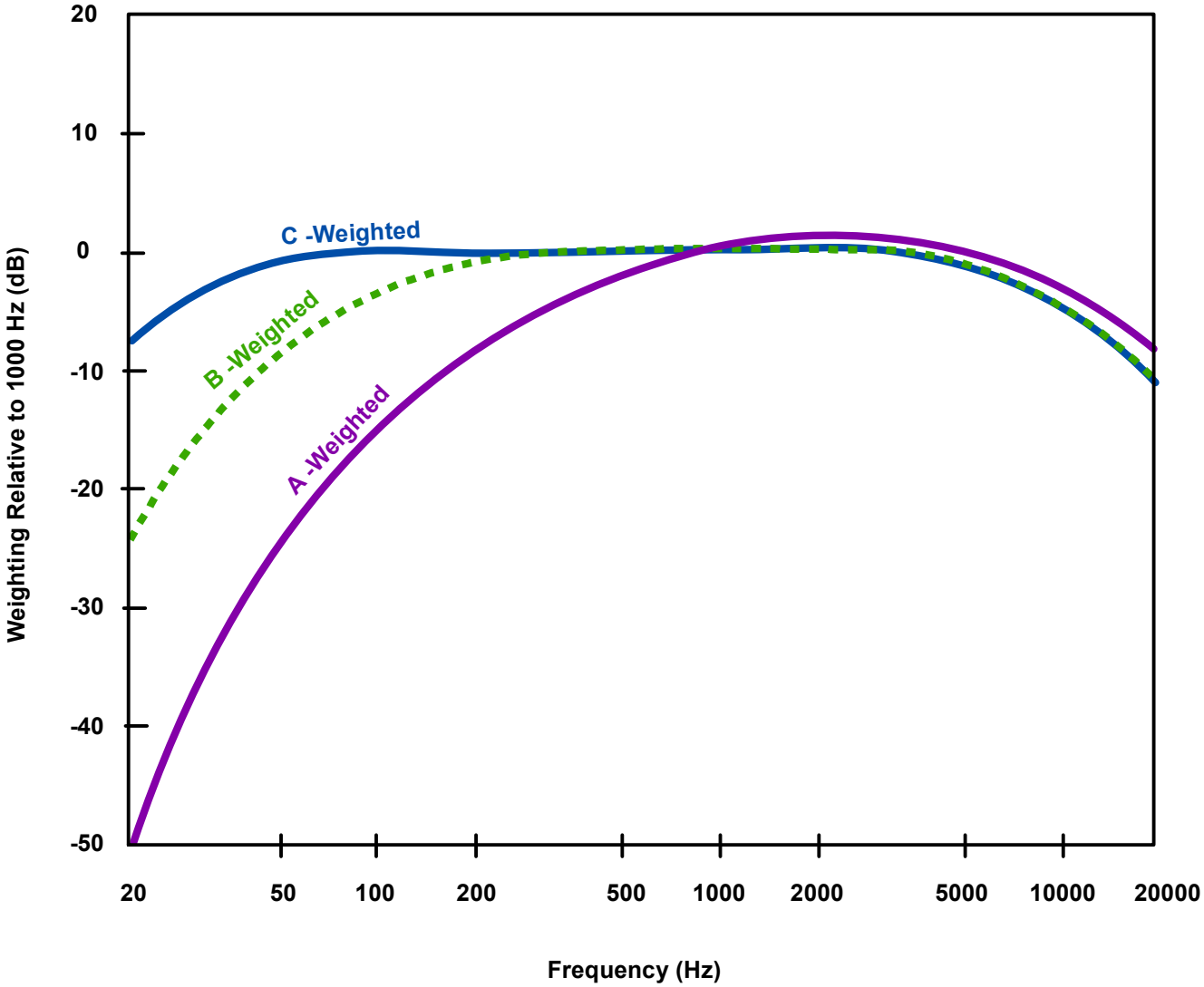
Example of Sound Level Averaging

Exhibit:
3-3



Source: Federal Highway Administation

3.1.5 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. If sound is radiated from a source in an homogeneous and undisturbed manner, the sound 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 the levels that are received by the 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. Sample atmospheric attenuation graphs are presented in **Exhibit 3-5, *Sound 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 be dissipate by 10 dB per for every 1,000 feet (305 meters) from the source.

The rate of atmospheric absorption varies with sound frequency. 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.

Turbulence and gradients of wind, temperature, and humidity also play a significant role in determining the degree of attenuation. Certain conditions, such as inversions, can also 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.

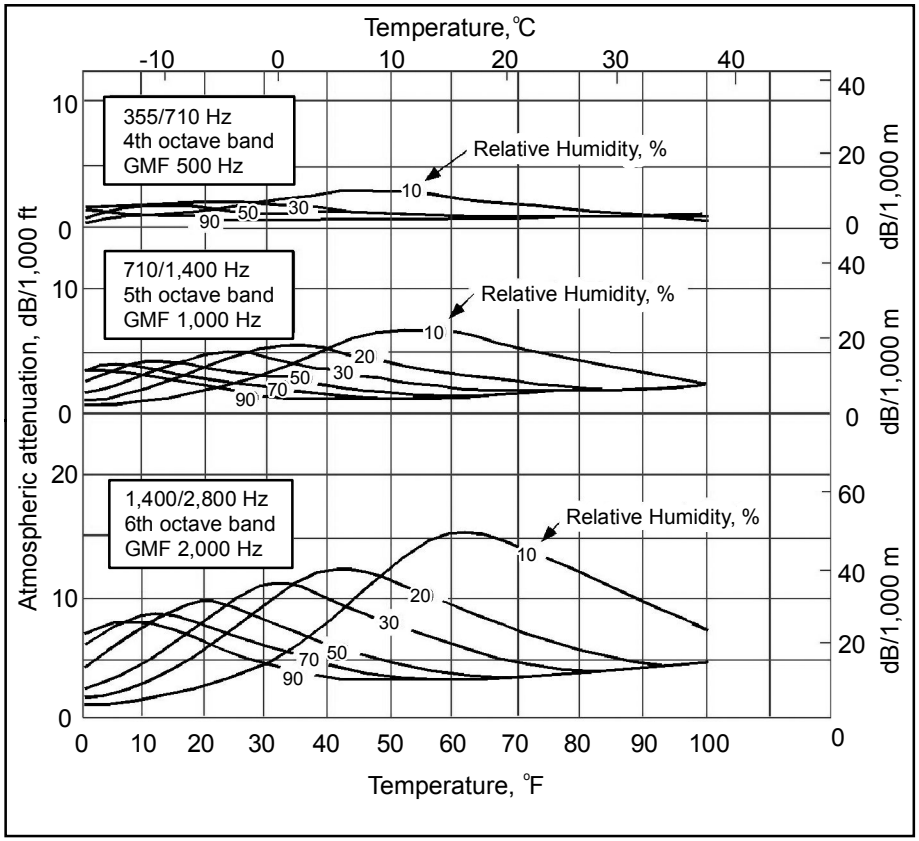
3.2 FACTORS INFLUENCING HUMAN RESPONSE TO SOUND

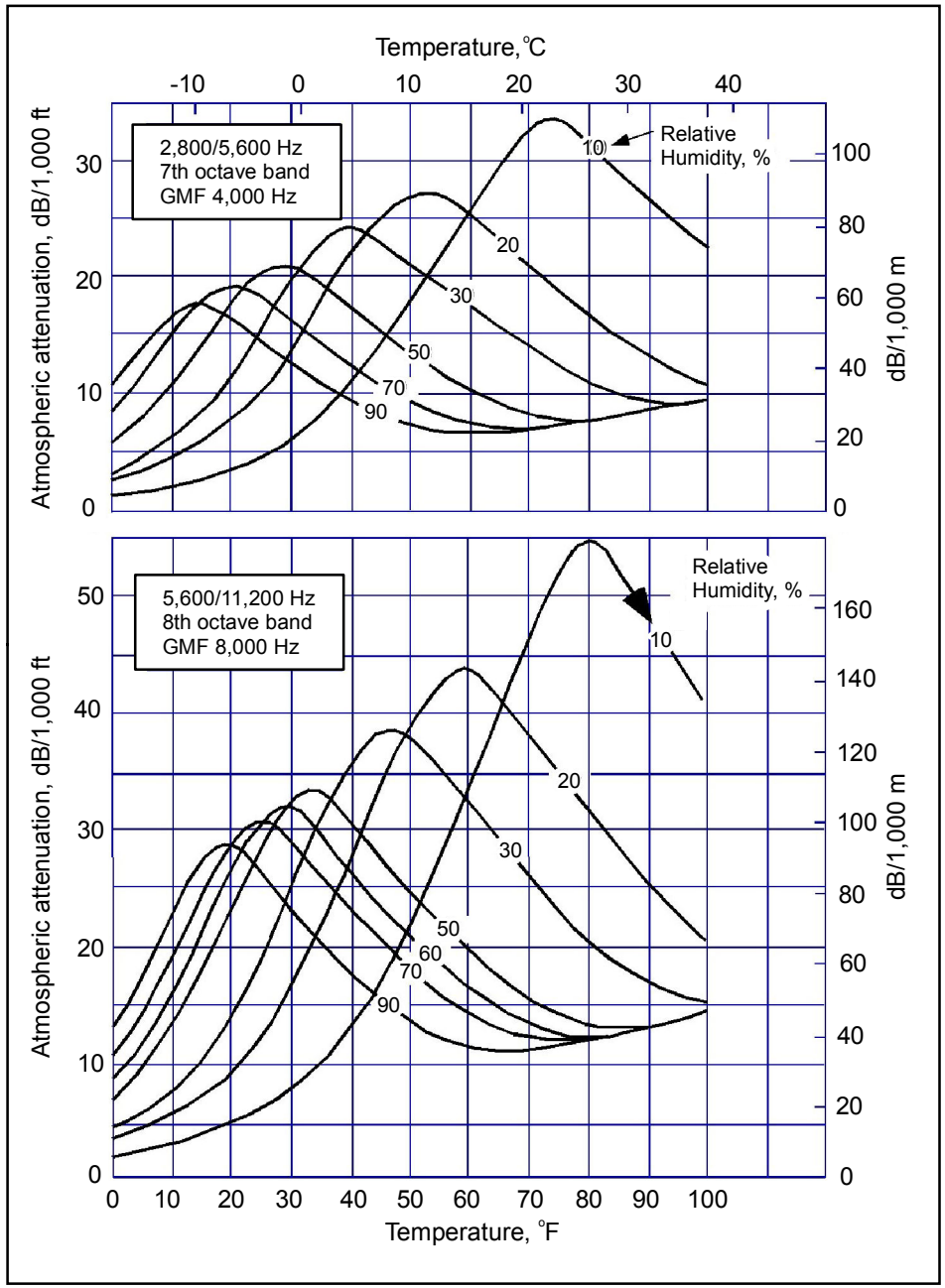
Many factors influence how a sound is perceived and whether or not it is considered annoying to the listener. These factors include not only physical (acoustic) characteristics of the sound but also secondary (non-acoustic) factors, such as sociological and external factors.

Sound rating scales are developed to account for the factors that affect human response to sound. Nearly all of these factors are relevant in describing how sounds are perceived in the community. Many of the non-acoustic parameters play a prominent role in affecting individual response to noise. Background sound (ambient noise) is also important in describing sound in rural settings. Some non-acoustic factors that may influence an individual's response to aircraft noise include:

- Predictability of when the sound/noise will occur;
- How the noise affect certain activities;
- Fear of an aircraft crashing;
- Belief that aircraft noise could be prevented or reduced by aircraft designers, pilots, or authorities related to airlines or airports; and
- Sensitivity to noise in general.

Thus, it is important to recognize that non-acoustic factors such as those described above, as well as acoustic factors, contribute to human response to noise.





SOURCE: Beranek, 1981

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Sound Attenuation Graphs

Exhibit:
3-5

3.3 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, increases the complexity of determining the health effects of noise, and has caused considerable variability in the results of past studies. The health effects of noise are often divided into the following topics: cardiovascular effects, hearing loss, sleep disturbance, and speech/communication interference.

3.3.1 CARDIOVASCULAR EFFECTS

Several studies have suggested that increased hypertension or other cardiovascular effects, such as increased blood pressure, and change in pulse rate, may be associated with long-term exposure to high levels of environmental noise. When conducting cross-sectional studies of environmental noise exposure, it is difficult to control for other important variables. Subsequent reviews of past research has pointed out that such studies "…are notoriously difficult to interpret. They often report conflicting results, generally do not identify a cause and effect relationship, and often do not report a dose-response relationship between the cause and effect."[3] Therefore, it is not known what, if any, cardiovascular effects are caused by aircraft noise exposure.

3.3.2 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."[4] Because aviation noise levels near airports does not approach levels of occupational or recreational noise exposures associated with hearing loss, hearing impairment is likely not caused by aircraft noise for populations living near an airport.

3.3.3 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

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

measuring sleep disturbance (behavioral awakenings or sleep interruption), and different settings in which to measure it (laboratory setting or field setting). 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.

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, Federal Interagency Committee on Aviation Noise (FICAN) recommended a revised sleep disturbance relationship based on data and analysis from three field studies.

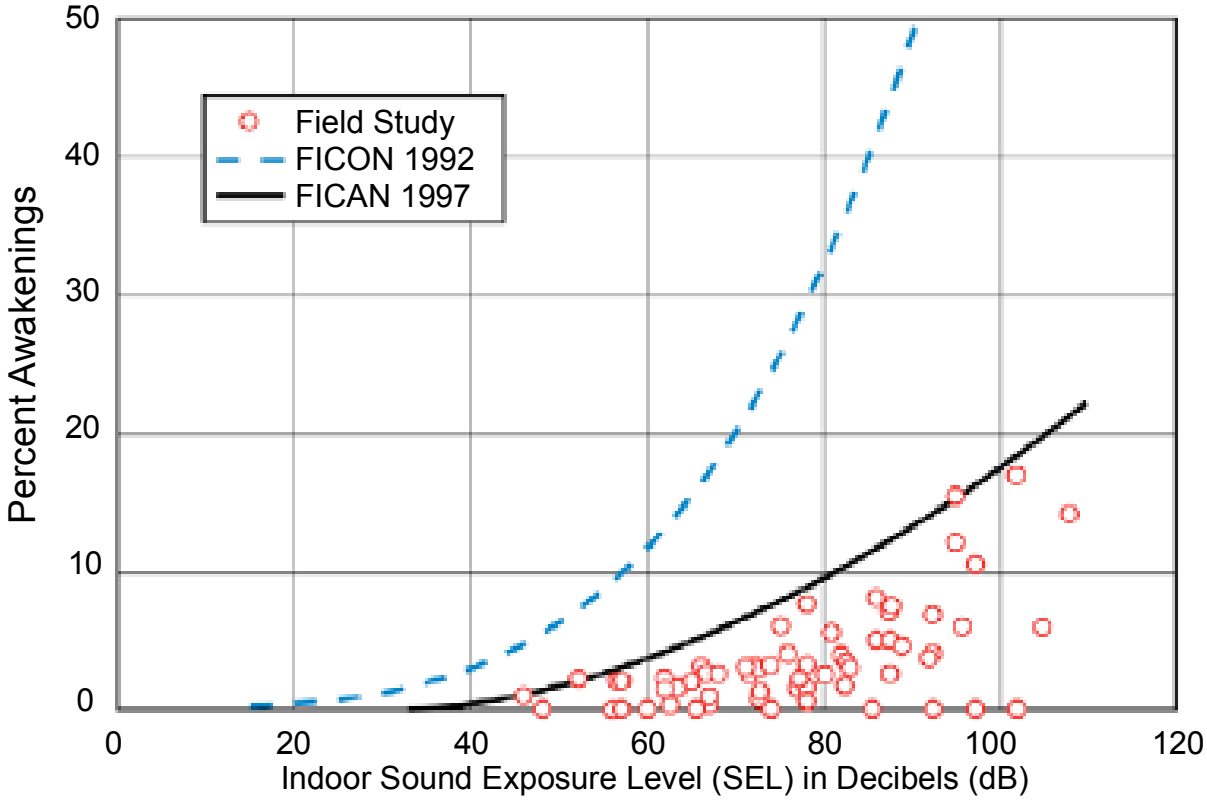
Exhibit 3-6, *Sleep Disturbance Dose-Response Curves*, show the results of the 1992 and 1997 analyses. The top graph shows a comparison of the 1992 FICON and 1997 FICAN curves. The 1997 FICAN curve represents the upper limit of the observed field data, and should be interpreted as predicting the "maximum 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) in 2008.[5] 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 3-6, 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 Sound Exposure Level (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.

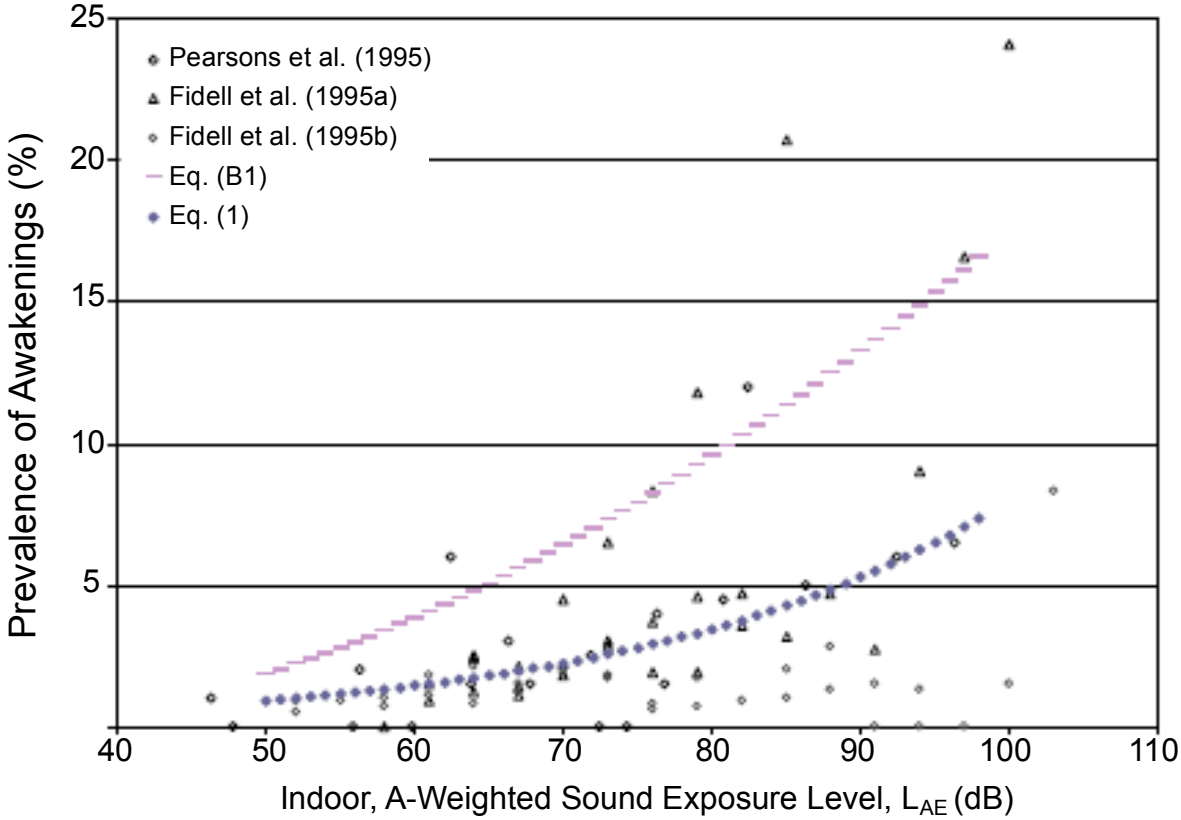
No definitive conclusions have been drawn on the percent of a population that is estimated to be awakened by a certain level of aircraft noise and recent studies have cautioned about the over-interpretation of the data.

[5] 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.

FICAN 1997 Recommended Sleep Disturbance Dose-Response Relationship



ANSI 2008 Recommended Sleep Disturbance Dose-Response Relationship



Sources: Federal Interagency Committee on Aviation Noise (FICAN), June 1997; American National Standards Institute, 2008.

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Sleep Disturbance Dose-Response Curves

Exhibit: **3-6**

3.3.4 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 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 3-7, *Noise Effects on Distance Necessary for Speech Communication***, 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."[6] 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."[7]

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

[7] 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.

Exhibit 3-7
NOISE EFFECTS ON DISTANCE NECESSARY FOR SPEECH COMMUNICATION
Seattle-Tacoma International Airport

Source: FICON, 1992; from USEPA, 1974.

3.4 STANDARD NOISE DESCRIPTORS

Given the multiple dimensions of sound, a variety of descriptors, or metrics, have been developed for describing sound and noise. Some of the most commonly used metrics are discussed in this section. They include:

1. Maximum Level (**Lmax**)
2. Time Above Level (**TA**)
3. Sound Exposure Level (**SEL**)
4. Equivalent Sound Level (**Leq**)
5. Day-Night Average Sound Level (**DNL**)

3.4.1 MAXIMUM LEVEL (Lmax)

Lmax is simply the highest sound level recorded during an event or over a given period of time. It provides a simple and understandable way to describe a sound event and compare it with other events. In addition to describing the peak sound level, Lmax can be reported on an appropriate weighted decibel scale (A-weighted, for example) so that it can disclose information about the frequency range of the sound event in addition to the loudness.

Lmax, however, fails to provide any information about the duration of the sound event. This can be a critical shortcoming when comparing different sounds. Even if they have identical Lmax values, sounds of greater duration contain more sound energy than sounds of shorter duration. Research has demonstrated that for many kinds of sound effects, the total sound energy, not just the peak sound level, is a critical consideration.

3.4.2 TIME ABOVE LEVEL (TA)

The "time above," or TA, metric indicates the amount of time that sound at a particular location exceeds a given sound level threshold. TA is often expressed in terms of the total time per day that the threshold is exceeded. The TA metric explicitly provides information about the duration of sound events, although it conveys no information about the peak levels during the period of observation.

3.4.3 NUMBER OF EVENTS ABOVE LEVEL (NA)

Similar to TA, the Number of Events Above (NA) metric indicates the total number of aircraft events at particular location that exceed a given sound level threshold in dB. The TA metric explicitly provides information about the number of sound events, although it conveys no information about the duration of the event(s).

3.4.4 SOUND EXPOSURE LEVEL (SEL)

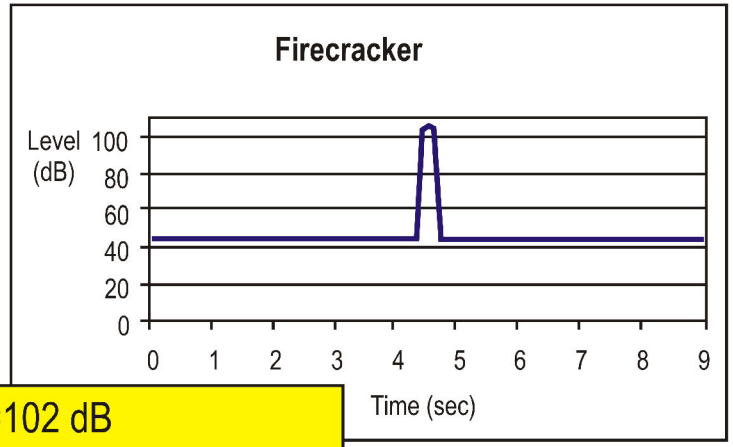
The sound exposure level, or SEL metric, provides a way of describing the total sound energy of a single event. In computing the SEL value, all sound energy occurring during the event, within 10 dB of the peak level (Lmax), is mathematically integrated over one second. (Very little information is lost by discarding the sound below the 10 dB cut-off, since the highest sound levels completely dominate the integration calculation.) Consequently, the SEL is always greater than the Lmax for events with a duration greater than one second. SELs for aircraft overflights typically range from five to 10 dB higher than the Lmax for the event.

Exhibit 3-8, *Measurement of Different Types of Sound*, shows graphs of instantaneous sound levels for three different events: an aircraft flyover, steady roadway noise, and a firecracker. The Lmax and the duration of each event differ greatly. The pop of the firecracker is quite loud, 102 dB but lasts less than a second. The aircraft flyover has a considerably lower Lmax at 90 dB, but the event lasts for over a minute. The Lmax from the roadway noise is even quieter at only 72 dB, but it lasts for 15 minutes. By considering the loudness and the duration of these very different events simultaneously, the SEL metric reveals that the total sound energy of all three is identical. This can be a critical finding for studies where total noise dosage is the focus of study. As it happens, research has shown conclusively that noise dosage is crucial in understanding the effects of noise on animals and humans.

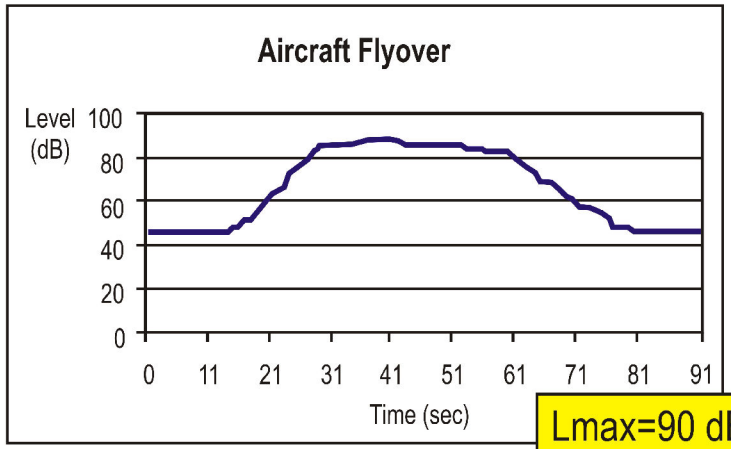
3.4.5 EQUIVALENT SOUND LEVEL (LEQ)

The equivalent sound level (Leq) metric may be used to define cumulative noise dosage, or noise exposure, over a period of time. In computing Leq, the total noise energy over a given period of time, during which numerous events may have occurred, is logarithmically averaged over the time period. The Leq represents the steady sound level that is equivalent to the varying sound levels actually occurring during the period of observation. For example, an 8-hour Leq of 67 dB indicates that the amount of sound energy in all the peaks and valleys that occurred in the 8-hour period is equivalent to the energy in a continuous sound level of 67 dB. Leq is typically computed for measurement periods of 1 hour, 8 hours, or 24 hours, although any time period can be specified.

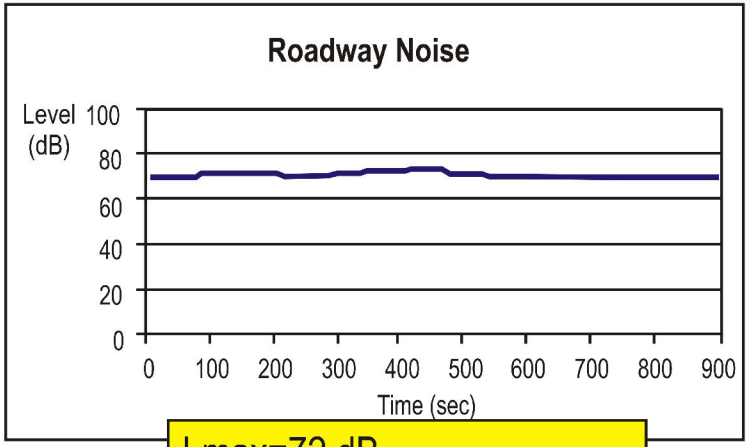
Exhibit 3-9, *Relationship Among Sound Metrics*, shows the relationship of Leq to Lmax and SEL. In this example, a single aircraft event lasting 18 seconds is represented. The instantaneous noise levels for the event range from 64 to an Lmax of 101 dBA. The area under the curve represents the sound energy accumulated during the entire event. The compression of this energy into a single second results in an SEL of 105 dBA. The Leq average of the sound energy for each second during the event would be 93 dB. If this event were the only event to occur during an hour, the aircraft sound energy for the other 3,582 seconds would be considered to be zero. When converted to an hourly LEQ, the level would be nearly 70 dB of Leq. This again indicates the dominance of loud events in noise summation and averaging computations.



Lmax=102 dB
SEL=100 dB
Leq=105
Event Duration=0.3 seconds



Lmax=90 dB
SEL=100 dB
Leq=82
Event Duration=70 seconds



Lmax=72 dB
SEL=100 dB
Leq=71
Event Duration=900 seconds

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Measurement of Different Types of Sound

Exhibit:
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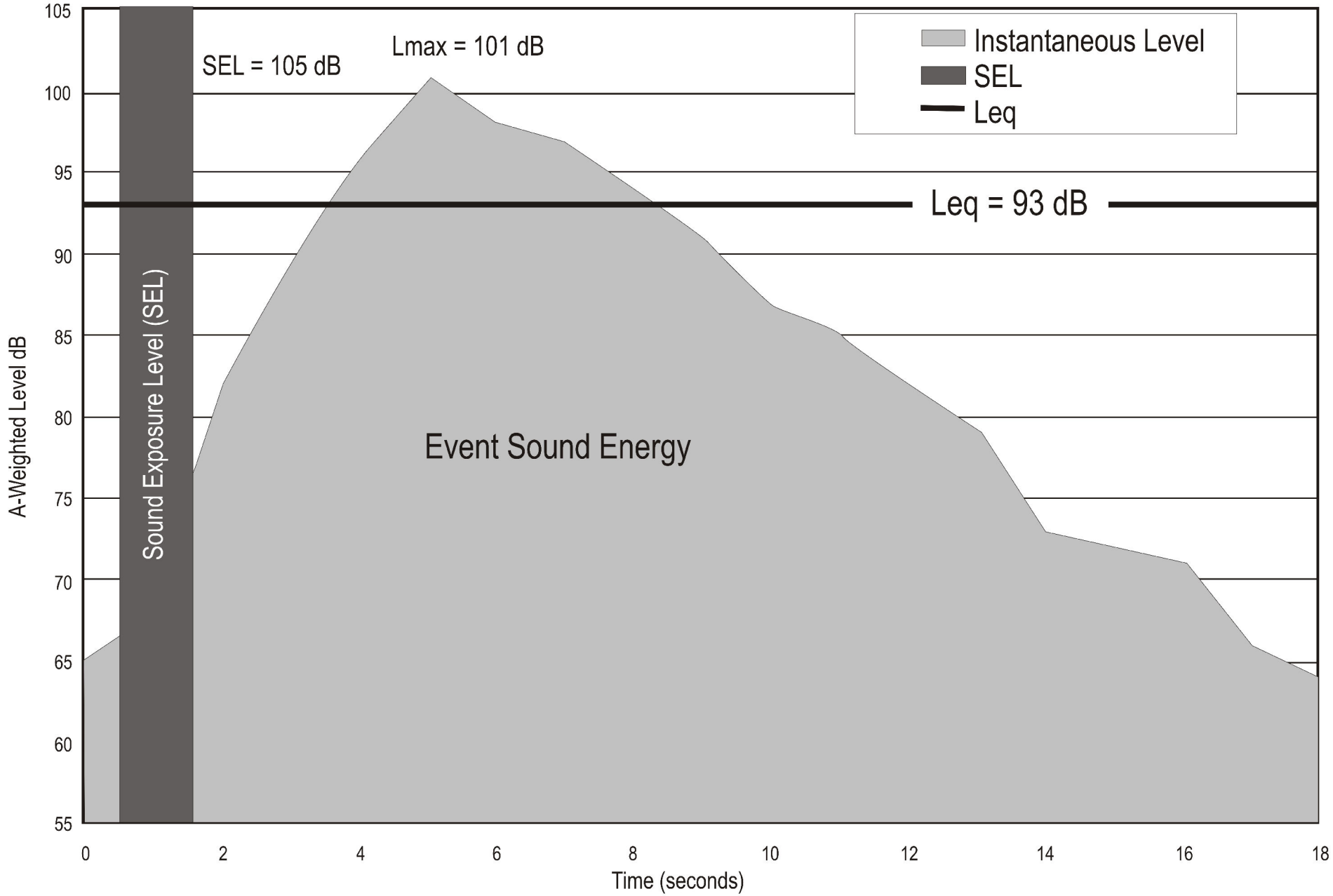

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Relationship Among Sound Metrics

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Leq is a critical noise metric for many kinds of analysis where total noise dosage, or noise exposure, is under investigation. As already noted, noise dosage is important in understanding the effects of noise on both animals and people. Indeed, research has led to the formulation of the "equal energy rule." This rule states that it is the total acoustical energy to which people are exposed that explains the effects the noise will have on them. That is, a very loud noise with a short duration will have the same effect as a lesser noise with a longer duration if they have the same total sound energy.

3.4.6 DAY-NIGHT AVERAGE SOUND LEVEL (DNL)

The Day-Night Average Sound Level (DNL) metric is really a variation of the 24-hour Leq metric. Like Leq, the DNL metric describes the total noise exposure during a given period. Unlike Leq, however, DNL, by definition, can only be applied to a 24-hour period. In computing DNL, an extra weight of 10 dB is assigned to any sound levels occurring between the hours of 10:00 p.m. and 7:00 a.m. This is intended to account for the greater annoyance that nighttime noise is presumed to cause for most people. Recalling the logarithmic nature of the dB scale, this extra weight treats one nighttime noise event as equivalent to 10 daytime events of the same magnitude.

As with Leq, DNL values are strongly influenced by the loud events. 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 occurred at night, it would yield a DNL of 75 dB.

This example can be roughly equated to an airport noise environment. Recall that an SEL is the mathematical compression of a noise event into one second. Thus, 30 SELs of 100 dB during a 24-hour period would equal DNL 65 dB, or DNL 75 dB if they occurred at night. This situation could actually occur in places around a real airport. If the area experienced 30 overflights during the day, each of which produced an SEL of 100 dB, it would be exposed to DNL 65 dB. Recalling the relationship of SEL to the peak noise level (Lmax) of an aircraft overflight, the Lmax recorded for each of those overflights (the peak level a person would actually hear) would typically range from 90 to 95 dB.

3.5 FEDERAL LAWS AND POLICIES AND RESEARCH RELATED TO NOISE

This section presents information regarding noise and land use criteria that may be useful in the evaluation of noise impacts. With respect to airports, the FAA has a long history of publishing noise and use assessment criteria. These laws and regulations provide the basis for local development of airport plans, analyses of airport impacts, and the enactment of Compatibility policies. Other agencies, including the USEPA and the Department of Defense, have developed noise and use criteria. A summary of some of the more pertinent regulations and guidelines is presented in the following paragraphs.

3.5.1 NOISE CONTROL ACT

Congress passed the Noise Control Act (42 U.S.C. §4901 et seq.) in 1972, which established a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. The act set forth the foundation for conducting research and setting guidelines to restrict noise pollution.

3.5.2 U. S. ENVIRONMENTAL PROTECTION AGENCY NOISE ASSESSMENT GUIDELINES

In response to the Noise Control Act, the USEPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* This document identifies safe levels of environmental noise exposure without consideration for economic cost for achieving these levels. In this document, 55 dB DNL is identified as the requisite level with an adequate margin of safety for residential and recreational uses. This document does not constitute USEPA regulations or standards; rather, it is intended to "provide state and local governments as well as the Federal government and the private sector with an informational point of departure for the purpose of decision-making."

3.5.3 FEDERAL AVIATION NOISE ABATEMENT POLICY

On November 18, 1976, the U.S. Department of Transportation and FAA jointly issued the Federal Aviation Noise Abatement Policy. This policy recognized aircraft noise as a major constraint on the further development of the commercial aviation established key responsibilities for addressing aircraft noise. The policy stated that the Federal Government has the authority and responsibility to regulate noise at the source by designing and managing flight procedures to limit the impact of aircraft noise on local communities; and by providing funding to airports for noise abatement planning.

3.5.4 AVIATION SAFETY AND NOISE ABATEMENT ACT OF 1979

The Aviation Safety and Noise Abatement Act of 1979 (ASNA), which is codified as 49 U.S.C. 47501-47510, set forth the foundation for the airport noise compatibility planning program outlined in 14 Code of Federal Regulations (CFR) Part 150 (see Section 3.5.8). The act established the requirements for conducting noise compatibility planning and provided assistance to and funding for which airport operators could apply to undertake such planning.

3.5.5 AIRPORT NOISE AND CAPACITY ACT OF 1990

The Airport Noise and Capacity Act (ANCA) of 1990 established two broad directives for the FAA: 1) to establish a method by which to review airport noise and access/use restrictions imposed by airport proprietors, and 2) to institute a program to phase out Stage 2 aircraft over 75,000 lbs. by December 31, 1999, as defined by 14 CFR Part 36 (see Section 3.4.4). To implement ANCA, the FAA amended 14 CFR Part 91 (see Section 3.5.5) and issued 14 CFR Part 161 (see Section 3.5.7).

3.5.6 14 CFR PART 36

Title 14, Part 36 of the CFR sets forth noise levels that are permitted for aircraft of various weights, engine number, and date of certification. Originally released in 1974 as a result of Congress' modification of the Federal Aviation Act of 1958 through the Noise Control Act of 1972, aircraft were divided into three classes, based on the amount of noise they produced at three specific noise measurement locations during certification testing. These classes (or stages) were:

Stage 1 – the oldest and loudest aircraft, typically of the first generation of jets, designed before 1974, and having measured noise levels that exceed the standards set for the other classes of aircraft. This group included many of the first generation of jet aircraft used in passenger and cargo service, including the B-707, early B-727 and B-737 aircraft, and early DC-8s. Under 14 CFR Part 91, all such aircraft weighing more than 75,000 pounds were removed from the U.S. operating fleet by 1985, unless modified to meet Stage 2 noise standards.

Stage 2 – aircraft that were type certified before November 15, 1975 that met noise levels defined by the FAA at takeoff, sideline, and approach measurement locations. The permissible amount of noise increased with the weight of the aircraft above 75,000 pounds and the number of engines. This category included many of the second-generation jet aircraft such as the B-727, B-737-200, and DC-9 that were extensively used in passenger and cargo service. Under 14 CFR Part 91, all such aircraft weighing more than 75,000 pounds were removed from the U.S. operating fleet by 2000, unless modified to meet Stage 3 noise standards.

Stage 3 – aircraft that meet the most stringent noise level requirements at takeoff, sideline, and approach measurement locations for their weight and engine number. This category includes the great majority of active business jet aircraft and all aircraft in passenger and cargo service that weigh more than 75,000 pounds.

The Committee on Aviation Environmental Protection, an International Civil Aviation Organization subcommittee, of which the U.S. is an active participant, has been debating the merits of adopting a more stringent standard for new aircraft type designs. In July 2005, the FAA, through notice in the *Federal Register*, adopted a Final Rule for Stage 4 Aircraft Noise Standards. No action had been taken by July 2013 to establish a phase out schedule for Stage 3 aircraft.

Stage 4 – all jet and transport-category airplanes with a maximum take-off weight of 12,500 pounds or more for which application of a new type design is submitted on or after January 1, 2006. The FAA's final Part 36 Stage 4 noise levels are a cumulative 10 EPNdB (effective perceived noise level in decibels) less than the current Stage 3 limits. They are based on the work of the International Civil Aviation Organization's committee on aviation environmental protection, in which the FAA and the International Business Aviation Council are active members.

All business jets are currently manufactured meet Stage 3 limits (by law), and nearly all would qualify to be recertified to meet Stage 4. Although the proposal doesn't contain a Stage 4 retrofit requirement and the FAA said it has no plans to impose such a requirement, one of the committee's recommendations called for a phase-out of Stage 3 airplanes with a maximum take-off weight of more than 75,000 pounds by 2020.

3.5.7 14 CFR PART 91

Title 14, Part 91 of the CFR as applied to noise, established schedules for phasing louder equipment out of the operating fleet of aircraft weighing more than 75,000 pounds. The schedules called for all Stage 1 aircraft over 75,000 pounds to be removed from the fleet by 1982, with the exception of two engine aircraft in small city service, which were allowed to continue in service until 1985. The schedule for the retirement of Stage 2 aircraft called for the removal of all such aircraft over 75,000 pounds by the end of 1999, with interim retirement dates of 1994, 1996, and 1998 for the removal of portions of the Stage 2 fleet.

On July 2, 2013, the FAA issued a Final Rule which prohibits the operation in the contiguous United States of jet airplanes weighing 75,000 pounds or less that do not meet Stage 3 noise levels after December 31, 2015.[8]

[8] Federal Aviation Administration, Final Rule: Adoption of Statutory Prohibition on the Operation of Jets Weighing 75,000 Pounds or Less That Are Not Stage 3 Noise Compliant, Federal Register Volume 78, Number 127 (Tuesday, July 2, 2013).

As of July 2013, no retirement schedules have been imposed for aircraft weighing less than 75,000 pounds nor has there been any indication of the imposition of a phase-out of Stage 3 aircraft.

3.5.8 14 CFR PART 150

Title 14, Part 150 of the CFR sets forth the standards under which a Part 150 Noise Compatibility Study is conducted. The background and requirements for such studies are presented in **Chapter One, *Inventory***, of this document. Notably, the preparation of a Noise Compatibility Program (NCP) under 14 CFR Part 150 is a voluntary action by an airport proprietor. The process of preparing the plan is intended to open/enhance lines of communication between the airport, its neighbors, and users. It is the only mechanism to provide for the mitigation of aircraft noise impacts on noise-sensitive surrounding areas that is not directly tied to airfield development or airspace utilization conducted subject to the rules for preparation of an Environmental Impact Statement (EIS) or Environmental Assessment (EA).

Through Fiscal Year 2011, airports receiving Federal Airport Improvement Program (AIP) grant monies as a result of approved Part 150 NCPs, completed since 1982, have received grants totaling more than $5.7 billion for the implementation of Part 150 NCP recommendations. Additionally, another $3.4 billion has been committed to noise mitigation actions funded by Passenger Facility Charges (PFCs) authorized for collection for as many as 49 years into the future at different airports.[9]

The Part 150 Program allows airport operators to voluntarily submit noise exposure maps (NEMs) and NCPs to the FAA for review and approval. An NCP sets forth the measures that an airport operator "has taken" or "has proposed" for the reduction of existing incompatible land uses and the prevention of additional incompatible land uses within the area covered by NEMs.

3.5.9 14 CFR PART 161

Title 14, Part 161 of the CFR was published in 1991, subsequent to passage of the ANCA. That act established the requirement and schedule for the phase out of Stage 2 aircraft over 75,000 pounds. In return for that action, Congress severely restricted the ability of local communities to impose actions that would restrict the aircraft access to any airport. Different levels of requirements were established for voluntary restrictions, restrictions on Stage 2 aircraft, and restrictions on Stage 3 aircraft. These requirements are applicable to all aircraft except propeller-driven aircraft weighing less than 12,500 pounds, supersonic aircraft, and Stage 1 aircraft.

3.5.9.1 Restrictive Agreements

Subpart B of 14 CFR Part 161 sets notification requirements for the implementation of Stage 3 restrictions through agreements between airport operators and all

[9] Federal Aviation Administration, AIP and PFC Funding Summary for Noise Compatibility Projects, online at: http://www.faa.gov/airports/environmental/airport_noise/part_150/funding/.

affected airport users. (Presumably, this same procedure would be followed for implementing agreements for Stage 2 restrictions.) Before going into effect, notice of these proposed agreements must be published in local newspapers of area wide circulation, posted prominently at the airport, and sent directly to all regular airport users; the FAA; Federal, state, and local agencies with land use control authority; community groups and business organizations; and any aircraft operators that are known to be interested in providing service to the airport (new entrants). After this notification period, the agreement can be implemented if all current users and any new entrants proposing to serve the airport within 180 days sign on to the proposed restriction.

STAGE 2 RESTRICTIONS

Subpart C of 14 CFR Part 161 sets forth the requirements for establishing restrictions on Stage 2 aircraft operations. It requires a study of the proposed restriction that must include:

1. an analysis of the costs and benefits of the proposed restriction;
2. a description of the alternative restrictions;
3. a description of the non-restrictive alternatives that were considered and a comparison of the costs and benefits of those alternatives to the costs and benefits of the proposed restriction.

It further requires that the study use the noise methodology and land use compatibility criteria established in 14 CFR Part 150.[10] The study must also use currently accepted economic methodology. Where restrictions on Stage 2 aircraft weighing less than 75,000 pounds are involved, the study must include separate detail on how the restriction would apply to aircraft in this class.

After completing the study, the airport operator must publish a notice of the proposed restriction and an opportunity for public comment in a newspaper of general circulation in the area, post a notice prominently in the airport; and notify the FAA, local governments, all airport tenants whose operations might be affected by the proposed restrictions, and community groups and business organizations.[11] The FAA must publish an announcement of the proposed restriction in the *Federal Register*.[12]

The required study and public notice must be completed at least 180 days before the airport operator implements the proposed restriction.[13] There is no specific provision in ANCA or Part 161 for FAA action on the airport's proposed Stage 2 restriction. In practice, the FAA has reviewed Stage 2 Part 161 Studies for completeness. No specific deadlines for this review process are set in Part 161.

[10] 14 CFR Part 161, Secs. 161.9, 161.11, and 161.205(b).
[11] 14 CFR Part 161, Sec. 161.203(b).
[12] 14 CFR Part 161, Sec. 161.203(e).
[13] 14 CFR Part 161, Sec. 161.203(a).

STAGE 3 RESTRICTIONS

Subpart D of 14 CFR Part 161 establishes the requirements that an airport operator must follow in order to implement a noise or access restriction on Stage 3 aircraft. The required analysis must include the same elements required for a proposed restriction on Stage 2 aircraft. In addition, the required Part 161 Study must demonstrate "by substantial evidence that the statutory conditions are met." These six conditions, specified in ANCA are:

- Condition 1: The restriction is reasonable, non-arbitrary, and non-discriminatory.
- Condition 2: The restriction does not create an undue burden on interstate or foreign commerce.
- Condition 3: The proposed restriction maintains safe and efficient use of the navigable airspace.
- Condition 4: The proposed restriction does not conflict with any existing Federal statute or regulation.
- Condition 5: The applicant has provided adequate opportunity for public comment on the proposed restriction.
- Condition 6: The proposed restriction does not create an undue burden on the national aviation system.[14]

The applicant must also prepare an EA or documentation supporting a categorical exclusion.[15]

After submission by an airport operator of a complete Part 161 application package, the FAA has 30 days to review it for completeness. Notice of the proposed restriction must be published by the FAA in the *Federal Register*. After reviewing the application and public comments, the FAA must issue a decision approving or disapproving the proposed restriction within 180 days after receipt of a complete application. This decision is a final decision of the FAA Administrator for purposes of judicial review.[16]

3.5.9.2 Consequences of Failing to Comply with Part 161

Subpart F of 14 CFR Part 161 describes the consequences of an airport operator's failure to comply with Part 161. The sanction provided for in Subpart F is the termination of the airport's eligibility to receive airport grant funds and to collect PFCs.[17] Most of Subpart F describes the process for notifying airport operators of apparent violations, dispute resolution, and implementation of the required sanctions.

[14] 14 CFR Part 161, Sec. 161.305(e).
[15] 14 CRF Part 161, Sec. 161.305(c).
[16] 14 CFR Part 161, Sec. 161.313(b)(2).
[17] 14 CFR Part 161, Sec. 161.501.

3.5.10 FEDERAL INTERAGENCY COMMITTEE ON NOISE

FICON was formed in 1990 to review specific elements of the assessment of airport noise impacts and to make recommendations regarding potential improvements. The FICON review focused primarily on the manner in which noise impacts are determined, including:

- whether aircraft noise impacts are fundamentally different from other transportation noise impacts;
- the manner in which noise impacts are described;
- the extent of impacts outside of DNL 65 decibels (dB) that should be reviewed in a National Environmental Policy Act (NEPA) document;
- the range of FAA-controlled mitigation options (noise abatement and flight track procedures) analyzed; and,
- the relationship of the 14 CFR Part 150 process to the NEPA process; including ramifications to the NEPA process if they are separate, and exploration of the means by which the two processes can be handled to maximize benefits.

The committee determined that there are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric. The methodology employing DNL as the noise exposure metric and appropriate dose-response relationships to determine noise impact is considered the proper one for civil and military aviation scenarios in the general vicinity of airports.

The recommended the continued use of DNL as the principle means of assessing noise impacts and encouraged agency discretion in the use of supplemental noise analysis. FICON also recommended continued research on the impact of aircraft noise, and recommended that "a standing federal interagency committee should be established to assist agencies in providing adequate forums for discussion of public and private sector proposals, identifying needed research, and in encouraging the conduct of research and development in these areas."

FEDERAL INTERAGENCY COMMITTEE ON AVIATION NOISE

The FICAN was formed in 1993 to fulfill the FICON recommendation. The following Federal agencies concerned with aviation noise, including those with policy roles, are represented on the Committee:

- Department of Defense
  - U.S. Air Force
  - U.S. Army
  - U.S. Navy

- Department of Interior
  - National Park Service
- Department of Transportation
  - Federal Aviation Administration
- Environmental Protection Agency
- National Aeronautics and Space Administration (NASA)
- Department of Housing and Urban Development

3.5.11 FEDERAL REQUIREMENTS TO USE DNL IN ENVIRONMENTAL NOISE STUDIES

DNL is the standard metric used for environmental noise analysis in the U.S. This practice originated with the USEPA's effort to comply with the Noise Control Act of 1972. The USEPA designated a task group to "consider the characterization of the impact of airport community noise and develop a community noise exposure measure."[18] The task group recommended using the DNL metric. The USEPA accepted the recommendation in 1974, based on the following considerations:

1. The measure is applicable to the evaluation of pervasive, long-term noise in various defined areas and under various conditions over long periods of time.
2. The measure correlates well with known effects of the noise environment on individuals and the public.
3. The measure is simple, practical, and accurate.
4. Measurement equipment is commercially available.
5. The metric at a given location is predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.[19]

The Schultz Curve, which is depicted in **Exhibit 3-10, *Schultz Curve***, was first published by T.J. Schultz in *Synthesis of Social Surveys on Noise Annoyance* in 1978. The curve relates specific DNL levels to the percent of people in a community whom those noise levels highly annoy. The Curve provides a widely-accepted dose-response relationship between cumulative environmental noise and annoyance. Like other Federal agencies that have established Federal land use guidelines for noise, FAA used the Schultz curve, when it designated the DNL 65 dB contour as the cumulative noise exposure level above which residential land uses are not compatible without mitigation. At DNL 65 dBA, the Schultz Curve predicts that approximately 12 percent of the population will be highly annoyed.

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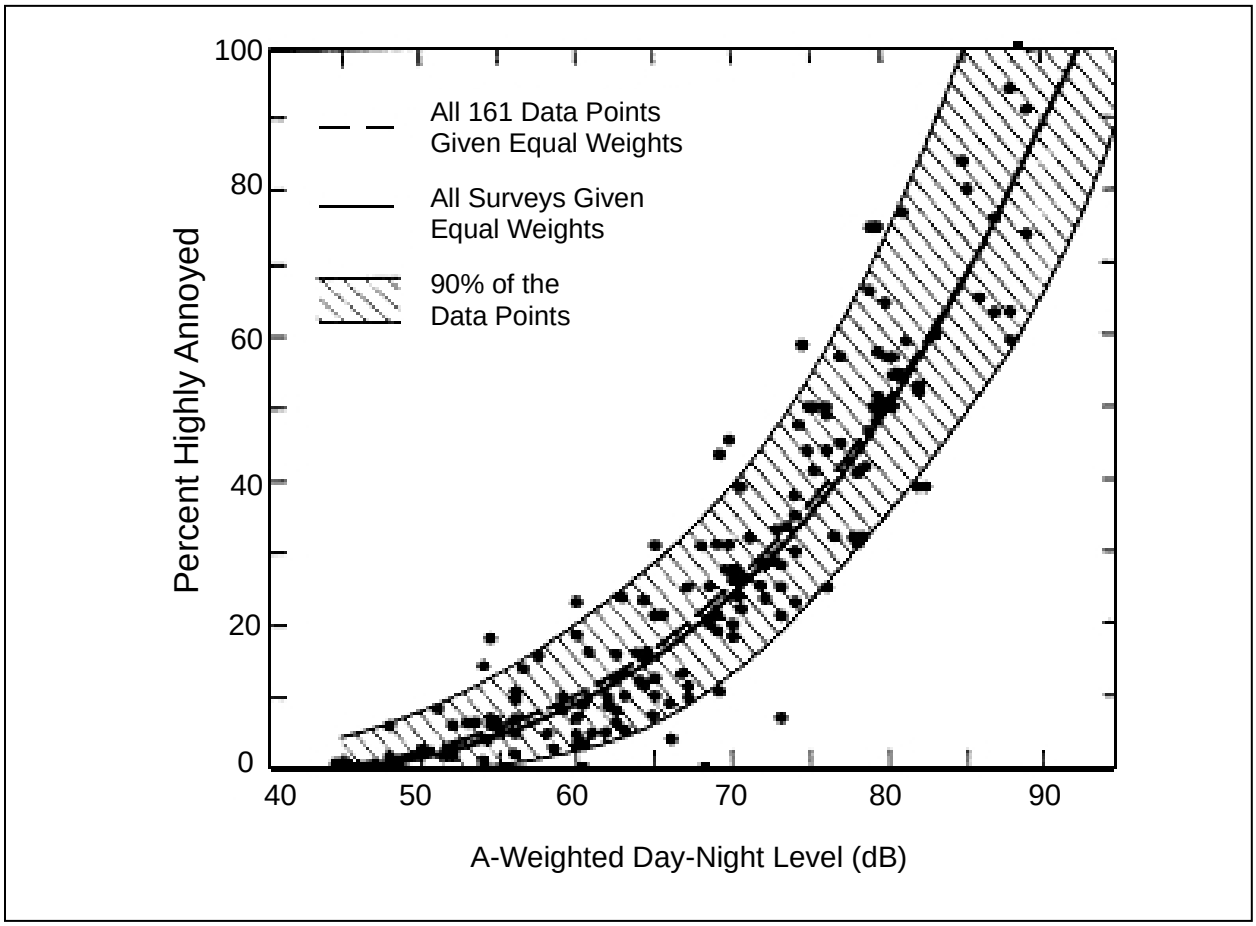
[18] *Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety.* U.S. Environmental Protection Agency, Office of Noise Abatement and Control. 1974, P. A-10.

[19] *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, Pp. A-1–A-23.

Exhibit 3-10
SCHULTZ CURVE
Seattle-Tacoma International Airport



Soon thereafter, the Department of Housing and Urban Development (HUD), Department of Defense, and the Veterans Administration adopted the use of DNL.

At about the same time, the Acoustical Society of America developed a standard (ANSI S3.23-1980) which established DNL as the preferred metric for outdoor environments. This standard was reevaluated in 1990 and they reached the same conclusions regarding the use of DNL (ANSI S12.40-1990).

In 1980, the Federal Interagency Committee on Urban Noise (FICUN) met to consolidate Federal guidance on incorporating noise considerations in local land use planning. The committee selected DNL as the best noise metric for the purpose, thus endorsing the USEPA's earlier work and making it applicable to all Federal agencies.[20]

[20] *Guidelines for Considering Noise in Land Use Planning and Control*. Federal Interagency Committee on Urban Noise (FICUN). 1980.

In response to the requirements of the ASNA Act of 1979 and the recommendations of FICUN and USEPA, the FAA established DNL in 1981 as the single metric for use in airport noise and land use compatibility planning. This decision was incorporated into the final rule implementing ASNA, 14 CFR Part 150, in 1985. Part 150 established the DNL as the noise metric for determining the exposure of individuals to aircraft noise and identified residential land uses as being normally compatible with noise levels below DNL 65 dBA.

In the early 1990s, Congress authorized the creation of a new interagency committee to study airport noise issues. The FICON was formed with membership from the USEPA, the FAA, the U.S. Air Force, the U.S. Navy, HUD, the Department of Veterans Affairs, and others. FICON concluded in its 1992 report that Federal agencies should "continue the use of the DNL metric as the principal means for describing long term noise exposure of civil and military aircraft operations."[21] FICON further concluded that there were no new sound descriptors of sufficient scientific standing to substitute for the DNL cumulative noise exposure metric.[22]

In 1993, the FAA issued its *Report to Congress on Effects of Airport Noise*. Regarding DNL, the FAA stated, "Overall, the best measure of the social, economic, and health effects of airport noise on communities is the Day-Night Average Sound Level (DNL)."[23] According to this report, DNL 65 dBA "…as a criterion of significance, and of the land use compatibility guidelines in in Part 150 is reasonable."[24]

3.6 BASELINE NOISE EXPOSURE

The purpose of this section is to present the existing conditions noise levels. This includes noise measurement data from the Sea-Tac Aircraft Noise and Operations Monitoring System (ANOMS) system and the short-term noise monitoring program that was conducted for this study.

3.6.1 NOISE MEASUREMENT PROGRAM

As part of the aircraft noise analysis conducted for the Sea-Tac Airport Part 150 Study Update, temporary noise measurements were performed at 13 sites near the Airport. Noise meters were located at different residences and churches to capture noise from aircraft operations. Measurement staff coordinated with property owners and caretakers to gain access to the backyards and roofs of the selected sites. Each site was selected relative to flight patterns, proximity to existing permanent airport noise monitors, and in response to community suggestions on places to measure aircraft noise. The data collected from the temporary noise measurement program was supplemented with data from Sea-Tac Airport's permanent noise monitors.

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[21] *Federal Agency Review of Selected Airport Noise Analysis Issues*. Federal Interagency Committee on Noise (FICON). August 1992, Pp. 3-1.

[22] *Federal Agency Review of Selected Airport Noise Analysis Issues, Technical Report, Volume 2. Federal Interagency Committee on Noise (Technical). August 1992, Pp. 2-3.*

[23] *Report to Congress on Effects of Airport Noise. Federal Aviation Administration. 1993, P. 1.*

[24] *Report to Congress on Effects of Airport Noise. Federal Aviation Administration. 1993, P. 13.*

3.6.1.1 Noise Measurement Methodology

EQUIPMENT TYPE

State of the art equipment used in this program included the Bruel & Kjaer model 2238 and the Larson Davis 824 sound level meters. These are Class I Precision Sound Level Meters (as defined by American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC)). The equipment was calibrated in compliance with manufacturer's procedures. Microphones and recording equipment are the highest quality and are capable of recording and calculating the various noise metrics. Each meter logged noise levels every second in terms of the one-second equivalent noise level, Leq.

NOISE MEASUREMENT SITES

Sites for the temporary noise measurements included single-family residences and public churches and were chosen to supplement the existing network of permanent airport noise monitors. The microphones were placed in backyards, decks, or roofs with clear line of sight to aircraft flight patterns. **Table 3-1, *Temporary Noise Measurement Sites*** lists the residences and churches where the temporary noise measurement microphones were located. **Table 3-2, *Permanent Airport Noise Monitors*** lists the locations of the airport's permanent monitors. **Exhibit 3-11, *Noise Monitoring Sites***, illustrates the locations of the temporary noise measurement sites and the nearby permanent airport noise monitors as reference.

These sites were selected based on suggestions provided at Public Information Workshops, Technical Review Committee meetings, and Highline Forum meetings; as well as consultant experience. Sites were selected to provide coverage of areas within major flight corridors that were not in close proximity to the existing permanent noise monitors. Sites were also selected to avoid community noise sources or unusual terrain characteristics, which could affect measurements.

DURATION OF MONITORING

The temporary noise monitoring was conducted for a few days at each site. The weather during the monitoring period was clear with minor precipitation. The microphone windscreen at Site M was knocked off (probably by a bird) during the third day of measurements exposing the microphone to enough moisture to affect the measurements. Both North and South air traffic flow were observed during the measurement dates. **Table 3-3, *Temporary Noise Monitoring Program Duration***, lists the dates and times of the monitoring periods at each site and the north/south air traffic flow ratio. During an average year, Sea-Tac Airport experiences North Flow approximately 35 percent of the time and South Flow about 65 percent of the time.

Table 3-1
TEMPORARY NOISE MEASUREMENT SITES
Seattle-Tacoma International Airport

SITE	ADDRESS	CITY
A	1046 S Elmgrove St	Seattle
B	12112 26th Ave SW	Burien
C	11401 10th Ave S	Burien
D	537 S 137th Pl	Burien
E	17600 Sylvester Rd SW	Burien
F	16856 Des Moines Memorial Dr	Burien
G	360 SW 178th St	Normandy Park
H	19438 Edgecliff Dr SW	Normandy Park
I	19030 8th Ave S	SeaTac
J	25617 Marine View Dr	Des Moines
K	1811 SW 152nd St	Burien
L	25722 79th Ave SW	Vashon
M	10311 SW 116th Pl	Vashon

Table 3-2
PERMANENT AIRPORT NOISE MONITORS
Seattle-Tacoma International Airport

MONITOR	LOCATION	CITY
1	Air Cargo 4 (on Sea-Tac Airport property)	SeaTac
2	South Run-up AOA (on Sea-Tac Airport property)	SeaTac
3	Maple Leaf Reservoir	Seattle
4	Magnolia Elementary School	Seattle
5	Medina Elementary School	Medina
6	Hamilton Viewpoint Park	Seattle
7	Central Area Senior Center	Seattle
8	Mercer View Community Center	Mercer Island
9	Beacon Hill Reservoir	Seattle
10	Brighton Playfield	Seattle
11	Beverly Park School	Seattle
12	2226 S 126th Street	Seattle
13	Cedarhurst Elementary School	Seattle
14	North Clear Zone	Seattle
15	Sylvester Middle School	Burien
16	Chinook Middle School	SeaTac
17	1217 S 207th Street	Des Moines
18	1205 S 226th Street	Des Moines
19	Midway Elementary School	Des Moines
20	Parkside Elementary School	Des Moines
21	Mark Twain School	Federal Way
22	Sacajewea Jr. High School	Federal Way
23	Merideth Hills Elementary	Auburn
24	Federal Way Public School	Federal Way
25	Twin Lakes Elementary School	Federal Way

Source: Port of Seattle

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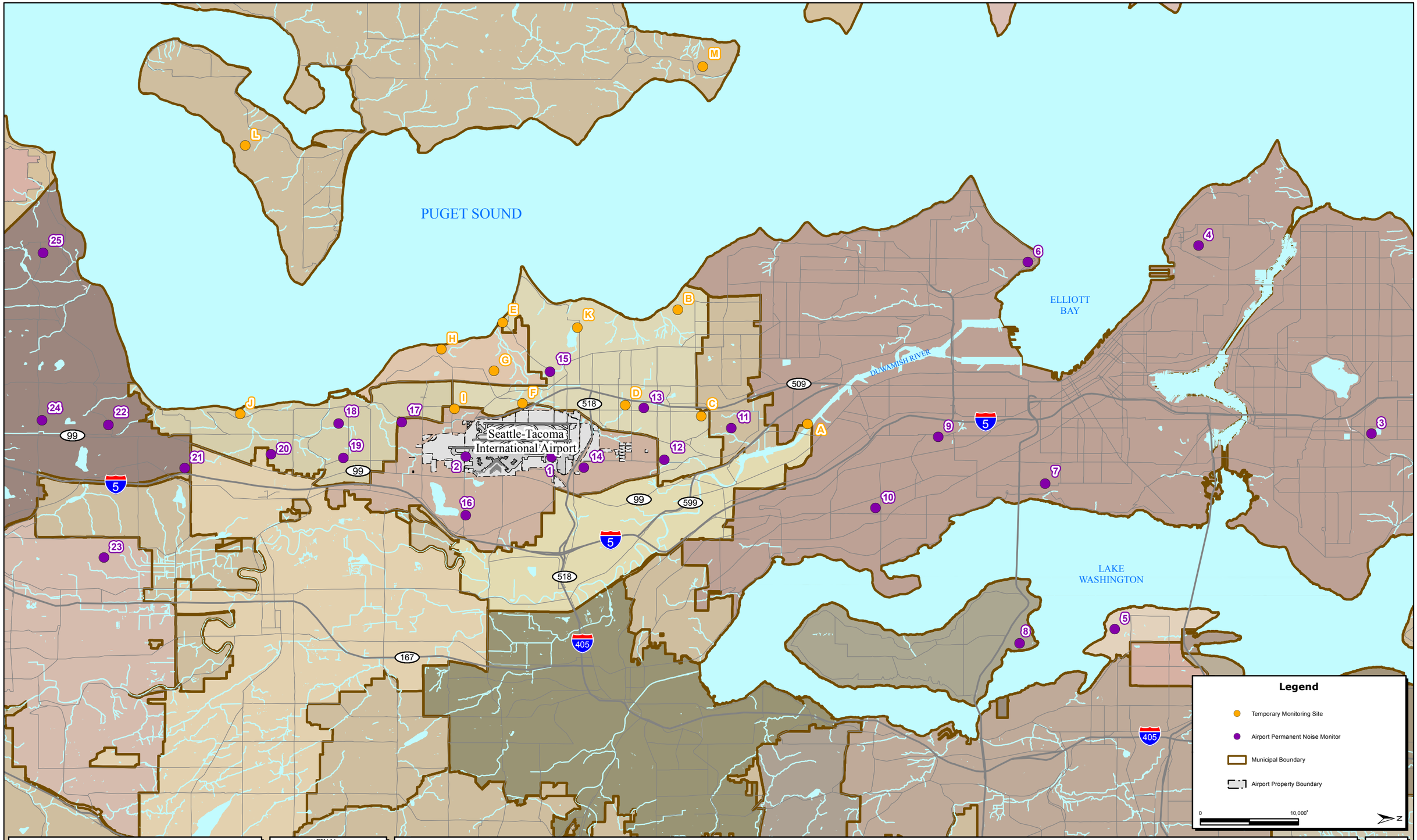

Port of Seattle
14 CFR Part 150 Study
Seattle-Tacoma International Airport

FINAL
5/30/2013 Prepared by Landrum & Brown
Filename: P:\SEA\Part 150 Update - 2009\GIS\MXD\Exhibits\Document\3-11_Noise_Monitoring_Sites.mxd

Noise Monitoring Sites

Exhibit:
3-11

Table 3-3
TEMPORARY NOISE MONITORING PROGRAM DURATION
Seattle-Tacoma International Airport

SITE	START DATE	START TIME	END DATE	END TIME	DAYS OF MONITORING	NORTH/SOUTH
A	6/28/2010	14:26:26	7/1/2010	14:24:43	3	18% / 82%
B	7/5/2010	10:56:13	7/9/2010	13:14:10	4	94% / 6%
C	7/6/2010	15:09:06	7/9/2010	12:50:17	3	99.5% / 0.5%
D	7/6/2010	9:16:27	7/9/2010	12:04:22	3	99.5% / 0.5%
E	7/2/2010	12:35:43	7/5/2010	15:36:12	3	15% / 85%
F	6/28/2010	15:06:41	7/4/2010	14:40:59	6	15% / 85%
G	6/29/2010	15:18:14	7/4/2010	15:00:43	5	18% / 82%
H	7/2/2010	11:46:19	7/5/2010	15:20:03	3	15% / 85%
I	7/6/2010	10:00:29	7/9/2010	14:13:38	3	99.5% / 0.5%
J	6/28/2010	16:19:54	7/1/2010	17:35:04	3	18% / 82%
K	7/5/2010	10:18:04	7/9/2010	11:41:51	4	94% / 6%
L	7/14/2010	10:30:00	7/22/2010	6:45:00	8	28% / 72%
M	9/16/2010	11:30:00	9/19/2010	12:30:00	3	14% / 86%

Source: Landrum & Brown, 2013.

METHODS FOR NOISE EVENT CORRELATION

Measured noise events were matched with specific aircraft operations using the following two-step method:

1. Once data was downloaded, noise levels greater than 60 dB for duration longer that three seconds were identified as individual noise events.
2. Using the flight data from the airport noise and operations monitoring system, noise events that occurred while aircraft flew within 1.9 nm (4 nm at Site I) from the measurement site were correlated and classified as aircraft noise events. The airport's permanent monitors use a similar correlation distance setting.

Although this method provided positive identification of aircraft operations and highly accurate correlation with measured noise events, some community noise (e.g. cars, lawnmowers, animals) and aircraft noise occurred simultaneously and correlated as aircraft noise events. Unfortunately, there is currently no technology to separate aircraft noise levels from simultaneous non-aircraft noise levels.

3.6.1.2 Noise Measurement Results

Noise level readings were used to characterize the noise environment at each location and to distinguish the various noise levels associated with individual aircraft operations. The results of the noise measurement program are summarized in **Table 3-4, *Summary of Noise Measurement Program Results***, and discussed in the following sections.

Table 3-4
SUMMARY OF NOISE MEASUREMENT PROGRAM RESULTS
Seattle-Tacoma International Airport

SITE	AIRCRAFT DNL	COMMUNITY (NON-AIRCRAFT) DNL	AMBIENT NOISE LEVEL (L_{50})	NUMBER OF AIRCRAFT EVENTS	LOUDEST AIRCRAFT EVENT (LMAX)	LOUDEST AIRCRAFT
A	62.6	62.1	53.6	1,003	88.7	DeHavilland Dash 8D
B	39.4	56.1	42.9	12	81.3	Embraer 120
C	62.6	60.1	54.9	1,042	86.7	McDonnell Douglas MD80
D	59.7	60.0	54.3	1,028	83.5	McDonnell Douglas MD80
E	36.4	61.5	40.9	4	72.9	DeHavilland Dash 8D
F	35.8	61.0	50.4	36	75.0	Boeing 737-400
G	30.9*	51.7	38.0	7	71.1	Unknown Aircraft
H	35.5	60.8	42.6	27	76.9	Airbus A332
I	64.4	63.4	55.9	2,191	84.2	McDonnell Douglas MD80
J	61.1	57.1	47.4	615	83.5	McDonnell Douglas MD80
K	33.9	52.3	43.4	13	70.0	Boeing 737-800
L	39.0	**	*	43	73.9	Unknown Aircraft
M	42.2	65.7***	54.9	63	73.6	Unknown Aircraft

Notes:
* Site G had a limited number of noise event-to-aircraft correlations due to the small difference between aircraft noise and ambient noise levels.
** Site L measurements had computer problems that prevented the storage of noise levels not part of a distinct noise event and therefore the community noise levels were not recorded. Note that aircraft noise event data were recorded for 8 days of measurements appropriately allowing the aircraft DNL to be measured correctly. Note that at this site there were many overflights that did not trigger a noise event because the noise event did not cause noise levels to exceed the noise event threshold. The noise event threshold varied by time of day from 50 to 64 dBA.
*** Site M community noise levels were measured high due to the predominance of rain that occurred sporadically, and sometimes heavily, throughout the measurement period. Raindrops impacting the home roof and spa cover, and road traffic on wet pavement caused background noise levels to be higher than the ambient would have been had it not been raining. During dry periods, ambient levels as low as 30 dBA were recorded. However, the sound level meter had a lower measurement limit of 30 dBA. So during some periods, the measurement site was quieter than 30 dBA, a very low noise level. Note that at this site there were some overflights that did not trigger a noise event because the noise event did not cause noise levels to exceed the noise event threshold, which was set at 60 dBA.

Source: Landrum & Brown, 2013.

AIRCRAFT NOISE

The noise measurement process was designed to capture the noise levels of a representative mix of aircraft operations near the measurement sites that includes various general aviation, commuter, and air carrier operations from Sea-Tac Airport, Boeing Field, and transient aircraft operations from other airports. Aircraft from other airports aside from Sea-Tac Airport were included in this study to capture the noise impact from all aircraft operations at each measurement site. At each site, the majority of aircraft noise events were operations to or from Sea-Tac Airport.

CUMULATIVE NOISE LEVEL RESULTS

The noise measurement data were used to compute DNL for each temporary site. An aircraft only and community (non-aircraft) DNL were calculated for each site. The aircraft DNL was calculated from all one-second data that was recorded at each temporary site during an aircraft noise event. The community DNL was computed from all one-second data that were recorded at each temporary site when there were no aircraft noise events. These DNL values of a few days of measurements should not be compared to an annual average DNL value because different aircraft types and runway utilization are used to calculate the annual average DNL. The results are shown below.

AIRCRAFT SINGLE EVENT MAXIMUM NOISE LEVEL RESULTS

Individual aircraft noise events were measured using the Lmax. The Lmax was recorded for each type of aircraft operation at measurement sites. The loudest aircraft event recorded at each site is shown in Table 3-4. The loudest recorded aircraft noise events in which the aircraft type was not identified by the airport ANOMS is identified in this table as 'unknown aircraft'. Aircraft operations that are not identified by the system are usually made by General Aviation propeller aircraft.

AMBIENT NOISE LEVELS

The data collected during the measurement program can be summarized as a noise environment in terms of the noise level exceeded 10 percent, 50 percent, and 90 percent of the time and designated as L_{10}, L_{50}, L_{90}, respectively. The L_{10} is the noise level exceeded 10 percent of the time and represents the typical peak noise level. The L_{50} is the median noise level. L_{90} is the noise level exceeded 90 percent of the time. The L_{90} is a good approximation of the background noise level, i.e., the noise level that would occur in the absence of identifiable noise events. **Table 3-5, *Ambient Noise Levels at Temporary Noise Monitoring Sites*** lists the L_{10}, L_{50}, and L_{90} levels at each measurement site.

Table 3-5
AMBIENT NOISE LEVELS AT TEMPORARY NOISE MONITORING SITES
Seattle-Tacoma International Airport

SITE	L_{10} (DB)	L_{50} (DB)	L_{90} (DB)
A	63.4	53.6	49.6
B	53.6	42.9	30.9
C	63.0	54.9	48.6
D	60.6	54.3	47.2
E	48.8	40.9	33.3
F	55.3	50.4	42.2
G	45.1	38.0	29.7
H	51.7	42.6	29.9
I	64.1	55.9	50.6
J	60.7	47.4	32.6
K	49.7	43.4	36.5
L	*	*	*
M	62.9	54.9	35.3

Source: Landrum & Brown, 2013.

3.6.2 BASELINE NOISE EXPOSURE

This section discussed the methodology and results of the analysis of existing and future noise exposure. The noise analysis presents the noise exposure for the existing conditions base year (2013) and the current and potential noise levels in 2018 (five years from the base year). Aircraft-related noise exposure is defined through noise contours prepared using the FAA's Integrated Noise Model (INM). This noise exposure is presented using the DNL metric.

The impact of noise exposure patterns on the surrounding communities and the numbers of persons and housing units that fall within the noise exposure contour are discussed in **Chapter Four, *Land Use Analysis***.

3.6.2.1 Noise Modeling Methodology

The same noise metrics and noise model was used to compute all noise contours and other evaluations prepared for the Part 150 Study Update for Sea-Tac Airport.

NOISE METRICS

The FAA has stipulated that noise exposure maps prepared for Part 150 studies will be based on the annual DNL. The DNL metric was used to prepare all noise exposure contours for this study. Noise exposure contours were prepared at levels of 65, 70, and 75 DNL for this study.

An analysis using supplemental noise metrics was also prepared for informational purposes; however, per Federal regulations, supplemental metrics cannot be used to justify noise abatement measures. Information regarding this supplemental noise analysis is included in **Appendix F, *Supplemental Noise Analysis***.

NOISE MODEL

The noise levels were computed during this study using Version 7.0b of the INM, which was the latest version of the model at the time the study was initiated. The INM was developed under the guidance of the FAA and is the only model generally approved by the FAA for use in Part 150 studies. The noise pattern calculated by the INM for an airport is a function of several factors, including; the number of aircraft operations during the period evaluated, the types of aircraft flown, the time of day when they are flown, the way they are flown, how frequently each runway is used for landing and takeoff, and the routes of flight used to and from the runways. Substantial variations in any one of these factors may, when extended over a long period of time, cause marked changes to the noise pattern.

NUMBER OF OPERATIONS AND FLEET MIX

The Existing Baseline noise exposure contour is labeled 2013, per 14 CFR Part 150 guidelines which stipulate that the existing year be the same year in which the study is submitted to the FAA. The number of operations included in the Existing (2013) Baseline noise exposure contour is based on ANOMS radar data collected from June 2011 through May 2012, the most recent data that was available when the noise modeling began. During that period, 313,352 total annual operations occurred at Sea-Tac Airport, which results in 858.12 average-annual day operations. Specific aircraft types and times of operation were also obtained from the 2011 to 2012 ANOMS data. **Table 3-6, *Distribution of Average Day Operations by Aircraft Type Existing (2013) Baseline***, provides a summary of the average daily operations and fleet mix at Sea-Tac Airport, organized by aircraft category, operation type, and time of day.

Per 14 CFR Part 150 requirements, the future NEMs are to be dated five years after the date of submission. Therefore, the future year NEMs are dated 2018. To represent Future (2018) condition, aircraft fleet mix data was developed from the Forecast of Aviation Activity prepared for this Part 150 Study. The forecast is based upon aviation industry trends and specific airline activity at Sea-Tac Airport. More information about this forecast is included in **Chapter Two, *Forecast***, of this document. The Future (2018) condition includes 385,270 annual operations or 1,055.53 average-annual day operations, an increase of 15.1 percent from the Existing (2013) Baseline operating levels. **Table 3-7, *Distribution of Average Day Operations by Aircraft Type Future (2018) Baseline***, provides a summary of the average daily operations and fleet mix at Sea-Tac Airport, organized by aircraft type, operation type, and time of day for Future (2018) conditions.

Table 3-6
DISTRIBUTION OF AVERAGE DAY OPERATIONS BY AIRCRAFT TYPE
EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

AIRCRAFT TYPE	INM TYPE	ARRIVALS		DEPARTURES		TOTAL
		DAY	NIGHT	DAY	NIGHT	
LARGE JETS						
Boeing 737-300	737300	10.57	1.44	11.16	0.84	24.01
Boeing 737-400	737400	20.69	3.65	21.66	2.68	48.68
Boeing 737-500	737500	0.81	0.05	0.80	0.04	1.70
Boeing 737-700	737700	44.95	5.56	45.45	5.05	101.00
Boeing 737-800	737800	88.67	18.16	89.73	17.09	213.66
Boeing 747-400	747400	2.87	0.72	2.57	1.00	7.15
Boeing 757-300	757300	2.09	1.03	2.84	0.28	6.24
Boeing 757-200	757PW	17.23	3.78	14.49	6.51	42.01
Boeing 767-300	767300	4.12	2.98	5.96	1.14	14.19
Boeing 777-200	777200	1.93	0.04	1.95	0.02	3.94
Boeing 777-300	777300	0.24	0.00	0.00	0.24	0.47
Airbus A300-622R	A300-622R	0.67	0.45	1.08	0.04	2.24
Airbus A300B4-203	A300B4-203	0.10	0.07	0.17	0.00	0.34
Airbus A319	A319-131	5.48	1.20	5.94	0.73	13.36
Airbus A320-211	A320-211	27.15	5.17	25.20	7.11	64.63
Airbus A321-232	A321-232	1.54	0.12	1.06	0.60	3.31
Airbus A330-301	A330-301	1.10	0.00	1.09	0.01	2.20
Airbus A330-343	A330-343	3.70	0.11	3.81	0.00	7.63
Airbus A340-200	A340-211	0.41	0.00	0.42	0.00	0.83
Douglas DC10-10	DC1010	0.75	0.26	0.30	0.70	2.01
McDonnell Douglas MD-11	MD11GE	1.00	1.12	1.51	0.62	4.24
McDonnell Douglas MD-83	MD83	3.36	0.10	3.42	0.03	6.92
McDonnell Douglas MD-90	MD9028	0.15	0.04	0.15	0.05	0.39
Sub-Total		*239.58*	*46.07*	*240.75*	*44.78*	*571.18*
REGIONAL JETS						
Bombardier CRJ900	CRJ9-ER	11.32	0.98	10.95	1.35	24.61
Sub-Total		*11.32*	*0.98*	*10.95*	*1.35*	24.61

Table 3-6, *Continued*
DISTRIBUTION OF AVERAGE DAY OPERATIONS BY AIRCRAFT TYPE
EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

AIRCRAFT TYPE	INM TYPE	ARRIVALS		DEPARTURES		TOTAL
		DAY	NIGHT	DAY	NIGHT	
BUSINESS JETS						
Twin Engine Regional Jet	CIT3	0.08	0.01	0.08	0.01	0.18
Twin Engine Regional Jet	CL600	0.52	0.03	0.46	0.08	1.09
Twin Engine Regional Jet	CL601	1.78	0.07	1.83	0.02	3.71
Twin Engine Regional Jet	CNA500	0.11	0.01	0.11	0.01	0.24
Twin Engine Regional Jet	CNA750	0.15	0.00	0.14	0.01	0.31
Twin Engine Regional Jet	GV	1.71	0.17	1.73	0.15	3.76
Twin Engine Regional Jet	HS1258	0.21	0.02	0.21	0.02	0.47
Twin Engine Regional Jet	LEAR35	0.21	0.03	0.22	0.02	0.48
Twin Engine Regional Jet	MU3001	0.40	0.03	0.40	0.04	0.87
Sub-Total		*5.18*	*0.37*	*5.19*	*0.37*	*11.10*
TURBOPROPS						
Avions de Transport Regional ATR-42	ATR42	0.43	0.00	0.38	0.06	0.87
Avions de Transport Regional ATR-72	ATR72	0.45	0.00	0.38	0.07	0.90
Commuter Prop	CNA441	0.20	0.01	0.19	0.03	0.42
Commuter Prop	DHC8	0.15	0.00	0.13	0.02	0.30
Commuter Prop	DHC830	96.06	11.87	96.06	11.87	215.87
Embraer 120 Commuter Prop	EMB120	7.48	0.92	7.90	0.50	16.82
Commuter Prop	SD330	0.07	0.00	0.07	0.00	0.15
Sub-Total		*104.84*	*12.81*	*105.12*	*12.55*	*235.33*
GENERAL AVIATION PROPS						
GA Prop	CNA172	0.13	0.01	0.14	0.01	0.29
GA Prop	CNA208	2.53	0.00	2.41	0.13	5.07
GA Prop	PA31	0.17	0.00	0.14	0.04	0.35
GA Prop	GASEPF	4.51	0.50	4.46	0.55	10.02
GA Prop	GASEPV	0.09	0.00	0.09	0.00	0.18
Sub-Total		*7.43*	*0.51*	*7.24*	*0.72*	*15.90*
Grand Total		**368.36**	**60.74**	**369.25**	**59.77**	**858.12**

Note: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.

Source: Seattle-Tacoma International Airport ANOMS Data, 2011-2012; Landrum & Brown, 2013.

Table 3-7
DISTRIBUTION OF AVERAGE DAY OPERATIONS BY AIRCRAFT TYPE
FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

AIRCRAFT TYPE	INM TYPE	ARRIVALS		DEPARTURES		TOTAL
		DAY	NIGHT	DAY	NIGHT	
LARGE JETS						
Boeing 737-300	737300	2.88	0.39	3.03	0.23	6.53
Boeing 737	737QN	0.00	0.00	0.00	0.00	0.01
Boeing 737-400	737400	4.23	0.75	4.43	0.55	9.95
Boeing 737-700	737700	61.41	7.59	62.10	6.90	137.99
Boeing 737-800	737800	138.26	28.32	139.92	26.65	333.15
Boeing 747-200	747200	0.26	0.07	0.22	0.09	0.64
Boeing 747-400	747400	5.52	1.38	4.96	1.93	13.79
Boeing 757-200	757RR	0.28	0.06	0.23	0.10	0.68
Boeing 757-300	757300	6.69	3.30	9.09	0.90	19.97
Boeing 767-300	767300	2.80	2.03	4.06	0.77	9.67
Boeing 777-200	777200	3.47	0.07	3.50	0.04	7.07
Boeing 777-300	777300	0.53	0.00	0.01	0.53	1.06
Airbus A300B4-203	A300B4-203	0.51	0.38	0.90	0.00	1.79
Airbus A319	A319-131	12.18	2.67	13.22	1.63	29.70
Airbus A320-211	A320-211	14.88	2.83	13.82	3.90	35.43
Airbus A320-232	A320-232	32.36	6.16	30.05	8.48	77.05
Airbus A321-232	A321-232	3.55	0.27	2.44	1.37	7.64
Airbus A330-301	A330-301	2.40	0.00	2.37	0.02	4.79
Airbus A330-343	A330-343	4.04	0.13	4.16	0.00	8.33
Airbus A340-200	A340-211	0.30	0.00	0.31	0.00	0.61
Douglas DC10-10	DC1010	2.16	0.76	0.87	2.04	5.83
McDonnell Douglas MD-11	MD11PW	0.43	0.48	0.64	0.26	1.81
Sub-Total		*299.14*	*57.64*	*300.31*	*56.38*	*713.48*
REGIONAL JETS						
Bombardier CRJ900	CRJ9-ER	21.89	1.90	21.17	2.62	47.58
Sub-Total		*21.89*	*1.90*	*21.17*	*2.62*	*47.58*

Table 3-7, *Continued*
DISTRIBUTION OF AVERAGE DAY OPERATIONS BY AIRCRAFT TYPE
FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

AIRCRAFT TYPE	INM TYPE	ARRIVALS		DEPARTURES		TOTAL
		DAY	NIGHT	DAY	NIGHT	
BUSINESS JETS						
Twin Engine Regional Jet	CNA500	0.09	0.01	0.09	0.01	0.19
Twin Engine Regional Jet	CNA750	0.18	0.00	0.17	0.02	0.37
Twin Engine Regional Jet	GIV	0.09	0.01	0.09	0.01	0.20
Twin Engine Regional Jet	GV	5.83	0.58	5.89	0.51	12.81
Twin Engine Regional Jet	IA1125	0.21	0.03	0.22	0.02	0.48
Twin Engine Regional Jet	LEAR35	0.37	0.05	0.38	0.04	0.84
Twin Engine Regional Jet	MU3001	0.61	0.05	0.60	0.06	1.32
Twin Engine Regional Jet	CIT3	0.10	0.01	0.10	0.01	0.22
Twin Engine Regional Jet	CL600	0.58	0.03	0.52	0.09	1.22
Twin Engine Regional Jet	CL601	2.95	0.12	3.04	0.03	6.14
Sub-Total		*11.01*	*0.88*	*11.10*	*0.80*	*23.79*
COMMUTER PROPS						
Avions de Transport Regional ATR-42	ATR42	0.28	0.00	0.25	0.04	0.56
Avions de Transport Regional ATR-72	ATR72	0.14	0.00	0.12	0.02	0.27
Commuter Prop	DHC830	110.78	13.69	110.78	13.69	248.94
Commuter Prop	CNA441	5.50	0.02	4.99	0.68	11.18
Sub-Total		*116.69*	*13.72*	*116.13*	*14.43*	*260.96*
GENERAL AVIATION PROPS						
GA Prop	CNA172	0.34	0.00	0.34	0.02	0.70
GA Prop	CNA208	4.34	0.00	4.13	0.22	8.69
GA Prop	PA31	0.17	0.00	0.14	0.03	0.34
Sub-Total		*4.85*	*0.00*	*4.61*	*0.27*	*9.73*
Grand Total		**453.57**	**74.14**	**453.32**	**74.50**	**1,055.53**

Note: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
Source: Forecast of Aviation Activity, Landrum & Brown, 2013.

COMPARABILITY OF CONDITIONS

Total operations used in the modeling of the Existing (2013) Baseline condition are based on actual operating levels for June 2011 through May 2012, which was the most recent data available at the time noise modeling began. This data included the number of arrival and departure operations by individual types of aircraft during daytime and nighttime periods, the distribution of aircraft activities among the runway ends, and the distribution of aircraft along the flight paths leading to or from each runway.

There were 313,352 total annual operations at Sea-Tac Airport from June 2011 through May 2012. The FAA's Terminal Area Forecast (TAF), issued in January 2012, projects annual operations in Fiscal Year 2013 to be approximately 321,942. This represents a difference of less that 2.7 percent. Generally, a difference of less than ten percent between modeled and forecasted operating levels is considered within the range of an acceptable tolerance. Therefore, the aircraft operating levels modeled for the Existing (2013) Baseline conditions is substantially representative of 2013 conditions.

No significant runway closures or other events occurred during the period from June 2011 through May 2012 that would cause runway use patterns to differ from normal conditions. Therefore, runway use modeled for the Existing (2013) Baseline is substantially representative of actual 2013 conditions.

The total annual operations modeled for the Future (2018) Baseline is based on the forecast of aviation activity prepared for this Part 150 Study (see Chapter Two). This forecast projected 385,270 annual operations at Sea-Tac in 2018. The 2011 TAF projects 358,432 total operations at Sea-Tac in Fiscal Year 2018, which represents a difference of approximately seven percent. Generally, a difference of less than ten percent between modeled and forecasted operating levels is considered within the range of an acceptable tolerance. Therefore, the aircraft operating levels modeled for the Future (2018) Baseline conditions is within an acceptable range of tolerance with the 2011 TAF.

RUNWAY END UTILIZATION

Average-annual day runway end utilization was derived from ANOMS data from June 2011 through May 2012. **Table 3-8, *Runway End Utilization – Existing (2013) Baseline***, summarizes the percentage of use by each aircraft category on each of the runways at Sea-Tac Airport during the daytime (7:00 a.m.–9:59 p.m.) and nighttime (10:00 p.m.–6:59 a.m.) periods.

The airport primarily operates in a south flow configuration due to the prevailing winds. When the airport operates in this configuration, aircraft arrive from the north, landing on Runways 16L, 16C, and 16R; and depart to the south, taking off from Runways 16C, 16L, and to a lesser extent Runway 16R. A review of ANOMS data from June 2011 through May 2012 shows that Sea-Tac Airport operated in south flow configuration approximately 77.5 percent of the time.

When in a north flow configuration, aircraft arrive from the south, landing on Runways 34L, 34C, and 34R, and depart to the north, taking off on Runways 34C, 34R, and, to a lesser extent, 34L. A review of ANOMS data from June 2011 through May 2012, shows that Sea-Tac Airport operated in north flow configuration approximately 22.5 percent of the time. Therefore, runway use percentages modeled for the Existing (2013) Baseline noise exposure contour reflect this average-annual runway use pattern.

When in north flow, aircraft are permitted to conduct departures on Runway 34R from the intersection at Taxiway Q when Sea-Tac Airport is operating in a north flow configuration. When performing this maneuver, aircraft begin their take-off roll from the intersection of Runway 34R and Taxiway Q. Approximately nine percent of departures from Runway 34R, excluding heavy jets, are conducted from the Taxiway Q intersection.

Table 3-8
RUNWAY END UTILIZATION – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

DAYTIME ARRIVALS						
AIRCRAFT CATEGORY	**16C**	**16L**	**16R**	**34C**	**34L**	**34R**
Large Jets	32.4%	13.3%	31.4%	10.2%	7.1%	5.5%
Regional Jets	38.4%	4.3%	34.5%	12.0%	8.3%	2.5%
Business Jets	24.2%	9.5%	42.1%	9.0%	11.7%	3.5%
Turboprops	37.5%	7.6%	32.5%	11.4%	7.9%	3.1%
General Aviation Props	27.1%	19.1%	35.1%	5.3%	10.5%	2.9%
DAYTIME DEPARTURES						
AIRCRAFT CATEGORY	**16C**	**16L**	**16R**	**34C**	**34L**	**34R**
Large Jets	13.6%	63.7%	0.0%	6.3%	0.1%	16.3%
Regional Jets	16.7%	60.7%	0.1%	7.2%	0.0%	15.4%
Business Jets	17.4%	48.0%	9.8%	8.8%	4.9%	11.2%
Turboprops	14.4%	62.2%	1.1%	8.9%	1.1%	12.3%
General Aviation Props	9.7%	54.1%	6.0%	8.0%	3.8%	18.5%
NIGHTTIME ARRIVALS						
AIRCRAFT CATEGORY	**16C**	**16L**	**16R**	**34C**	**34L**	**34R**
Large Jets	50.4%	22.5%	5.1%	12.1%	1.0%	8.9%
Regional Jets	52.3%	18.1%	6.9%	13.8%	2.6%	6.3%
Business Jets	41.6%	20.2%	15.4%	10.6%	3.3%	9.0%
Turboprops	60.6%	12.3%	9.6%	12.1%	1.1%	4.4%
General Aviation Props	56.4%	27.9%	3.5%	3.0%	3.3%	5.9%
NIGHTTIME DEPARTURES						
AIRCRAFT CATEGORY	**16C**	**16L**	**16R**	**34C**	**34L**	**34R**
Large Jets	1.8%	77.6%	0.0%	2.2%	0.0%	18.4%
Regional Jets	3.4%	78.5%	0.0%	2.7%	0.0%	15.4%
Business Jets	13.0%	37.7%	22.9%	3.8%	3.8%	18.9%
Turboprops	6.1%	69.8%	1.3%	6.7%	1.1%	15.0%
General Aviation Props	6.1%	62.4%	4.7%	4.2%	0.4%	22.2%

Note: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.

Source: Seattle-Tacoma International Airport ANOMS Data, 2011-2012 Landrum & Brown, 2013.

Runway use is in part determined by wind conditions and can vary from year to year. While ANOMS data from June 2011 through May 2012, shows that the ratio of north flow to south flow operations at Sea-Tac Airport was approximately 22.5 percent to 77.5 percent. Historically, Sea-Tac Airport has operated in north flow approximately 35 percent of the time and in south flow approximately 65 percent of the time.[25] In the future, average-annual day runway end utilization at Sea-Tac Airport is expected to remain similar to these historic conditions. Therefore, unlike the Existing (2013) Baseline, runway use patterns that were modeled for the Future (2018) Baseline noise exposure contour match this historic runway use pattern rather than conditions from June 2011 through May 2012. The runway use percentages that were modeled for the Future (2018) Baseline are shown in **Table 3-9, *Runway End Utilization – Future (2018) Baseline***.

Table 3-9
RUNWAY END UTILIZATION – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

DAYTIME ARRIVALS						
AIRCRAFT CATEGORY	**16C**	**16L**	**16R**	**34C**	**34L**	**34R**
Large Jets	21.0%	20.0%	23.0%	11.0%	11.0%	14.0%
Regional Jets	23.7%	17.4%	24.9%	12.7%	9.9%	11.4%
Business Jets	14.3%	7.4%	41.2%	6.2%	23.6%	7.4%
Turboprops	25.1%	16.8%	23.7%	12.2%	11.7%	10.5%
General Aviation Props	27.0%	19.0%	12.0%	18.0%	15.0%	9.0%
DAYTIME DEPARTURES						
AIRCRAFT CATEGORY	**16C**	**16L**	**16R**	**34C**	**34L**	**34R**
Large Jets	20.0%	46.0%	0.0%	17.0%	0.0%	17.0%
Regional Jets	23.9%	41.7%	0.0%	18.0%	0.1%	16.3%
Business Jets	26.2%	22.1%	15.1%	27.3%	4.0%	5.3%
Turboprops	19.0%	43.5%	1.0%	18.7%	2.3%	15.5%
General Aviation Props	14.0%	11.0%	0.0%	27.0%	0.0%	48.0%
NIGHTTIME ARRIVALS						
AIRCRAFT CATEGORY	**16C**	**16L**	**16R**	**34C**	**34L**	**34R**
Large Jets	51.0%	10.0%	2.0%	28.0%	1.0%	8.0%
Regional Jets	56.3%	8.3%	0.9%	25.0%	0.0%	9.5%
Business Jets	66.9%	0.0%	33.1%	0.0%	0.0%	0.0%
Turboprops	56.5%	7.6%	5.3%	25.0%	0.5%	5.1%
General Aviation Props	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NIGHTTIME DEPARTURES						
AIRCRAFT CATEGORY	**16C**	**16L**	**16R**	**34C**	**34L**	**34R**
Large Jets	1.0%	64.0%	0.0%	5.0%	0.0%	30.0%
Regional Jets	1.4%	71.2%	0.0%	8.7%	0.0%	18.7%
Business Jets	52.0%	13.0%	0.0%	35.0%	0.0%	0.0%
Turboprops	9.5%	56.6%	0.4%	7.4%	1.3%	24.8%
General Aviation Props	25.0%	75.0%	0.0%	0.0%	0.0%	0.0%

Note: Day = 7:00 a.m. to 9:59 p.m., Night = 10:00 p.m. to 6:59 a.m.
Source: Seattle-Tacoma International Airport ANOMS Data, 2011-2012; Landrum & Brown, 2013.

[25] This historic runway use pattern is based on a review of data over the past ten years.

FLIGHT TRACKS

There are two components to flight tracks used for noise modeling, flight track definition/location and percentage of use. Flight track definition and percent utilization was based on ANOMS radar data from calendar year 2009 and verified with data from June 2011 through May 2012. **Exhibit 3-12, *INM Flight Tracks – North Flow***, depicts the north flow INM flight tracks that were modeled for the Existing (2013) Baseline noise exposure contour. **Exhibit 3-13, *INM Flight Tracks – South Flow***, depicts the south flow INM flight tracks that were modeled for the Existing (2013) Baseline noise exposure contour. **Table 3-10, *INM Arrival Flight Tracks – Existing (2013) Baseline***, shows the INM flight track distribution percentages for arrival flight tracks; and **Table 3-11, *INM Departure Flight Tracks – Existing (2013) Baseline***, shows the INM flight track distribution percentages for departure flight tracks that were modeled for the Existing (2013) Baseline.

Flight track locations are expected to remain the same for the Future (2018) Baseline condition as shown on Exhibit 3-12 and 3-13. Flight track distribution percentages expected to remain similar to existing conditions, with minor variation due to a slight variation in fleet mix. **Table 3-12, *INM Arrival Flight Tracks – Future (2018) Baseline***, shows the INM flight track distribution percentages for arrival flight tracks; and **Table 3-13, *INM Departure Flight Tracks – Future (2018) Baseline***, shows the INM flight track distribution percentages for departure flight tracks that were modeled for the Future (2018) Baseline.

Concurrent with this Part 150 Study, the FAA conducted the Greener Skies Over Seattle initiative that will add new arrival procedures at Sea-Tac Airport, expanding the use of Optimized Profile Descents, Area Navigation (RNAV) arrivals and Required Navigation Performance (RNP) approaches. These new procedures are expected to modify arrival flight tracks and procedures. With regard to future runway utilizations, because wind and weather conditions are largely responsible for the direction of traffic flow and are not expected to shift in future years, and because the Proposed Action includes new flight procedures to each of the six runway ends, change in runway use is expected to occur due to implementation of the Greener Skies Over Seattle Initiative.[26] Furthermore, any changes to flight track location are expected to occur outside the Study Area for this Part 150 study; therefore, no changes to flight tracks or runway use are expected that would affect the DNL 65 dBA of the Future (2018) NEM.

[26] Federal Aviation Administration, Final Environmental Assessment for Proposed Arrival Procedures to Seattle-Tacoma International Airport, Chapter Six, Environmental Consequences, Section 6.1 Noise, November 1, 2012.

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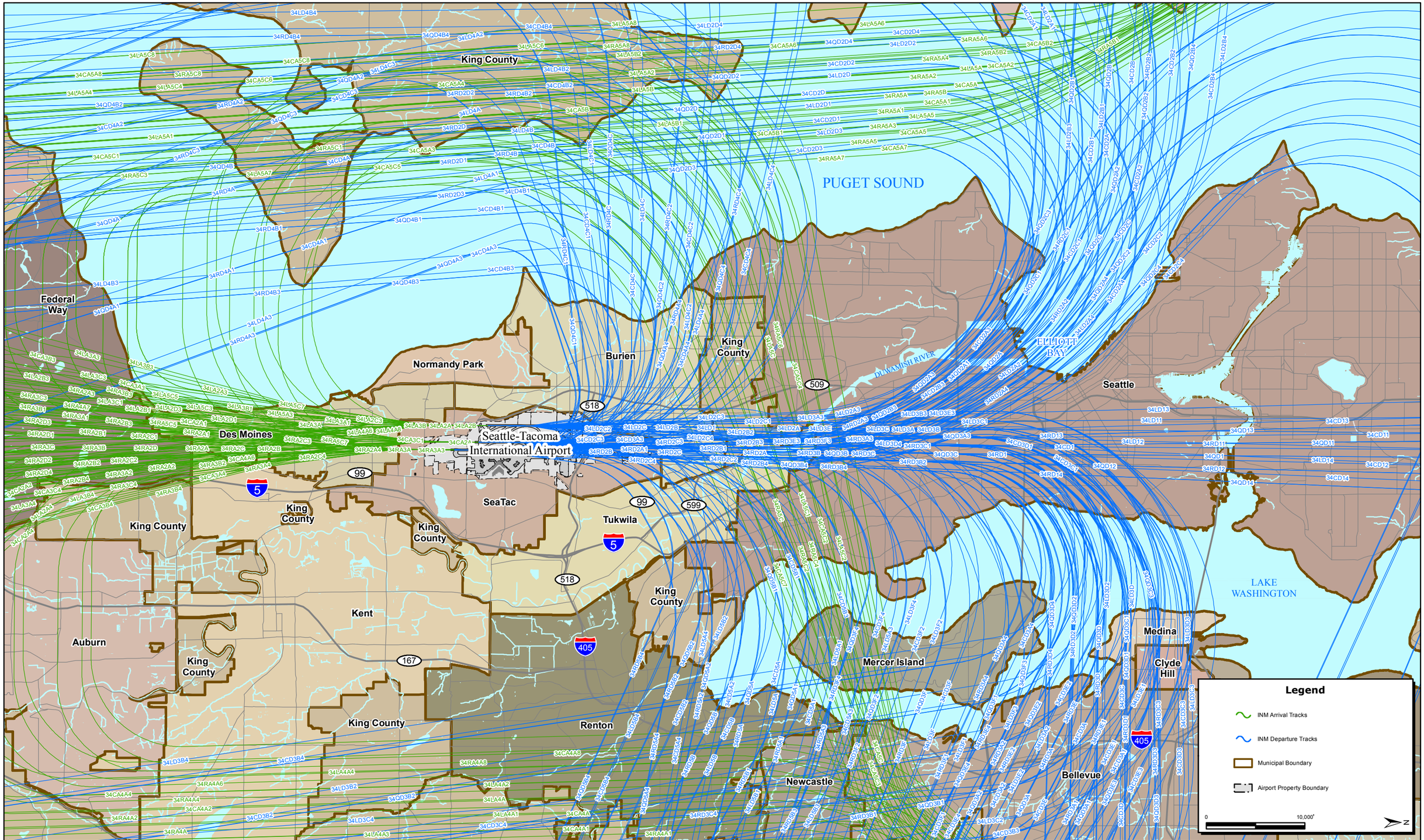


Port of Seattle

14 CFR Part 150 Study

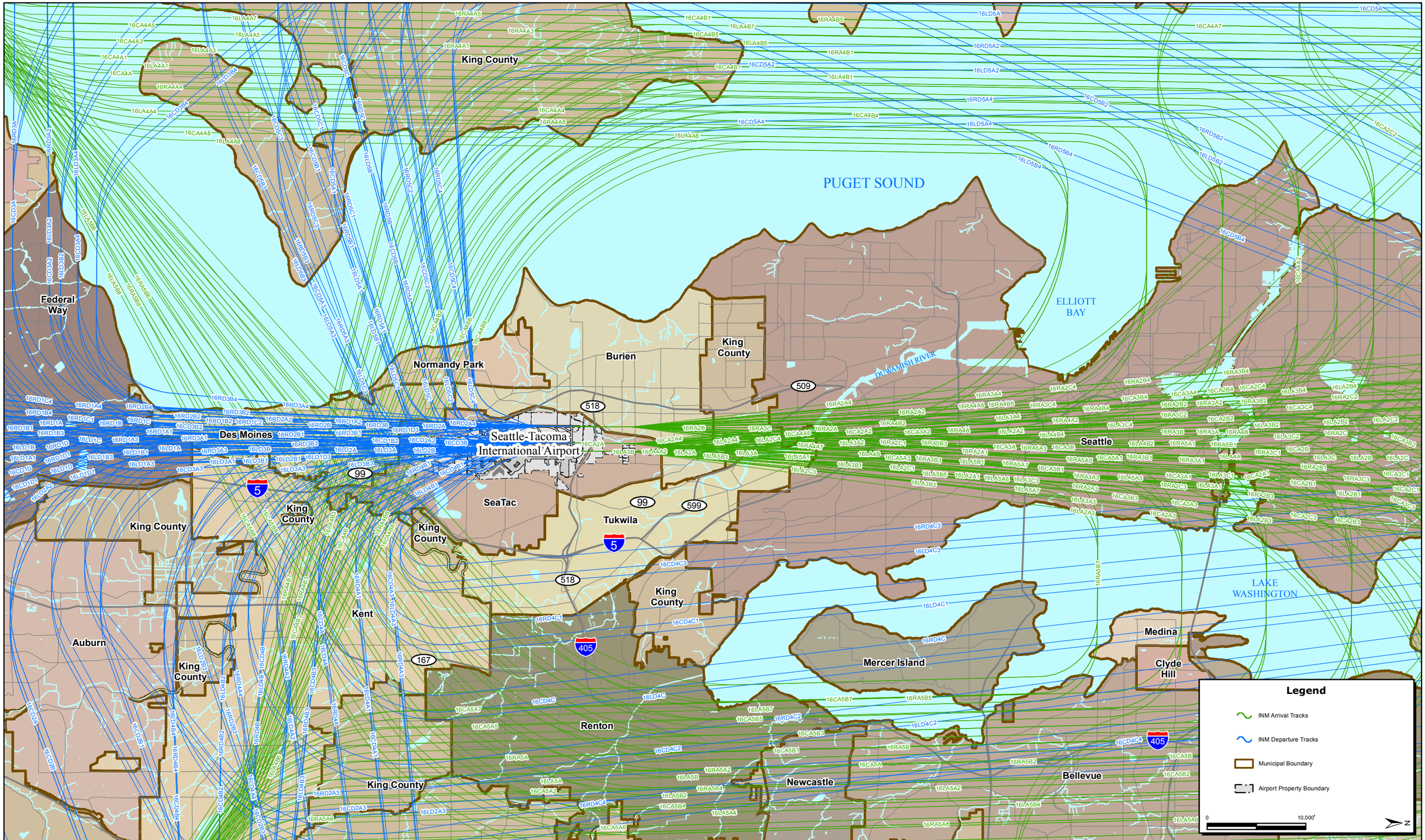
Seattle-Tacoma International Airport

FINAL

5/30/2013 Prepared by Landrum & Brown
Filename: P:\SEA\Part 150 Update - 2009\GIS\MXD\Exhibits\Document\3-12_North Flow Tracks.mxd

INM Flight Tracks - North Flow

Exhibit:
3-12



Port of Seattle
14 CFR Part 150 Study
Seattle-Tacoma International Airport

FINAL
5/30/2013 Prepared by Landrum & Brown
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INM Flight Tracks - South Flow

Exhibit:
3-13

Table 3-10
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16C	16CA2A	1.36%	1.52%	0.99%	1.55%	1.12%
16C	16CA2A1	0.86%	0.96%	0.62%	0.98%	0.71%
16C	16CA2A2	0.86%	0.96%	0.62%	0.98%	0.71%
16C	16CA2A3	0.22%	0.25%	0.16%	0.25%	0.18%
16C	16CA2A4	0.22%	0.25%	0.16%	0.25%	0.18%
16C	16CA2B	0.27%	0.30%	0.19%	0.31%	0.22%
16C	16CA2B1	0.17%	0.19%	0.12%	0.20%	0.14%
16C	16CA2B2	0.17%	0.19%	0.12%	0.20%	0.14%
16C	16CA2B3	0.04%	0.05%	0.03%	0.05%	0.04%
16C	16CA2B4	0.04%	0.05%	0.03%	0.05%	0.04%
16C	16CA2C	0.14%	0.15%	0.09%	0.15%	0.11%
16C	16CA2C1	0.09%	0.10%	0.06%	0.10%	0.07%
16C	16CA2C2	0.09%	0.10%	0.06%	0.10%	0.07%
16C	16CA2C3	0.02%	0.02%	0.01%	0.03%	0.02%
16C	16CA2C4	0.02%	0.02%	0.01%	0.03%	0.02%
16C	16CA3A	2.05%	2.29%	1.48%	2.32%	1.68%
16C	16CA3A1	1.29%	1.45%	0.93%	1.46%	1.06%
16C	16CA3A2	1.29%	1.45%	0.93%	1.46%	1.06%
16C	16CA3A3	0.33%	0.37%	0.24%	0.38%	0.27%
16C	16CA3A4	0.33%	0.37%	0.24%	0.38%	0.27%
16C	16CA3B	1.64%	1.83%	1.18%	1.85%	1.34%
16C	16CA3B1	1.04%	1.16%	0.75%	1.17%	0.85%
16C	16CA3B2	1.04%	1.16%	0.75%	1.17%	0.85%
16C	16CA3B3	0.27%	0.30%	0.19%	0.30%	0.22%
16C	16CA3B4	0.27%	0.30%	0.19%	0.30%	0.22%
16C	16CA3C	0.41%	0.46%	0.29%	0.46%	0.34%
16C	16CA3C1	0.26%	0.29%	0.18%	0.29%	0.21%
16C	16CA3C2	0.26%	0.29%	0.18%	0.29%	0.21%
16C	16CA3C3	0.07%	0.07%	0.04%	0.08%	0.05%
16C	16CA3C4	0.07%	0.07%	0.04%	0.08%	0.05%
16C	16CA4A	2.35%	2.63%	1.70%	2.67%	1.93%
16C	16CA4A1	2.03%	2.26%	1.46%	2.29%	1.66%
16C	16CA4A2	2.03%	2.26%	1.46%	2.29%	1.66%
16C	16CA4A3	1.28%	1.43%	0.93%	1.45%	1.05%
16C	16CA4A4	1.28%	1.43%	0.93%	1.45%	1.05%
16C	16CA4A5	0.60%	0.68%	0.43%	0.68%	0.50%
16C	16CA4A6	0.60%	0.68%	0.43%	0.68%	0.50%
16C	16CA4A7	0.21%	0.24%	0.15%	0.24%	0.17%
16C	16CA4A8	0.21%	0.24%	0.15%	0.24%	0.17%
16C	16CA4B	0.08%	0.09%	0.05%	0.09%	0.06%
16C	16CA4B1	0.07%	0.08%	0.04%	0.08%	0.05%
16C	16CA4B2	0.07%	0.08%	0.04%	0.08%	0.05%
16C	16CA4B3	0.04%	0.05%	0.03%	0.05%	0.03%
16C	16CA4B4	0.04%	0.05%	0.03%	0.05%	0.03%

Table 3-10, *Continued*
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16C	16CA4B5	0.02%	0.02%	0.01%	0.02%	0.02%
16C	16CA4B6	0.02%	0.02%	0.01%	0.02%	0.02%
16C	16CA4B7	0.01%	0.01%	0.00%	0.01%	0.00%
16C	16CA4B8	0.01%	0.01%	0.00%	0.01%	0.00%
16C	16CA5A	1.96%	2.19%	1.42%	2.22%	1.61%
16C	16CA5A1	1.69%	1.89%	1.22%	1.91%	1.38%
16C	16CA5A2	1.69%	1.89%	1.22%	1.91%	1.38%
16C	16CA5A3	1.07%	1.19%	0.77%	1.21%	0.88%
16C	16CA5A4	1.07%	1.19%	0.77%	1.21%	0.88%
16C	16CA5A5	0.50%	0.56%	0.36%	0.57%	0.41%
16C	16CA5A6	0.50%	0.56%	0.36%	0.57%	0.41%
16C	16CA5A7	0.18%	0.20%	0.12%	0.20%	0.14%
16C	16CA5A8	0.18%	0.20%	0.12%	0.20%	0.14%
16C	16CA5B	0.08%	0.09%	0.05%	0.09%	0.06%
16C	16CA5B1	0.07%	0.08%	0.04%	0.08%	0.05%
16C	16CA5B2	0.07%	0.08%	0.04%	0.08%	0.05%
16C	16CA5B3	0.04%	0.05%	0.03%	0.05%	0.03%
16C	16CA5B4	0.04%	0.05%	0.03%	0.05%	0.03%
16C	16CA5B5	0.02%	0.02%	0.01%	0.02%	0.02%
16C	16CA5B6	0.02%	0.02%	0.01%	0.02%	0.02%
16C	16CA5B7	0.01%	0.01%	0.00%	0.01%	0.00%
16C	16CA5B8	0.01%	0.01%	0.00%	0.01%	0.00%
16L	16LA2A	0.57%	0.21%	0.40%	0.31%	0.76%
16L	16LA2A1	0.36%	0.13%	0.25%	0.20%	0.48%
16L	16LA2A2	0.36%	0.13%	0.25%	0.20%	0.48%
16L	16LA2A3	0.09%	0.03%	0.06%	0.05%	0.12%
16L	16LA2A4	0.09%	0.03%	0.06%	0.05%	0.12%
16L	16LA2B	0.11%	0.04%	0.08%	0.06%	0.15%
16L	16LA2B1	0.07%	0.03%	0.05%	0.04%	0.10%
16L	16LA2B2	0.07%	0.03%	0.05%	0.04%	0.10%
16L	16LA2B3	0.02%	0.01%	0.01%	0.01%	0.02%
16L	16LA2B4	0.02%	0.01%	0.01%	0.01%	0.02%
16L	16LA2C	0.06%	0.02%	0.04%	0.03%	0.07%
16L	16LA2C1	0.04%	0.01%	0.02%	0.02%	0.05%
16L	16LA2C2	0.04%	0.01%	0.02%	0.02%	0.05%
16L	16LA2C3	0.01%	0.00%	0.01%	0.01%	0.01%
16L	16LA2C4	0.01%	0.00%	0.01%	0.01%	0.01%
16L	16LA3A	0.86%	0.31%	0.60%	0.47%	1.14%
16L	16LA3A1	0.54%	0.20%	0.38%	0.30%	0.72%
16L	16LA3A2	0.54%	0.20%	0.38%	0.30%	0.72%
16L	16LA3A3	0.14%	0.05%	0.09%	0.08%	0.19%
16L	16LA3A4	0.14%	0.05%	0.09%	0.08%	0.19%
16L	16LA3B	0.68%	0.25%	0.48%	0.37%	0.91%
16L	16LA3B1	0.43%	0.16%	0.30%	0.24%	0.58%

Table 3-10, *Continued*
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16L	16LA3B2	0.43%	0.16%	0.30%	0.24%	0.58%
16L	16LA3B3	0.11%	0.04%	0.08%	0.06%	0.15%
16L	16LA3B4	0.11%	0.04%	0.08%	0.06%	0.15%
16L	16LA3C	0.17%	0.06%	0.12%	0.09%	0.23%
16L	16LA3C1	0.11%	0.04%	0.07%	0.06%	0.14%
16L	16LA3C2	0.11%	0.04%	0.07%	0.06%	0.14%
16L	16LA3C3	0.03%	0.01%	0.02%	0.02%	0.04%
16L	16LA3C4	0.03%	0.01%	0.02%	0.02%	0.04%
16L	16LA4A	0.98%	0.36%	0.69%	0.54%	1.31%
16L	16LA4A1	0.85%	0.31%	0.60%	0.46%	1.13%
16L	16LA4A2	0.85%	0.31%	0.60%	0.46%	1.13%
16L	16LA4A3	0.54%	0.20%	0.38%	0.29%	0.71%
16L	16LA4A4	0.54%	0.20%	0.38%	0.29%	0.71%
16L	16LA4A5	0.25%	0.09%	0.17%	0.14%	0.34%
16L	16LA4A6	0.25%	0.09%	0.17%	0.14%	0.34%
16L	16LA4A7	0.09%	0.03%	0.06%	0.05%	0.12%
16L	16LA4A8	0.09%	0.03%	0.06%	0.05%	0.12%
16L	16LA4B	0.03%	0.01%	0.02%	0.02%	0.04%
16L	16LA4B1	0.03%	0.01%	0.02%	0.02%	0.04%
16L	16LA4B2	0.03%	0.01%	0.02%	0.02%	0.04%
16L	16LA4B3	0.02%	0.01%	0.01%	0.01%	0.02%
16L	16LA4B4	0.02%	0.01%	0.01%	0.01%	0.02%
16L	16LA4B5	0.01%	0.00%	0.00%	0.00%	0.01%
16L	16LA4B6	0.01%	0.00%	0.00%	0.00%	0.01%
16L	16LA4B7	0.00%	0.00%	0.00%	0.00%	0.00%
16L	16LA4B8	0.00%	0.00%	0.00%	0.00%	0.00%
16L	16LA5A	0.82%	0.30%	0.58%	0.45%	1.09%
16L	16LA5A1	0.71%	0.26%	0.50%	0.39%	0.94%
16L	16LA5A2	0.71%	0.26%	0.50%	0.39%	0.94%
16L	16LA5A3	0.45%	0.16%	0.31%	0.24%	0.60%
16L	16LA5A4	0.45%	0.16%	0.31%	0.24%	0.60%
16L	16LA5A5	0.21%	0.08%	0.14%	0.12%	0.28%
16L	16LA5A6	0.21%	0.08%	0.14%	0.12%	0.28%
16L	16LA5A7	0.07%	0.03%	0.05%	0.04%	0.10%
16L	16LA5A8	0.07%	0.03%	0.05%	0.04%	0.10%
16L	16LA5B	0.03%	0.01%	0.02%	0.02%	0.04%
16L	16LA5B1	0.03%	0.01%	0.02%	0.02%	0.04%
16L	16LA5B2	0.03%	0.01%	0.02%	0.02%	0.04%
16L	16LA5B3	0.02%	0.01%	0.01%	0.01%	0.02%
16L	16LA5B4	0.02%	0.01%	0.01%	0.01%	0.02%
16L	16LA5B5	0.01%	0.00%	0.00%	0.00%	0.01%
16L	16LA5B6	0.01%	0.00%	0.00%	0.00%	0.01%
16L	16LA5B7	0.00%	0.00%	0.00%	0.00%	0.00%
16L	16LA5B8	0.00%	0.00%	0.00%	0.00%	0.00%

Table 3-10, *Continued*
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16R	16RA2A	1.05%	1.25%	1.56%	1.16%	1.28%
16R	16RA2A1	0.66%	0.79%	0.99%	0.73%	0.81%
16R	16RA2A2	0.66%	0.79%	0.99%	0.73%	0.81%
16R	16RA2A3	0.17%	0.20%	0.25%	0.19%	0.21%
16R	16RA2A4	0.17%	0.20%	0.25%	0.19%	0.21%
16R	16RA2B	0.21%	0.25%	0.31%	0.23%	0.26%
16R	16RA2B1	0.13%	0.16%	0.20%	0.15%	0.16%
16R	16RA2B2	0.13%	0.16%	0.20%	0.15%	0.16%
16R	16RA2B3	0.03%	0.04%	0.05%	0.04%	0.04%
16R	16RA2B4	0.03%	0.04%	0.05%	0.04%	0.04%
16R	16RA2C	0.10%	0.12%	0.16%	0.12%	0.13%
16R	16RA2C1	0.07%	0.08%	0.10%	0.07%	0.08%
16R	16RA2C2	0.07%	0.08%	0.10%	0.07%	0.08%
16R	16RA2C3	0.02%	0.02%	0.02%	0.02%	0.02%
16R	16RA2C4	0.02%	0.02%	0.02%	0.02%	0.02%
16R	16RA3A	1.57%	1.87%	2.34%	1.74%	1.92%
16R	16RA3A1	0.99%	1.18%	1.48%	1.10%	1.21%
16R	16RA3A2	0.99%	1.18%	1.48%	1.10%	1.21%
16R	16RA3A3	0.26%	0.31%	0.38%	0.28%	0.31%
16R	16RA3A4	0.26%	0.31%	0.38%	0.28%	0.31%
16R	16RA3B	1.26%	1.50%	1.87%	1.39%	1.53%
16R	16RA3B1	0.79%	0.95%	1.18%	0.88%	0.97%
16R	16RA3B2	0.79%	0.95%	1.18%	0.88%	0.97%
16R	16RA3B3	0.21%	0.24%	0.31%	0.23%	0.25%
16R	16RA3B4	0.21%	0.24%	0.31%	0.23%	0.25%
16R	16RA3C	0.31%	0.37%	0.47%	0.35%	0.38%
16R	16RA3C1	0.20%	0.24%	0.30%	0.22%	0.24%
16R	16RA3C2	0.20%	0.24%	0.30%	0.22%	0.24%
16R	16RA3C3	0.05%	0.06%	0.08%	0.06%	0.06%
16R	16RA3C4	0.05%	0.06%	0.08%	0.06%	0.06%
16R	16RA4A	1.81%	2.15%	2.69%	2.00%	2.21%
16R	16RA4A1	1.56%	1.85%	2.31%	1.72%	1.90%
16R	16RA4A2	1.56%	1.85%	2.31%	1.72%	1.90%
16R	16RA4A3	0.99%	1.17%	1.47%	1.09%	1.20%
16R	16RA4A4	0.99%	1.17%	1.47%	1.09%	1.20%
16R	16RA4A5	0.46%	0.55%	0.69%	0.51%	0.57%
16R	16RA4A6	0.46%	0.55%	0.69%	0.51%	0.57%
16R	16RA4A7	0.16%	0.19%	0.24%	0.18%	0.20%
16R	16RA4A8	0.16%	0.19%	0.24%	0.18%	0.20%
16R	16RA4B	0.06%	0.07%	0.09%	0.07%	0.07%
16R	16RA4B1	0.05%	0.06%	0.08%	0.06%	0.06%
16R	16RA4B2	0.05%	0.06%	0.08%	0.06%	0.06%
16R	16RA4B3	0.03%	0.04%	0.05%	0.04%	0.04%
16R	16RA4B4	0.03%	0.04%	0.05%	0.04%	0.04%

Table 3-10, *Continued*
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16R	16RA4B5	0.02%	0.02%	0.02%	0.02%	0.02%
16R	16RA4B6	0.02%	0.02%	0.02%	0.02%	0.02%
16R	16RA4B7	0.01%	0.01%	0.00%	0.01%	0.01%
16R	16RA4B8	0.01%	0.01%	0.00%	0.01%	0.01%
16R	16RA5A	1.51%	1.79%	2.24%	1.67%	1.84%
16R	16RA5A1	1.30%	1.54%	1.93%	1.43%	1.58%
16R	16RA5A2	1.30%	1.54%	1.93%	1.43%	1.58%
16R	16RA5A3	0.82%	0.98%	1.22%	0.91%	1.00%
16R	16RA5A4	0.82%	0.98%	1.22%	0.91%	1.00%
16R	16RA5A5	0.39%	0.46%	0.58%	0.43%	0.47%
16R	16RA5A6	0.39%	0.46%	0.58%	0.43%	0.47%
16R	16RA5A7	0.14%	0.16%	0.20%	0.15%	0.16%
16R	16RA5A8	0.14%	0.16%	0.20%	0.15%	0.16%
16R	16RA5B	0.06%	0.07%	0.09%	0.07%	0.07%
16R	16RA5B1	0.05%	0.06%	0.08%	0.06%	0.06%
16R	16RA5B2	0.05%	0.06%	0.08%	0.06%	0.06%
16R	16RA5B3	0.03%	0.04%	0.05%	0.04%	0.04%
16R	16RA5B4	0.03%	0.04%	0.05%	0.04%	0.04%
16R	16RA5B5	0.02%	0.02%	0.02%	0.02%	0.02%
16R	16RA5B6	0.02%	0.02%	0.02%	0.02%	0.02%
16R	16RA5B7	0.01%	0.01%	0.00%	0.01%	0.01%
16R	16RA5B8	0.01%	0.01%	0.00%	0.01%	0.01%
34C	34CA2A	0.33%	0.38%	0.28%	0.35%	0.16%
34C	34CA2A1	0.21%	0.24%	0.18%	0.22%	0.10%
34C	34CA2A2	0.21%	0.24%	0.18%	0.22%	0.10%
34C	34CA2A3	0.05%	0.06%	0.04%	0.06%	0.03%
34C	34CA2A4	0.05%	0.06%	0.04%	0.06%	0.03%
34C	34CA2B	0.28%	0.33%	0.25%	0.31%	0.14%
34C	34CA2B1	0.18%	0.21%	0.15%	0.20%	0.09%
34C	34CA2B2	0.18%	0.21%	0.15%	0.20%	0.09%
34C	34CA2B3	0.05%	0.05%	0.04%	0.05%	0.02%
34C	34CA2B4	0.05%	0.05%	0.04%	0.05%	0.02%
34C	34CA2C	0.08%	0.09%	0.07%	0.09%	0.04%
34C	34CA2C1	0.05%	0.06%	0.04%	0.06%	0.02%
34C	34CA2C2	0.05%	0.06%	0.04%	0.06%	0.02%
34C	34CA2C3	0.01%	0.02%	0.01%	0.01%	0.00%
34C	34CA2C4	0.01%	0.02%	0.01%	0.01%	0.00%
34C	34CA2D	0.28%	0.33%	0.25%	0.31%	0.14%
34C	34CA2D1	0.18%	0.21%	0.15%	0.20%	0.09%
34C	34CA2D2	0.18%	0.21%	0.15%	0.20%	0.09%
34C	34CA2D3	0.05%	0.05%	0.04%	0.05%	0.02%
34C	34CA2D4	0.05%	0.05%	0.04%	0.05%	0.02%
34C	34CA3A	0.73%	0.85%	0.64%	0.80%	0.36%
34C	34CA3A1	0.46%	0.53%	0.40%	0.50%	0.23%

Table 3-10, *Continued*
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34C	34CA3A2	0.46%	0.53%	0.40%	0.50%	0.23%
34C	34CA3A3	0.12%	0.14%	0.10%	0.13%	0.06%
34C	34CA3A4	0.12%	0.14%	0.10%	0.13%	0.06%
34C	34CA3B	0.69%	0.80%	0.60%	0.75%	0.34%
34C	34CA3B1	0.44%	0.50%	0.38%	0.48%	0.21%
34C	34CA3B2	0.44%	0.50%	0.38%	0.48%	0.21%
34C	34CA3B3	0.11%	0.13%	0.10%	0.12%	0.06%
34C	34CA3B4	0.11%	0.13%	0.10%	0.12%	0.06%
34C	34CA3C	0.08%	0.09%	0.07%	0.09%	0.04%
34C	34CA3C1	0.05%	0.06%	0.04%	0.06%	0.02%
34C	34CA3C2	0.05%	0.06%	0.04%	0.06%	0.02%
34C	34CA3C3	0.01%	0.02%	0.01%	0.01%	0.00%
34C	34CA3C4	0.01%	0.02%	0.01%	0.01%	0.00%
34C	34CA4A	0.54%	0.62%	0.47%	0.56%	0.25%
34C	34CA4A1	0.46%	0.53%	0.40%	0.48%	0.22%
34C	34CA4A2	0.46%	0.53%	0.40%	0.48%	0.22%
34C	34CA4A3	0.29%	0.34%	0.26%	0.31%	0.14%
34C	34CA4A4	0.29%	0.34%	0.26%	0.31%	0.14%
34C	34CA4A5	0.14%	0.16%	0.12%	0.14%	0.06%
34C	34CA4A6	0.14%	0.16%	0.12%	0.14%	0.06%
34C	34CA4A7	0.05%	0.06%	0.04%	0.05%	0.02%
34C	34CA4A8	0.05%	0.06%	0.04%	0.05%	0.02%
34C	34CA5A	0.35%	0.41%	0.31%	0.38%	0.17%
34C	34CA5A1	0.30%	0.35%	0.26%	0.33%	0.15%
34C	34CA5A2	0.30%	0.35%	0.26%	0.33%	0.15%
34C	34CA5A3	0.19%	0.22%	0.17%	0.21%	0.09%
34C	34CA5A4	0.19%	0.22%	0.17%	0.21%	0.09%
34C	34CA5A5	0.09%	0.10%	0.08%	0.10%	0.04%
34C	34CA5A6	0.09%	0.10%	0.08%	0.10%	0.04%
34C	34CA5A7	0.03%	0.04%	0.02%	0.03%	0.01%
34C	34CA5A8	0.03%	0.04%	0.02%	0.03%	0.01%
34C	34CA5B	0.00%	0.00%	0.00%	0.08%	0.03%
34C	34CA5B1	0.00%	0.00%	0.00%	0.02%	0.01%
34C	34CA5B2	0.00%	0.00%	0.00%	0.02%	0.01%
34C	34CA5C	0.02%	0.03%	0.02%	0.03%	0.01%
34C	34CA5C1	0.02%	0.02%	0.01%	0.02%	0.01%
34C	34CA5C2	0.02%	0.02%	0.01%	0.02%	0.01%
34C	34CA5C3	0.01%	0.01%	0.01%	0.01%	0.00%
34C	34CA5C4	0.01%	0.01%	0.01%	0.01%	0.00%
34C	34CA5C5	0.01%	0.01%	0.00%	0.01%	0.00%
34C	34CA5C6	0.01%	0.01%	0.00%	0.01%	0.00%
34C	34CA5C7	0.00%	0.00%	0.00%	0.00%	0.00%
34C	34CA5C8	0.00%	0.00%	0.00%	0.00%	0.00%
34L	34LA2A	0.19%	0.24%	0.35%	0.22%	0.31%

Table 3-10, *Continued*
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34L	34LA2A1	0.12%	0.15%	0.22%	0.14%	0.20%
34L	34LA2A2	0.12%	0.15%	0.22%	0.14%	0.20%
34L	34LA2A3	0.03%	0.04%	0.05%	0.04%	0.05%
34L	34LA2A4	0.03%	0.04%	0.05%	0.04%	0.05%
34L	34LA2B	0.17%	0.21%	0.30%	0.19%	0.27%
34L	34LA2B1	0.11%	0.13%	0.19%	0.12%	0.17%
34L	34LA2B2	0.11%	0.13%	0.19%	0.12%	0.17%
34L	34LA2B3	0.03%	0.03%	0.05%	0.03%	0.04%
34L	34LA2B4	0.03%	0.03%	0.05%	0.03%	0.04%
34L	34LA2C	0.05%	0.06%	0.09%	0.06%	0.08%
34L	34LA2C1	0.03%	0.04%	0.05%	0.03%	0.05%
34L	34LA2C2	0.03%	0.04%	0.05%	0.03%	0.05%
34L	34LA2C3	0.01%	0.01%	0.01%	0.01%	0.01%
34L	34LA2C4	0.01%	0.01%	0.01%	0.01%	0.01%
34L	34LA2D	0.17%	0.21%	0.30%	0.19%	0.27%
34L	34LA2D1	0.11%	0.13%	0.19%	0.12%	0.17%
34L	34LA2D2	0.11%	0.13%	0.19%	0.12%	0.17%
34L	34LA2D3	0.03%	0.03%	0.05%	0.03%	0.04%
34L	34LA2D4	0.03%	0.03%	0.05%	0.03%	0.04%
34L	34LA3A	0.43%	0.54%	0.78%	0.50%	0.70%
34L	34LA3A1	0.27%	0.34%	0.49%	0.32%	0.44%
34L	34LA3A2	0.27%	0.34%	0.49%	0.32%	0.44%
34L	34LA3A3	0.07%	0.09%	0.13%	0.08%	0.11%
34L	34LA3A4	0.07%	0.09%	0.13%	0.08%	0.11%
34L	34LA3B	0.40%	0.51%	0.74%	0.47%	0.66%
34L	34LA3B1	0.26%	0.32%	0.47%	0.30%	0.42%
34L	34LA3B2	0.26%	0.32%	0.47%	0.30%	0.42%
34L	34LA3B3	0.07%	0.08%	0.12%	0.08%	0.11%
34L	34LA3B4	0.07%	0.08%	0.12%	0.08%	0.11%
34L	34LA3C	0.05%	0.06%	0.09%	0.06%	0.08%
34L	34LA3C1	0.03%	0.04%	0.05%	0.03%	0.05%
34L	34LA3C2	0.03%	0.04%	0.05%	0.03%	0.05%
34L	34LA3C3	0.01%	0.01%	0.01%	0.01%	0.01%
34L	34LA3C4	0.01%	0.01%	0.01%	0.01%	0.01%
34L	34LA4A	0.31%	0.40%	0.58%	0.35%	0.49%
34L	34LA4A1	0.27%	0.34%	0.50%	0.30%	0.42%
34L	34LA4A2	0.27%	0.34%	0.50%	0.30%	0.42%
34L	34LA4A3	0.17%	0.22%	0.31%	0.19%	0.27%
34L	34LA4A4	0.17%	0.22%	0.31%	0.19%	0.27%
34L	34LA4A5	0.08%	0.10%	0.15%	0.09%	0.13%
34L	34LA4A6	0.08%	0.10%	0.15%	0.09%	0.13%
34L	34LA4A7	0.03%	0.04%	0.05%	0.03%	0.04%
34L	34LA4A8	0.03%	0.04%	0.05%	0.03%	0.04%
34L	34LA5A	0.21%	0.26%	0.38%	0.24%	0.34%

Table 3-10, *Continued*
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34L	34LA5A1	0.18%	0.22%	0.32%	0.21%	0.29%
34L	34LA5A2	0.18%	0.22%	0.32%	0.21%	0.29%
34L	34LA5A3	0.11%	0.14%	0.20%	0.13%	0.18%
34L	34LA5A4	0.11%	0.14%	0.20%	0.13%	0.18%
34L	34LA5A5	0.05%	0.07%	0.10%	0.06%	0.09%
34L	34LA5A6	0.05%	0.07%	0.10%	0.06%	0.09%
34L	34LA5A7	0.02%	0.02%	0.03%	0.02%	0.03%
34L	34LA5A8	0.02%	0.02%	0.03%	0.02%	0.03%
34L	34LA5B	0.00%	0.00%	0.00%	0.05%	0.07%
34L	34LA5B1	0.00%	0.00%	0.00%	0.01%	0.01%
34L	34LA5B2	0.00%	0.00%	0.00%	0.01%	0.01%
34L	34LA5C	0.01%	0.02%	0.02%	0.02%	0.02%
34L	34LA5C1	0.01%	0.01%	0.02%	0.01%	0.02%
34L	34LA5C2	0.01%	0.01%	0.02%	0.01%	0.02%
34L	34LA5C3	0.01%	0.01%	0.01%	0.01%	0.01%
34L	34LA5C4	0.01%	0.01%	0.01%	0.01%	0.01%
34L	34LA5C5	0.00%	0.00%	0.00%	0.00%	0.01%
34L	34LA5C6	0.00%	0.00%	0.00%	0.00%	0.01%
34L	34LA5C7	0.00%	0.00%	0.00%	0.00%	0.00%
34L	34LA5C8	0.00%	0.00%	0.00%	0.00%	0.00%
34R	34RA2A	0.19%	0.09%	0.12%	0.10%	0.10%
34R	34RA2A1	0.12%	0.05%	0.08%	0.06%	0.06%
34R	34RA2A2	0.12%	0.05%	0.08%	0.06%	0.06%
34R	34RA2A3	0.03%	0.01%	0.02%	0.02%	0.01%
34R	34RA2A4	0.03%	0.01%	0.02%	0.02%	0.01%
34R	34RA2B	0.16%	0.08%	0.10%	0.09%	0.09%
34R	34RA2B1	0.10%	0.05%	0.06%	0.06%	0.05%
34R	34RA2B2	0.10%	0.05%	0.06%	0.06%	0.05%
34R	34RA2B3	0.03%	0.01%	0.01%	0.01%	0.01%
34R	34RA2B4	0.03%	0.01%	0.01%	0.01%	0.01%
34R	34RA2C	0.05%	0.02%	0.03%	0.02%	0.02%
34R	34RA2C1	0.03%	0.01%	0.02%	0.02%	0.01%
34R	34RA2C2	0.03%	0.01%	0.02%	0.02%	0.01%
34R	34RA2C3	0.01%	0.00%	0.00%	0.00%	0.00%
34R	34RA2C4	0.01%	0.00%	0.00%	0.00%	0.00%
34R	34RA2D	0.16%	0.08%	0.10%	0.09%	0.09%
34R	34RA2D1	0.10%	0.05%	0.06%	0.06%	0.05%
34R	34RA2D2	0.10%	0.05%	0.06%	0.06%	0.05%
34R	34RA2D3	0.03%	0.01%	0.01%	0.01%	0.01%
34R	34RA2D4	0.03%	0.01%	0.01%	0.01%	0.01%
34R	34RA3A	0.42%	0.19%	0.28%	0.22%	0.22%
34R	34RA3A1	0.27%	0.12%	0.17%	0.14%	0.14%
34R	34RA3A2	0.27%	0.12%	0.17%	0.14%	0.14%
34R	34RA3A3	0.07%	0.03%	0.04%	0.04%	0.04%

Table 3-10, *Continued*
INM ARRIVAL FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34R	34RA3A4	0.07%	0.03%	0.04%	0.04%	0.04%
34R	34RA3B	0.40%	0.18%	0.26%	0.21%	0.21%
34R	34RA3B1	0.25%	0.12%	0.17%	0.13%	0.13%
34R	34RA3B2	0.25%	0.12%	0.17%	0.13%	0.13%
34R	34RA3B3	0.06%	0.03%	0.04%	0.03%	0.03%
34R	34RA3B4	0.06%	0.03%	0.04%	0.03%	0.03%
34R	34RA3C	0.05%	0.02%	0.03%	0.02%	0.02%
34R	34RA3C1	0.03%	0.01%	0.02%	0.02%	0.01%
34R	34RA3C2	0.03%	0.01%	0.02%	0.02%	0.01%
34R	34RA3C3	0.01%	0.00%	0.00%	0.00%	0.00%
34R	34RA3C4	0.01%	0.00%	0.00%	0.00%	0.00%
34R	34RA4A	0.31%	0.14%	0.20%	0.16%	0.16%
34R	34RA4A1	0.27%	0.12%	0.17%	0.14%	0.13%
34R	34RA4A2	0.27%	0.12%	0.17%	0.14%	0.13%
34R	34RA4A3	0.17%	0.08%	0.11%	0.09%	0.08%
34R	34RA4A4	0.17%	0.08%	0.11%	0.09%	0.08%
34R	34RA4A5	0.08%	0.04%	0.05%	0.04%	0.04%
34R	34RA4A6	0.08%	0.04%	0.05%	0.04%	0.04%
34R	34RA4A7	0.03%	0.01%	0.01%	0.01%	0.01%
34R	34RA4A8	0.03%	0.01%	0.01%	0.01%	0.01%
34R	34RA5A	0.20%	0.09%	0.13%	0.11%	0.11%
34R	34RA5A1	0.17%	0.08%	0.11%	0.09%	0.09%
34R	34RA5A2	0.17%	0.08%	0.11%	0.09%	0.09%
34R	34RA5A3	0.11%	0.05%	0.07%	0.06%	0.06%
34R	34RA5A4	0.11%	0.05%	0.07%	0.06%	0.06%
34R	34RA5A5	0.05%	0.02%	0.03%	0.03%	0.03%
34R	34RA5A6	0.05%	0.02%	0.03%	0.03%	0.03%
34R	34RA5A7	0.02%	0.01%	0.01%	0.01%	0.01%
34R	34RA5A8	0.02%	0.01%	0.01%	0.01%	0.01%
34R	34RA5B	0.00%	0.00%	0.00%	0.02%	0.02%
34R	34RA5B1	0.00%	0.00%	0.00%	0.01%	0.00%
34R	34RA5B2	0.00%	0.00%	0.00%	0.01%	0.00%
34R	34RA5C	0.01%	0.01%	0.01%	0.01%	0.01%
34R	34RA5C1	0.01%	0.01%	0.01%	0.01%	0.01%
34R	34RA5C2	0.01%	0.01%	0.01%	0.01%	0.01%
34R	34RA5C3	0.01%	0.00%	0.00%	0.00%	0.00%
34R	34RA5C4	0.01%	0.00%	0.00%	0.00%	0.00%
34R	34RA5C5	0.00%	0.00%	0.00%	0.00%	0.00%
34R	34RA5C6	0.00%	0.00%	0.00%	0.00%	0.00%
34R	34RA5C7	0.00%	0.00%	0.00%	0.00%	0.00%
34R	34RA5C8	0.00%	0.00%	0.00%	0.00%	0.00%

Note: Sum of totals may not equal 100 percent due to rounding; some tracks were modeled with less than 0.00 percent of operations.

Source: Seattle-Tacoma International Airport ANOMS Data, 2009-2012; Landrum & Brown, 2013.

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Table 3-11
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16C	16CD1A	1.45%	1.88%	2.12%	0.00%	0.00%
16C	16CD1A1	0.92%	1.19%	1.34%	0.00%	0.00%
16C	16CD1A2	0.92%	1.19%	1.34%	0.00%	0.00%
16C	16CD1A3	0.24%	0.31%	0.35%	0.00%	0.00%
16C	16CD1A4	0.24%	0.31%	0.35%	0.00%	0.00%
16C	16CD1B	0.36%	0.47%	0.53%	0.52%	0.36%
16C	16CD1B1	0.23%	0.30%	0.33%	0.33%	0.23%
16C	16CD1B2	0.23%	0.30%	0.33%	0.33%	0.23%
16C	16CD1B3	0.06%	0.08%	0.09%	0.08%	0.06%
16C	16CD1B4	0.06%	0.08%	0.09%	0.08%	0.06%
16C	16CD1C	0.00%	0.00%	0.00%	0.26%	0.18%
16C	16CD1C1	0.00%	0.00%	0.00%	0.16%	0.11%
16C	16CD1C2	0.00%	0.00%	0.00%	0.16%	0.11%
16C	16CD1C3	0.00%	0.00%	0.00%	0.04%	0.03%
16C	16CD1C4	0.00%	0.00%	0.00%	0.04%	0.03%
16C	16CD1D	0.09%	0.12%	0.13%	0.00%	0.00%
16C	16CD1D1	0.06%	0.07%	0.08%	0.00%	0.00%
16C	16CD1D2	0.06%	0.07%	0.08%	0.00%	0.00%
16C	16CD1D3	0.01%	0.02%	0.02%	0.00%	0.00%
16C	16CD1D4	0.01%	0.02%	0.02%	0.00%	0.00%
16C	16CD2A	0.23%	0.29%	0.33%	0.00%	0.00%
16C	16CD2A1	0.14%	0.19%	0.21%	0.00%	0.00%
16C	16CD2A2	0.14%	0.19%	0.21%	0.00%	0.00%
16C	16CD2A3	0.04%	0.05%	0.05%	0.00%	0.00%
16C	16CD2A4	0.04%	0.05%	0.05%	0.00%	0.00%
16C	16CD2B	1.45%	1.88%	2.12%	0.00%	0.00%
16C	16CD2B1	0.92%	1.19%	1.34%	0.00%	0.00%
16C	16CD2B2	0.92%	1.19%	1.34%	0.00%	0.00%
16C	16CD2B3	0.24%	0.31%	0.35%	0.00%	0.00%
16C	16CD2B4	0.24%	0.31%	0.35%	0.00%	0.00%
16C	16CD3A	0.68%	0.88%	0.99%	0.00%	0.00%
16C	16CD3A1	0.43%	0.56%	0.63%	0.00%	0.00%
16C	16CD3A2	0.43%	0.56%	0.63%	0.00%	0.00%
16C	16CD3A3	0.11%	0.14%	0.16%	0.00%	0.00%
16C	16CD3A4	0.11%	0.14%	0.16%	0.00%	0.00%
16C	16CD3B	0.27%	0.35%	0.40%	0.00%	0.00%
16C	16CD3B1	0.17%	0.22%	0.25%	0.00%	0.00%
16C	16CD3B2	0.17%	0.22%	0.25%	0.00%	0.00%
16C	16CD3B3	0.04%	0.06%	0.06%	0.00%	0.00%
16C	16CD3B4	0.04%	0.06%	0.06%	0.00%	0.00%
16C	16CD4A	0.00%	0.00%	0.00%	1.30%	0.91%
16C	16CD4A1	0.00%	0.00%	0.00%	0.82%	0.57%
16C	16CD4A2	0.00%	0.00%	0.00%	0.82%	0.57%
16C	16CD4A3	0.00%	0.00%	0.00%	0.21%	0.15%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16C	16CD4A4	0.00%	0.00%	0.00%	0.21%	0.15%
16C	16CD4B	0.00%	0.00%	0.00%	1.30%	0.91%
16C	16CD4B1	0.00%	0.00%	0.00%	0.82%	0.57%
16C	16CD4B2	0.00%	0.00%	0.00%	0.82%	0.57%
16C	16CD4B3	0.00%	0.00%	0.00%	0.21%	0.15%
16C	16CD4B4	0.00%	0.00%	0.00%	0.21%	0.15%
16C	16CD4C	0.00%	0.00%	0.00%	0.26%	0.18%
16C	16CD4C1	0.00%	0.00%	0.00%	0.16%	0.11%
16C	16CD4C2	0.00%	0.00%	0.00%	0.16%	0.11%
16C	16CD4C3	0.00%	0.00%	0.00%	0.04%	0.03%
16C	16CD4C4	0.00%	0.00%	0.00%	0.04%	0.03%
16C	16CD5A	0.00%	0.00%	0.00%	0.52%	0.36%
16C	16CD5A1	0.00%	0.00%	0.00%	0.33%	0.23%
16C	16CD5A2	0.00%	0.00%	0.00%	0.33%	0.23%
16C	16CD5A3	0.00%	0.00%	0.00%	0.08%	0.06%
16C	16CD5A4	0.00%	0.00%	0.00%	0.08%	0.06%
16C	16CD5B	0.00%	0.00%	0.00%	0.52%	0.36%
16C	16CD5B1	0.00%	0.00%	0.00%	0.33%	0.23%
16C	16CD5B2	0.00%	0.00%	0.00%	0.33%	0.23%
16C	16CD5B3	0.00%	0.00%	0.00%	0.08%	0.06%
16C	16CD5B4	0.00%	0.00%	0.00%	0.08%	0.06%
16C	16CD5C	0.00%	0.00%	0.00%	0.52%	0.36%
16C	16CD5C1	0.00%	0.00%	0.00%	0.33%	0.23%
16C	16CD5C2	0.00%	0.00%	0.00%	0.33%	0.23%
16C	16CD5C3	0.00%	0.00%	0.00%	0.08%	0.06%
16C	16CD5C4	0.00%	0.00%	0.00%	0.08%	0.06%
16L	16LD1A	8.14%	7.74%	5.85%	0.00%	0.00%
16L	16LD1A1	5.14%	4.89%	3.70%	0.00%	0.00%
16L	16LD1A2	5.14%	4.89%	3.70%	0.00%	0.00%
16L	16LD1A3	1.33%	1.26%	0.95%	0.00%	0.00%
16L	16LD1A4	1.33%	1.26%	0.95%	0.00%	0.00%
16L	16LD1B	2.03%	1.93%	1.46%	2.43%	2.12%
16L	16LD1B1	1.29%	1.22%	0.92%	1.54%	1.34%
16L	16LD1B2	1.29%	1.22%	0.92%	1.54%	1.34%
16L	16LD1B3	0.33%	0.32%	0.24%	0.40%	0.35%
16L	16LD1B4	0.33%	0.32%	0.24%	0.40%	0.35%
16L	16LD1C	0.00%	0.00%	0.00%	1.22%	1.06%
16L	16LD1C1	0.00%	0.00%	0.00%	0.77%	0.67%
16L	16LD1C2	0.00%	0.00%	0.00%	0.77%	0.67%
16L	16LD1C3	0.00%	0.00%	0.00%	0.20%	0.17%
16L	16LD1C4	0.00%	0.00%	0.00%	0.20%	0.17%
16L	16LD1D	0.51%	0.48%	0.37%	0.00%	0.00%
16L	16LD1D1	0.32%	0.31%	0.23%	0.00%	0.00%
16L	16LD1D2	0.32%	0.31%	0.23%	0.00%	0.00%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16L	16LD1D3	0.08%	0.08%	0.05%	0.00%	0.00%
16L	16LD1D4	0.08%	0.08%	0.05%	0.00%	0.00%
16L	16LD2A	1.27%	1.21%	0.91%	0.00%	0.00%
16L	16LD2A1	0.80%	0.76%	0.58%	0.00%	0.00%
16L	16LD2A2	0.80%	0.76%	0.58%	0.00%	0.00%
16L	16LD2A3	0.21%	0.20%	0.15%	0.00%	0.00%
16L	16LD2A4	0.21%	0.20%	0.15%	0.00%	0.00%
16L	16LD2B	8.14%	7.74%	5.85%	0.00%	0.00%
16L	16LD2B1	5.14%	4.89%	3.70%	0.00%	0.00%
16L	16LD2B2	5.14%	4.89%	3.70%	0.00%	0.00%
16L	16LD2B3	1.33%	1.26%	0.95%	0.00%	0.00%
16L	16LD2B4	1.33%	1.26%	0.95%	0.00%	0.00%
16L	16LD3A	3.81%	3.63%	2.74%	0.00%	0.00%
16L	16LD3A1	2.41%	2.29%	1.73%	0.00%	0.00%
16L	16LD3A2	2.41%	2.29%	1.73%	0.00%	0.00%
16L	16LD3A3	0.62%	0.59%	0.45%	0.00%	0.00%
16L	16LD3A4	0.62%	0.59%	0.45%	0.00%	0.00%
16L	16LD3B	1.53%	1.45%	1.10%	0.00%	0.00%
16L	16LD3B1	0.96%	0.92%	0.69%	0.00%	0.00%
16L	16LD3B2	0.96%	0.92%	0.69%	0.00%	0.00%
16L	16LD3B3	0.25%	0.24%	0.18%	0.00%	0.00%
16L	16LD3B4	0.25%	0.24%	0.18%	0.00%	0.00%
16L	16LD4A	0.00%	0.00%	0.00%	6.08%	5.29%
16L	16LD4A1	0.00%	0.00%	0.00%	3.84%	3.35%
16L	16LD4A2	0.00%	0.00%	0.00%	3.84%	3.35%
16L	16LD4A3	0.00%	0.00%	0.00%	0.99%	0.86%
16L	16LD4A4	0.00%	0.00%	0.00%	0.99%	0.86%
16L	16LD4B	0.00%	0.00%	0.00%	6.08%	5.29%
16L	16LD4B1	0.00%	0.00%	0.00%	3.84%	3.35%
16L	16LD4B2	0.00%	0.00%	0.00%	3.84%	3.35%
16L	16LD4B3	0.00%	0.00%	0.00%	0.99%	0.86%
16L	16LD4B4	0.00%	0.00%	0.00%	0.99%	0.86%
16L	16LD4C	0.00%	0.00%	0.00%	1.22%	1.06%
16L	16LD4C1	0.00%	0.00%	0.00%	0.77%	0.67%
16L	16LD4C2	0.00%	0.00%	0.00%	0.77%	0.67%
16L	16LD4C3	0.00%	0.00%	0.00%	0.20%	0.17%
16L	16LD4C4	0.00%	0.00%	0.00%	0.20%	0.17%
16L	16LD5A	0.00%	0.00%	0.00%	2.43%	2.12%
16L	16LD5A1	0.00%	0.00%	0.00%	1.54%	1.34%
16L	16LD5A2	0.00%	0.00%	0.00%	1.54%	1.34%
16L	16LD5A3	0.00%	0.00%	0.00%	0.40%	0.35%
16L	16LD5A4	0.00%	0.00%	0.00%	0.40%	0.35%
16L	16LD5B	0.00%	0.00%	0.00%	2.43%	2.12%
16L	16LD5B1	0.00%	0.00%	0.00%	1.54%	1.34%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16L	16LD5B2	0.00%	0.00%	0.00%	1.54%	1.34%
16L	16LD5B3	0.00%	0.00%	0.00%	0.40%	0.35%
16L	16LD5B4	0.00%	0.00%	0.00%	0.40%	0.35%
16L	16LD5C	0.00%	0.00%	0.00%	2.43%	2.12%
16L	16LD5C1	0.00%	0.00%	0.00%	1.54%	1.34%
16L	16LD5C2	0.00%	0.00%	0.00%	1.54%	1.34%
16L	16LD5C3	0.00%	0.00%	0.00%	0.40%	0.35%
16L	16LD5C4	0.00%	0.00%	0.00%	0.40%	0.35%
16R	16RD1A	0.00%	0.01%	1.32%	0.00%	0.00%
16R	16RD1A1	0.00%	0.01%	0.83%	0.00%	0.00%
16R	16RD1A2	0.00%	0.01%	0.83%	0.00%	0.00%
16R	16RD1A3	0.00%	0.00%	0.21%	0.00%	0.00%
16R	16RD1A4	0.00%	0.00%	0.21%	0.00%	0.00%
16R	16RD1B	0.00%	0.00%	0.33%	0.04%	0.23%
16R	16RD1B1	0.00%	0.00%	0.21%	0.03%	0.14%
16R	16RD1B2	0.00%	0.00%	0.21%	0.03%	0.14%
16R	16RD1B3	0.00%	0.00%	0.05%	0.01%	0.04%
16R	16RD1B4	0.00%	0.00%	0.05%	0.01%	0.04%
16R	16RD1C	0.00%	0.00%	0.00%	0.02%	0.11%
16R	16RD1C1	0.00%	0.00%	0.00%	0.01%	0.07%
16R	16RD1C2	0.00%	0.00%	0.00%	0.01%	0.07%
16R	16RD1C3	0.00%	0.00%	0.00%	0.00%	0.02%
16R	16RD1C4	0.00%	0.00%	0.00%	0.00%	0.02%
16R	16RD1D	0.00%	0.00%	0.08%	0.00%	0.00%
16R	16RD1D1	0.00%	0.00%	0.05%	0.00%	0.00%
16R	16RD1D2	0.00%	0.00%	0.05%	0.00%	0.00%
16R	16RD1D3	0.00%	0.00%	0.01%	0.00%	0.00%
16R	16RD1D4	0.00%	0.00%	0.01%	0.00%	0.00%
16R	16RD2A	0.00%	0.00%	0.20%	0.00%	0.00%
16R	16RD2A1	0.00%	0.00%	0.13%	0.00%	0.00%
16R	16RD2A2	0.00%	0.00%	0.13%	0.00%	0.00%
16R	16RD2A3	0.00%	0.00%	0.03%	0.00%	0.00%
16R	16RD2A4	0.00%	0.00%	0.03%	0.00%	0.00%
16R	16RD2B	0.00%	0.01%	1.32%	0.00%	0.00%
16R	16RD2B1	0.00%	0.01%	0.83%	0.00%	0.00%
16R	16RD2B2	0.00%	0.01%	0.83%	0.00%	0.00%
16R	16RD2B3	0.00%	0.00%	0.21%	0.00%	0.00%
16R	16RD2B4	0.00%	0.00%	0.21%	0.00%	0.00%
16R	16RD3A	0.00%	0.00%	0.62%	0.00%	0.00%
16R	16RD3A1	0.00%	0.00%	0.39%	0.00%	0.00%
16R	16RD3A2	0.00%	0.00%	0.39%	0.00%	0.00%
16R	16RD3A3	0.00%	0.00%	0.10%	0.00%	0.00%
16R	16RD3A4	0.00%	0.00%	0.10%	0.00%	0.00%
16R	16RD3B	0.00%	0.00%	0.25%	0.00%	0.00%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16R	16RD3B1	0.00%	0.00%	0.16%	0.00%	0.00%
16R	16RD3B2	0.00%	0.00%	0.16%	0.00%	0.00%
16R	16RD3B3	0.00%	0.00%	0.04%	0.00%	0.00%
16R	16RD3B4	0.00%	0.00%	0.04%	0.00%	0.00%
16R	16RD4A	0.00%	0.00%	0.00%	0.11%	0.57%
16R	16RD4A1	0.00%	0.00%	0.00%	0.07%	0.36%
16R	16RD4A2	0.00%	0.00%	0.00%	0.07%	0.36%
16R	16RD4A3	0.00%	0.00%	0.00%	0.02%	0.09%
16R	16RD4A4	0.00%	0.00%	0.00%	0.02%	0.09%
16R	16RD4B	0.00%	0.00%	0.00%	0.11%	0.57%
16R	16RD4B1	0.00%	0.00%	0.00%	0.07%	0.36%
16R	16RD4B2	0.00%	0.00%	0.00%	0.07%	0.36%
16R	16RD4B3	0.00%	0.00%	0.00%	0.02%	0.09%
16R	16RD4B4	0.00%	0.00%	0.00%	0.02%	0.09%
16R	16RD4C	0.00%	0.00%	0.00%	0.02%	0.11%
16R	16RD4C1	0.00%	0.00%	0.00%	0.01%	0.07%
16R	16RD4C2	0.00%	0.00%	0.00%	0.01%	0.07%
16R	16RD4C3	0.00%	0.00%	0.00%	0.00%	0.02%
16R	16RD4C4	0.00%	0.00%	0.00%	0.00%	0.02%
16R	16RD5A	0.00%	0.00%	0.00%	0.04%	0.23%
16R	16RD5A1	0.00%	0.00%	0.00%	0.03%	0.14%
16R	16RD5A2	0.00%	0.00%	0.00%	0.03%	0.14%
16R	16RD5A3	0.00%	0.00%	0.00%	0.01%	0.04%
16R	16RD5A4	0.00%	0.00%	0.00%	0.01%	0.04%
16R	16RD5B	0.00%	0.00%	0.00%	0.04%	0.23%
16R	16RD5B1	0.00%	0.00%	0.00%	0.03%	0.14%
16R	16RD5B2	0.00%	0.00%	0.00%	0.03%	0.14%
16R	16RD5B3	0.00%	0.00%	0.00%	0.01%	0.04%
16R	16RD5B4	0.00%	0.00%	0.00%	0.01%	0.04%
16R	16RD5C	0.00%	0.00%	0.00%	0.04%	0.23%
16R	16RD5C1	0.00%	0.00%	0.00%	0.03%	0.14%
16R	16RD5C2	0.00%	0.00%	0.00%	0.03%	0.14%
16R	16RD5C3	0.00%	0.00%	0.00%	0.01%	0.04%
16R	16RD5C4	0.00%	0.00%	0.00%	0.01%	0.04%
34C	34CD1	0.44%	0.52%	0.66%	0.00%	0.00%
34C	34CD11	0.28%	0.33%	0.42%	0.00%	0.00%
34C	34CD12	0.28%	0.33%	0.42%	0.00%	0.00%
34C	34CD13	0.07%	0.08%	0.11%	0.00%	0.00%
34C	34CD14	0.07%	0.08%	0.11%	0.00%	0.00%
34C	34CD2A	0.22%	0.26%	0.33%	0.00%	0.00%
34C	34CD2A1	0.14%	0.16%	0.21%	0.00%	0.00%
34C	34CD2A2	0.14%	0.16%	0.21%	0.00%	0.00%
34C	34CD2A3	0.04%	0.04%	0.05%	0.00%	0.00%
34C	34CD2A4	0.04%	0.04%	0.05%	0.00%	0.00%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34C	34CD2B	0.13%	0.15%	0.20%	0.00%	0.00%
34C	34CD2B1	0.08%	0.10%	0.13%	0.00%	0.00%
34C	34CD2B2	0.08%	0.10%	0.13%	0.00%	0.00%
34C	34CD2B3	0.02%	0.03%	0.02%	0.00%	0.00%
34C	34CD2B4	0.02%	0.03%	0.02%	0.00%	0.00%
34C	34CD2C	0.13%	0.15%	0.20%	0.00%	0.00%
34C	34CD2C1	0.08%	0.10%	0.13%	0.00%	0.00%
34C	34CD2C2	0.08%	0.10%	0.13%	0.00%	0.00%
34C	34CD2C3	0.02%	0.03%	0.02%	0.00%	0.00%
34C	34CD2C4	0.02%	0.03%	0.02%	0.00%	0.00%
34C	34CD2D	0.17%	0.21%	0.26%	0.00%	0.00%
34C	34CD2D1	0.11%	0.13%	0.17%	0.00%	0.00%
34C	34CD2D2	0.11%	0.13%	0.17%	0.00%	0.00%
34C	34CD2D3	0.03%	0.03%	0.04%	0.00%	0.00%
34C	34CD2D4	0.03%	0.03%	0.04%	0.00%	0.00%
34C	34CD3A	0.44%	0.52%	0.66%	0.00%	0.00%
34C	34CD3A1	0.28%	0.33%	0.42%	0.00%	0.00%
34C	34CD3A2	0.28%	0.33%	0.42%	0.00%	0.00%
34C	34CD3A3	0.07%	0.08%	0.11%	0.00%	0.00%
34C	34CD3A4	0.07%	0.08%	0.11%	0.00%	0.00%
34C	34CD3B	0.26%	0.31%	0.40%	0.00%	0.00%
34C	34CD3B1	0.17%	0.20%	0.25%	0.00%	0.00%
34C	34CD3B2	0.17%	0.20%	0.25%	0.00%	0.00%
34C	34CD3B3	0.04%	0.05%	0.06%	0.00%	0.00%
34C	34CD3B4	0.04%	0.05%	0.06%	0.00%	0.00%
34C	34CD3C	0.13%	0.15%	0.20%	0.00%	0.00%
34C	34CD3C1	0.08%	0.10%	0.13%	0.00%	0.00%
34C	34CD3C2	0.08%	0.10%	0.13%	0.00%	0.00%
34C	34CD3C3	0.02%	0.03%	0.02%	0.00%	0.00%
34C	34CD3C4	0.02%	0.03%	0.02%	0.00%	0.00%
34C	34CD3D	0.11%	0.13%	0.17%	0.00%	0.00%
34C	34CD3D1	0.07%	0.08%	0.10%	0.00%	0.00%
34C	34CD3D2	0.07%	0.08%	0.10%	0.00%	0.00%
34C	34CD3D3	0.02%	0.02%	0.02%	0.00%	0.00%
34C	34CD3D4	0.02%	0.02%	0.02%	0.00%	0.00%
34C	34CD3E	0.11%	0.13%	0.17%	0.00%	0.00%
34C	34CD3E1	0.07%	0.08%	0.10%	0.00%	0.00%
34C	34CD3E2	0.07%	0.08%	0.10%	0.00%	0.00%
34C	34CD3E3	0.02%	0.02%	0.02%	0.00%	0.00%
34C	34CD3E4	0.02%	0.02%	0.02%	0.00%	0.00%
34C	34CD3F	0.04%	0.05%	0.06%	0.00%	0.00%
34C	34CD3F1	0.03%	0.03%	0.04%	0.00%	0.00%
34C	34CD3F2	0.03%	0.03%	0.04%	0.00%	0.00%
34C	34CD3F3	0.01%	0.01%	0.01%	0.00%	0.00%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34C	34CD3F4	0.01%	0.01%	0.01%	0.00%	0.00%
34C	34CD4A	0.00%	0.00%	0.00%	0.67%	0.59%
34C	34CD4A1	0.00%	0.00%	0.00%	0.42%	0.37%
34C	34CD4A2	0.00%	0.00%	0.00%	0.42%	0.37%
34C	34CD4A3	0.00%	0.00%	0.00%	0.11%	0.10%
34C	34CD4A4	0.00%	0.00%	0.00%	0.11%	0.10%
34C	34CD4B	0.00%	0.00%	0.00%	0.50%	0.44%
34C	34CD4B1	0.00%	0.00%	0.00%	0.32%	0.28%
34C	34CD4B2	0.00%	0.00%	0.00%	0.32%	0.28%
34C	34CD4B3	0.00%	0.00%	0.00%	0.08%	0.07%
34C	34CD4B4	0.00%	0.00%	0.00%	0.08%	0.07%
34C	34CD4C	0.00%	0.00%	0.00%	0.17%	0.15%
34C	34CD4C1	0.00%	0.00%	0.00%	0.11%	0.09%
34C	34CD4C2	0.00%	0.00%	0.00%	0.11%	0.09%
34C	34CD4C3	0.00%	0.00%	0.00%	0.03%	0.02%
34C	34CD4C4	0.00%	0.00%	0.00%	0.03%	0.02%
34C	34CD5A	0.00%	0.00%	0.00%	1.17%	1.03%
34C	34CD5A1	0.00%	0.00%	0.00%	0.74%	0.65%
34C	34CD5A2	0.00%	0.00%	0.00%	0.74%	0.65%
34C	34CD5A3	0.00%	0.00%	0.00%	0.19%	0.17%
34C	34CD5A4	0.00%	0.00%	0.00%	0.19%	0.17%
34C	34CD5B	0.00%	0.00%	0.00%	0.83%	0.74%
34C	34CD5B1	0.00%	0.00%	0.00%	0.53%	0.47%
34C	34CD5B2	0.00%	0.00%	0.00%	0.53%	0.47%
34C	34CD5B3	0.00%	0.00%	0.00%	0.14%	0.12%
34C	34CD5B4	0.00%	0.00%	0.00%	0.14%	0.12%
34L	34LD1	0.01%	0.00%	0.38%	0.00%	0.00%
34L	34LD11	0.00%	0.00%	0.24%	0.00%	0.00%
34L	34LD12	0.00%	0.00%	0.24%	0.00%	0.00%
34L	34LD13	0.00%	0.00%	0.06%	0.00%	0.00%
34L	34LD14	0.00%	0.00%	0.06%	0.00%	0.00%
34L	34LD2A	0.00%	0.00%	0.19%	0.00%	0.00%
34L	34LD2A1	0.00%	0.00%	0.12%	0.00%	0.00%
34L	34LD2A2	0.00%	0.00%	0.12%	0.00%	0.00%
34L	34LD2A3	0.00%	0.00%	0.03%	0.00%	0.00%
34L	34LD2A4	0.00%	0.00%	0.03%	0.00%	0.00%
34L	34LD2B	0.00%	0.00%	0.11%	0.00%	0.00%
34L	34LD2B1	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD2B2	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD2B3	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD2B4	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD2C	0.00%	0.00%	0.11%	0.00%	0.00%
34L	34LD2C1	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD2C2	0.00%	0.00%	0.07%	0.00%	0.00%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34L	34LD2C3	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD2C4	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD2D	0.00%	0.00%	0.15%	0.00%	0.00%
34L	34LD2D1	0.00%	0.00%	0.10%	0.00%	0.00%
34L	34LD2D2	0.00%	0.00%	0.10%	0.00%	0.00%
34L	34LD2D3	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD2D4	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD3A	0.01%	0.00%	0.38%	0.00%	0.00%
34L	34LD3A1	0.00%	0.00%	0.24%	0.00%	0.00%
34L	34LD3A2	0.00%	0.00%	0.24%	0.00%	0.00%
34L	34LD3A3	0.00%	0.00%	0.06%	0.00%	0.00%
34L	34LD3A4	0.00%	0.00%	0.06%	0.00%	0.00%
34L	34LD3B	0.00%	0.00%	0.23%	0.00%	0.00%
34L	34LD3B1	0.00%	0.00%	0.14%	0.00%	0.00%
34L	34LD3B2	0.00%	0.00%	0.14%	0.00%	0.00%
34L	34LD3B3	0.00%	0.00%	0.03%	0.00%	0.00%
34L	34LD3B4	0.00%	0.00%	0.03%	0.00%	0.00%
34L	34LD3C	0.00%	0.00%	0.11%	0.00%	0.00%
34L	34LD3C1	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD3C2	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD3C3	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD3C4	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD3D	0.00%	0.00%	0.09%	0.00%	0.00%
34L	34LD3D1	0.00%	0.00%	0.06%	0.00%	0.00%
34L	34LD3D2	0.00%	0.00%	0.06%	0.00%	0.00%
34L	34LD3D3	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3D4	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3E	0.00%	0.00%	0.09%	0.00%	0.00%
34L	34LD3E1	0.00%	0.00%	0.06%	0.00%	0.00%
34L	34LD3E2	0.00%	0.00%	0.06%	0.00%	0.00%
34L	34LD3E3	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3E4	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3F	0.00%	0.00%	0.03%	0.00%	0.00%
34L	34LD3F1	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD3F2	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD3F3	0.00%	0.00%	0.00%	0.00%	0.00%
34L	34LD3F4	0.00%	0.00%	0.00%	0.00%	0.00%
34L	34LD4A	0.00%	0.00%	0.00%	0.09%	0.27%
34L	34LD4A1	0.00%	0.00%	0.00%	0.06%	0.17%
34L	34LD4A2	0.00%	0.00%	0.00%	0.06%	0.17%
34L	34LD4A3	0.00%	0.00%	0.00%	0.01%	0.04%
34L	34LD4A4	0.00%	0.00%	0.00%	0.01%	0.04%
34L	34LD4B	0.00%	0.00%	0.00%	0.07%	0.20%
34L	34LD4B1	0.00%	0.00%	0.00%	0.04%	0.13%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34L	34LD4B2	0.00%	0.00%	0.00%	0.04%	0.13%
34L	34LD4B3	0.00%	0.00%	0.00%	0.01%	0.03%
34L	34LD4B4	0.00%	0.00%	0.00%	0.01%	0.03%
34L	34LD4C	0.00%	0.00%	0.00%	0.02%	0.07%
34L	34LD4C1	0.00%	0.00%	0.00%	0.01%	0.04%
34L	34LD4C2	0.00%	0.00%	0.00%	0.01%	0.04%
34L	34LD4C3	0.00%	0.00%	0.00%	0.00%	0.01%
34L	34LD4C4	0.00%	0.00%	0.00%	0.00%	0.01%
34L	34LD5A	0.00%	0.00%	0.00%	0.15%	0.47%
34L	34LD5A1	0.00%	0.00%	0.00%	0.10%	0.30%
34L	34LD5A2	0.00%	0.00%	0.00%	0.10%	0.30%
34L	34LD5A3	0.00%	0.00%	0.00%	0.03%	0.08%
34L	34LD5A4	0.00%	0.00%	0.00%	0.03%	0.08%
34L	34LD5B	0.00%	0.00%	0.00%	0.11%	0.34%
34L	34LD5B1	0.00%	0.00%	0.00%	0.07%	0.21%
34L	34LD5B2	0.00%	0.00%	0.00%	0.07%	0.21%
34L	34LD5B3	0.00%	0.00%	0.00%	0.02%	0.05%
34L	34LD5B4	0.00%	0.00%	0.00%	0.02%	0.05%
34R	34RD1	1.28%	1.19%	0.92%	0.00%	0.00%
34R	34RD11	0.81%	0.75%	0.58%	0.00%	0.00%
34R	34RD12	0.81%	0.75%	0.58%	0.00%	0.00%
34R	34RD13	0.21%	0.19%	0.15%	0.00%	0.00%
34R	34RD14	0.21%	0.19%	0.15%	0.00%	0.00%
34R	34RD2A	0.64%	0.59%	0.45%	0.00%	0.00%
34R	34RD2A1	0.41%	0.37%	0.28%	0.00%	0.00%
34R	34RD2A2	0.41%	0.37%	0.28%	0.00%	0.00%
34R	34RD2A3	0.10%	0.10%	0.07%	0.00%	0.00%
34R	34RD2A4	0.10%	0.10%	0.07%	0.00%	0.00%
34R	34RD2B	0.38%	0.36%	0.27%	0.00%	0.00%
34R	34RD2B1	0.24%	0.22%	0.17%	0.00%	0.00%
34R	34RD2B2	0.24%	0.22%	0.17%	0.00%	0.00%
34R	34RD2B3	0.06%	0.06%	0.04%	0.00%	0.00%
34R	34RD2B4	0.06%	0.06%	0.04%	0.00%	0.00%
34R	34RD2C	0.38%	0.36%	0.27%	0.00%	0.00%
34R	34RD2C1	0.24%	0.22%	0.17%	0.00%	0.00%
34R	34RD2C2	0.24%	0.22%	0.17%	0.00%	0.00%
34R	34RD2C3	0.06%	0.06%	0.04%	0.00%	0.00%
34R	34RD2C4	0.06%	0.06%	0.04%	0.00%	0.00%
34R	34RD2D	0.51%	0.47%	0.36%	0.00%	0.00%
34R	34RD2D1	0.32%	0.30%	0.23%	0.00%	0.00%
34R	34RD2D2	0.32%	0.30%	0.23%	0.00%	0.00%
34R	34RD2D3	0.08%	0.08%	0.06%	0.00%	0.00%
34R	34RD2D4	0.08%	0.08%	0.06%	0.00%	0.00%
34R	34RD3A	1.28%	1.19%	0.92%	0.00%	0.00%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34R	34RD3A1	0.81%	0.75%	0.58%	0.00%	0.00%
34R	34RD3A2	0.81%	0.75%	0.58%	0.00%	0.00%
34R	34RD3A3	0.21%	0.19%	0.15%	0.00%	0.00%
34R	34RD3A4	0.21%	0.19%	0.15%	0.00%	0.00%
34R	34RD3B	0.77%	0.71%	0.55%	0.00%	0.00%
34R	34RD3B1	0.49%	0.45%	0.34%	0.00%	0.00%
34R	34RD3B2	0.49%	0.45%	0.34%	0.00%	0.00%
34R	34RD3B3	0.13%	0.12%	0.09%	0.00%	0.00%
34R	34RD3B4	0.13%	0.12%	0.09%	0.00%	0.00%
34R	34RD3C	0.38%	0.36%	0.27%	0.00%	0.00%
34R	34RD3C1	0.24%	0.22%	0.17%	0.00%	0.00%
34R	34RD3C2	0.24%	0.22%	0.17%	0.00%	0.00%
34R	34RD3C3	0.06%	0.06%	0.04%	0.00%	0.00%
34R	34RD3C4	0.06%	0.06%	0.04%	0.00%	0.00%
34R	34RD3D	0.32%	0.30%	0.22%	0.00%	0.00%
34R	34RD3D1	0.20%	0.19%	0.14%	0.00%	0.00%
34R	34RD3D2	0.20%	0.19%	0.14%	0.00%	0.00%
34R	34RD3D3	0.05%	0.05%	0.03%	0.00%	0.00%
34R	34RD3D4	0.05%	0.05%	0.03%	0.00%	0.00%
34R	34RD3E	0.32%	0.30%	0.22%	0.00%	0.00%
34R	34RD3E1	0.20%	0.19%	0.14%	0.00%	0.00%
34R	34RD3E2	0.20%	0.19%	0.14%	0.00%	0.00%
34R	34RD3E3	0.05%	0.05%	0.03%	0.00%	0.00%
34R	34RD3E4	0.05%	0.05%	0.03%	0.00%	0.00%
34R	34RD3F	0.13%	0.12%	0.09%	0.00%	0.00%
34R	34RD3F1	0.08%	0.07%	0.05%	0.00%	0.00%
34R	34RD3F2	0.08%	0.07%	0.05%	0.00%	0.00%
34R	34RD3F3	0.02%	0.02%	0.01%	0.00%	0.00%
34R	34RD3F4	0.02%	0.02%	0.01%	0.00%	0.00%
34R	34RD4A	0.00%	0.00%	0.00%	0.97%	1.45%
34R	34RD4A1	0.00%	0.00%	0.00%	0.62%	0.92%
34R	34RD4A2	0.00%	0.00%	0.00%	0.62%	0.92%
34R	34RD4A3	0.00%	0.00%	0.00%	0.16%	0.23%
34R	34RD4A4	0.00%	0.00%	0.00%	0.16%	0.23%
34R	34RD4B	0.00%	0.00%	0.00%	0.73%	1.09%
34R	34RD4B1	0.00%	0.00%	0.00%	0.46%	0.69%
34R	34RD4B2	0.00%	0.00%	0.00%	0.46%	0.69%
34R	34RD4B3	0.00%	0.00%	0.00%	0.12%	0.18%
34R	34RD4B4	0.00%	0.00%	0.00%	0.12%	0.18%
34R	34RD4C	0.00%	0.00%	0.00%	0.24%	0.36%
34R	34RD4C1	0.00%	0.00%	0.00%	0.15%	0.23%
34R	34RD4C2	0.00%	0.00%	0.00%	0.15%	0.23%
34R	34RD4C3	0.00%	0.00%	0.00%	0.04%	0.06%
34R	34RD4C4	0.00%	0.00%	0.00%	0.04%	0.06%

Table 3-11, *Continued*
INM DEPARTURE FLIGHT TRACKS – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34R	34RD5A	0.00%	0.00%	0.00%	1.70%	2.54%
34R	34RD5A1	0.00%	0.00%	0.00%	1.08%	1.61%
34R	34RD5A2	0.00%	0.00%	0.00%	1.08%	1.61%
34R	34RD5A3	0.00%	0.00%	0.00%	0.28%	0.41%
34R	34RD5A4	0.00%	0.00%	0.00%	0.28%	0.41%
34R	34RD5B	0.00%	0.00%	0.00%	1.22%	1.82%
34R	34RD5B1	0.00%	0.00%	0.00%	0.77%	1.15%
34R	34RD5B2	0.00%	0.00%	0.00%	0.77%	1.15%
34R	34RD5B3	0.00%	0.00%	0.00%	0.20%	0.29%
34R	34RD5B4	0.00%	0.00%	0.00%	0.20%	0.29%

Note: Sum of totals may not equal 100 percent due to rounding; some tracks were modeled with less than 0.00 percent of operations.

Source: Seattle-Tacoma International Airport ANOMS Data, 2009-2012; Landrum & Brown, 2013.

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Table 3-12
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16C	16CA2A	1.00%	1.02%	0.71%	1.10%	1.04%
16C	16CA2A1	0.63%	0.64%	0.45%	0.69%	0.66%
16C	16CA2A2	0.63%	0.64%	0.45%	0.69%	0.66%
16C	16CA2A3	0.16%	0.17%	0.11%	0.18%	0.17%
16C	16CA2A4	0.16%	0.17%	0.11%	0.18%	0.17%
16C	16CA2B	0.20%	0.20%	0.14%	0.22%	0.21%
16C	16CA2B1	0.13%	0.13%	0.09%	0.14%	0.13%
16C	16CA2B2	0.13%	0.13%	0.09%	0.14%	0.13%
16C	16CA2B3	0.03%	0.03%	0.02%	0.04%	0.03%
16C	16CA2B4	0.03%	0.03%	0.02%	0.04%	0.03%
16C	16CA2C	0.10%	0.10%	0.07%	0.11%	0.10%
16C	16CA2C1	0.06%	0.06%	0.04%	0.07%	0.07%
16C	16CA2C2	0.06%	0.06%	0.04%	0.07%	0.07%
16C	16CA2C3	0.02%	0.02%	0.01%	0.02%	0.02%
16C	16CA2C4	0.02%	0.02%	0.01%	0.02%	0.02%
16C	16CA3A	1.50%	1.52%	1.06%	1.64%	1.57%
16C	16CA3A1	0.95%	0.96%	0.67%	1.04%	0.99%
16C	16CA3A2	0.95%	0.96%	0.67%	1.04%	0.99%
16C	16CA3A3	0.24%	0.25%	0.17%	0.27%	0.26%
16C	16CA3A4	0.24%	0.25%	0.17%	0.27%	0.26%
16C	16CA3B	1.20%	1.22%	0.85%	1.32%	1.25%
16C	16CA3B1	0.76%	0.77%	0.54%	0.83%	0.79%
16C	16CA3B2	0.76%	0.77%	0.54%	0.83%	0.79%
16C	16CA3B3	0.20%	0.20%	0.14%	0.21%	0.20%
16C	16CA3B4	0.20%	0.20%	0.14%	0.21%	0.20%
16C	16CA3C	0.30%	0.30%	0.21%	0.33%	0.31%
16C	16CA3C1	0.19%	0.19%	0.13%	0.21%	0.20%
16C	16CA3C2	0.19%	0.19%	0.13%	0.21%	0.20%
16C	16CA3C3	0.05%	0.05%	0.03%	0.05%	0.05%
16C	16CA3C4	0.05%	0.05%	0.03%	0.05%	0.05%
16C	16CA4A	1.72%	1.75%	1.22%	1.89%	1.80%
16C	16CA4A1	1.48%	1.51%	1.05%	1.63%	1.55%
16C	16CA4A2	1.48%	1.51%	1.05%	1.63%	1.55%
16C	16CA4A3	0.94%	0.95%	0.66%	1.03%	0.98%
16C	16CA4A4	0.94%	0.95%	0.66%	1.03%	0.98%
16C	16CA4A5	0.44%	0.45%	0.31%	0.49%	0.46%
16C	16CA4A6	0.44%	0.45%	0.31%	0.49%	0.46%
16C	16CA4A7	0.16%	0.16%	0.11%	0.17%	0.16%
16C	16CA4A8	0.16%	0.16%	0.11%	0.17%	0.16%
16C	16CA4B	0.06%	0.06%	0.04%	0.06%	0.06%
16C	16CA4B1	0.05%	0.05%	0.03%	0.05%	0.05%
16C	16CA4B2	0.05%	0.05%	0.03%	0.05%	0.05%
16C	16CA4B3	0.03%	0.03%	0.02%	0.03%	0.03%
16C	16CA4B4	0.03%	0.03%	0.02%	0.03%	0.03%

Table 3-12, *Continued*
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16C	16CA4B5	0.01%	0.01%	0.01%	0.02%	0.01%
16C	16CA4B6	0.01%	0.01%	0.01%	0.02%	0.01%
16C	16CA4B7	0.01%	0.01%	0.00%	0.01%	0.00%
16C	16CA4B8	0.01%	0.01%	0.00%	0.01%	0.00%
16C	16CA5A	1.43%	1.46%	1.01%	1.58%	1.50%
16C	16CA5A1	1.23%	1.26%	0.87%	1.36%	1.29%
16C	16CA5A2	1.23%	1.26%	0.87%	1.36%	1.29%
16C	16CA5A3	0.78%	0.80%	0.55%	0.86%	0.82%
16C	16CA5A4	0.78%	0.80%	0.55%	0.86%	0.82%
16C	16CA5A5	0.37%	0.37%	0.26%	0.40%	0.39%
16C	16CA5A6	0.37%	0.37%	0.26%	0.40%	0.39%
16C	16CA5A7	0.13%	0.13%	0.09%	0.14%	0.14%
16C	16CA5A8	0.13%	0.13%	0.09%	0.14%	0.14%
16C	16CA5B	0.06%	0.06%	0.04%	0.06%	0.06%
16C	16CA5B1	0.05%	0.05%	0.03%	0.05%	0.05%
16C	16CA5B2	0.05%	0.05%	0.03%	0.05%	0.05%
16C	16CA5B3	0.03%	0.03%	0.02%	0.03%	0.03%
16C	16CA5B4	0.03%	0.03%	0.02%	0.03%	0.03%
16C	16CA5B5	0.01%	0.01%	0.01%	0.02%	0.01%
16C	16CA5B6	0.01%	0.01%	0.01%	0.02%	0.01%
16C	16CA5B7	0.01%	0.01%	0.00%	0.01%	0.00%
16C	16CA5B8	0.01%	0.01%	0.00%	0.01%	0.00%
16L	16LA2A	0.71%	0.64%	0.27%	0.61%	0.73%
16L	16LA2A1	0.45%	0.41%	0.17%	0.39%	0.46%
16L	16LA2A2	0.45%	0.41%	0.17%	0.39%	0.46%
16L	16LA2A3	0.12%	0.11%	0.04%	0.10%	0.12%
16L	16LA2A4	0.12%	0.11%	0.04%	0.10%	0.12%
16L	16LA2B	0.14%	0.13%	0.05%	0.12%	0.15%
16L	16LA2B1	0.09%	0.08%	0.03%	0.08%	0.09%
16L	16LA2B2	0.09%	0.08%	0.03%	0.08%	0.09%
16L	16LA2B3	0.02%	0.02%	0.01%	0.02%	0.02%
16L	16LA2B4	0.02%	0.02%	0.01%	0.02%	0.02%
16L	16LA2C	0.07%	0.06%	0.03%	0.06%	0.07%
16L	16LA2C1	0.04%	0.04%	0.02%	0.04%	0.04%
16L	16LA2C2	0.04%	0.04%	0.02%	0.04%	0.04%
16L	16LA2C3	0.01%	0.01%	0.00%	0.01%	0.01%
16L	16LA2C4	0.01%	0.01%	0.00%	0.01%	0.01%
16L	16LA3A	1.06%	0.97%	0.40%	0.92%	1.10%
16L	16LA3A1	0.67%	0.61%	0.26%	0.58%	0.70%
16L	16LA3A2	0.67%	0.61%	0.26%	0.58%	0.70%
16L	16LA3A3	0.17%	0.16%	0.06%	0.15%	0.18%
16L	16LA3A4	0.17%	0.16%	0.06%	0.15%	0.18%
16L	16LA3B	0.85%	0.77%	0.32%	0.73%	0.88%
16L	16LA3B1	0.54%	0.49%	0.20%	0.46%	0.56%

Table 3-12, *Continued*
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16L	16LA3B2	0.54%	0.49%	0.20%	0.46%	0.56%
16L	16LA3B3	0.14%	0.13%	0.05%	0.12%	0.14%
16L	16LA3B4	0.14%	0.13%	0.05%	0.12%	0.14%
16L	16LA3C	0.21%	0.19%	0.08%	0.18%	0.22%
16L	16LA3C1	0.13%	0.12%	0.05%	0.12%	0.14%
16L	16LA3C2	0.13%	0.12%	0.05%	0.12%	0.14%
16L	16LA3C3	0.03%	0.03%	0.01%	0.03%	0.03%
16L	16LA3C4	0.03%	0.03%	0.01%	0.03%	0.03%
16L	16LA4A	1.22%	1.11%	0.46%	1.05%	1.27%
16L	16LA4A1	1.05%	0.96%	0.40%	0.91%	1.09%
16L	16LA4A2	1.05%	0.96%	0.40%	0.91%	1.09%
16L	16LA4A3	0.67%	0.61%	0.25%	0.57%	0.69%
16L	16LA4A4	0.67%	0.61%	0.25%	0.57%	0.69%
16L	16LA4A5	0.31%	0.29%	0.12%	0.27%	0.33%
16L	16LA4A6	0.31%	0.29%	0.12%	0.27%	0.33%
16L	16LA4A7	0.11%	0.10%	0.04%	0.09%	0.11%
16L	16LA4A8	0.11%	0.10%	0.04%	0.09%	0.11%
16L	16LA4B	0.04%	0.04%	0.01%	0.04%	0.04%
16L	16LA4B1	0.04%	0.03%	0.01%	0.03%	0.04%
16L	16LA4B2	0.04%	0.03%	0.01%	0.03%	0.04%
16L	16LA4B3	0.02%	0.02%	0.01%	0.02%	0.02%
16L	16LA4B4	0.02%	0.02%	0.01%	0.02%	0.02%
16L	16LA4B5	0.01%	0.01%	0.00%	0.01%	0.01%
16L	16LA4B6	0.01%	0.01%	0.00%	0.01%	0.01%
16L	16LA4B7	0.00%	0.00%	0.00%	0.00%	0.00%
16L	16LA4B8	0.00%	0.00%	0.00%	0.00%	0.00%
16L	16LA5A	1.02%	0.93%	0.39%	0.88%	1.06%
16L	16LA5A1	0.88%	0.80%	0.33%	0.76%	0.91%
16L	16LA5A2	0.88%	0.80%	0.33%	0.76%	0.91%
16L	16LA5A3	0.56%	0.50%	0.21%	0.48%	0.58%
16L	16LA5A4	0.56%	0.50%	0.21%	0.48%	0.58%
16L	16LA5A5	0.26%	0.24%	0.10%	0.23%	0.27%
16L	16LA5A6	0.26%	0.24%	0.10%	0.23%	0.27%
16L	16LA5A7	0.09%	0.08%	0.03%	0.08%	0.10%
16L	16LA5A8	0.09%	0.08%	0.03%	0.08%	0.10%
16L	16LA5B	0.04%	0.04%	0.01%	0.04%	0.04%
16L	16LA5B1	0.04%	0.03%	0.01%	0.03%	0.04%
16L	16LA5B2	0.04%	0.03%	0.01%	0.03%	0.04%
16L	16LA5B3	0.02%	0.02%	0.01%	0.02%	0.02%
16L	16LA5B4	0.02%	0.02%	0.01%	0.02%	0.02%
16L	16LA5B5	0.01%	0.01%	0.00%	0.01%	0.01%
16L	16LA5B6	0.01%	0.01%	0.00%	0.01%	0.01%
16L	16LA5B7	0.00%	0.00%	0.00%	0.00%	0.00%
16L	16LA5B8	0.00%	0.00%	0.00%	0.00%	0.00%

Table 3-12, *Continued*
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16R	16RA2A	0.76%	0.89%	1.57%	0.84%	0.46%
16R	16RA2A1	0.48%	0.56%	0.99%	0.53%	0.29%
16R	16RA2A2	0.48%	0.56%	0.99%	0.53%	0.29%
16R	16RA2A3	0.12%	0.14%	0.26%	0.14%	0.08%
16R	16RA2A4	0.12%	0.14%	0.26%	0.14%	0.08%
16R	16RA2B	0.15%	0.18%	0.31%	0.17%	0.09%
16R	16RA2B1	0.10%	0.11%	0.20%	0.11%	0.06%
16R	16RA2B2	0.10%	0.11%	0.20%	0.11%	0.06%
16R	16RA2B3	0.02%	0.03%	0.05%	0.03%	0.01%
16R	16RA2B4	0.02%	0.03%	0.05%	0.03%	0.01%
16R	16RA2C	0.08%	0.09%	0.16%	0.08%	0.04%
16R	16RA2C1	0.05%	0.06%	0.10%	0.05%	0.03%
16R	16RA2C2	0.05%	0.06%	0.10%	0.05%	0.03%
16R	16RA2C3	0.01%	0.01%	0.02%	0.01%	0.01%
16R	16RA2C4	0.01%	0.01%	0.02%	0.01%	0.01%
16R	16RA3A	1.14%	1.33%	2.35%	1.26%	0.70%
16R	16RA3A1	0.72%	0.84%	1.49%	0.80%	0.44%
16R	16RA3A2	0.72%	0.84%	1.49%	0.80%	0.44%
16R	16RA3A3	0.19%	0.22%	0.38%	0.21%	0.11%
16R	16RA3A4	0.19%	0.22%	0.38%	0.21%	0.11%
16R	16RA3B	0.91%	1.06%	1.88%	1.01%	0.56%
16R	16RA3B1	0.57%	0.67%	1.19%	0.64%	0.35%
16R	16RA3B2	0.57%	0.67%	1.19%	0.64%	0.35%
16R	16RA3B3	0.15%	0.17%	0.31%	0.16%	0.09%
16R	16RA3B4	0.15%	0.17%	0.31%	0.16%	0.09%
16R	16RA3C	0.23%	0.27%	0.47%	0.25%	0.14%
16R	16RA3C1	0.14%	0.17%	0.30%	0.16%	0.09%
16R	16RA3C2	0.14%	0.17%	0.30%	0.16%	0.09%
16R	16RA3C3	0.04%	0.04%	0.07%	0.04%	0.02%
16R	16RA3C4	0.04%	0.04%	0.07%	0.04%	0.02%
16R	16RA4A	1.31%	1.53%	2.71%	1.45%	0.80%
16R	16RA4A1	1.12%	1.32%	2.33%	1.25%	0.69%
16R	16RA4A2	1.12%	1.32%	2.33%	1.25%	0.69%
16R	16RA4A3	0.71%	0.83%	1.48%	0.79%	0.44%
16R	16RA4A4	0.71%	0.83%	1.48%	0.79%	0.44%
16R	16RA4A5	0.34%	0.39%	0.70%	0.37%	0.21%
16R	16RA4A6	0.34%	0.39%	0.70%	0.37%	0.21%
16R	16RA4A7	0.12%	0.14%	0.24%	0.13%	0.07%
16R	16RA4A8	0.12%	0.14%	0.24%	0.13%	0.07%
16R	16RA4B	0.04%	0.05%	0.09%	0.05%	0.02%
16R	16RA4B1	0.04%	0.04%	0.08%	0.04%	0.02%
16R	16RA4B2	0.04%	0.04%	0.08%	0.04%	0.02%
16R	16RA4B3	0.02%	0.03%	0.05%	0.03%	0.01%
16R	16RA4B4	0.02%	0.03%	0.05%	0.03%	0.01%

Table 3-12, *Continued*
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16R	16RA4B5	0.01%	0.01%	0.02%	0.01%	0.01%
16R	16RA4B6	0.01%	0.01%	0.02%	0.01%	0.01%
16R	16RA4B7	0.00%	0.00%	0.01%	0.00%	0.00%
16R	16RA4B8	0.00%	0.00%	0.01%	0.00%	0.00%
16R	16RA5A	1.09%	1.28%	2.26%	1.21%	0.67%
16R	16RA5A1	0.94%	1.10%	1.94%	1.04%	0.57%
16R	16RA5A2	0.94%	1.10%	1.94%	1.04%	0.57%
16R	16RA5A3	0.59%	0.70%	1.23%	0.66%	0.36%
16R	16RA5A4	0.59%	0.70%	1.23%	0.66%	0.36%
16R	16RA5A5	0.28%	0.33%	0.58%	0.31%	0.17%
16R	16RA5A6	0.28%	0.33%	0.58%	0.31%	0.17%
16R	16RA5A7	0.10%	0.11%	0.20%	0.11%	0.06%
16R	16RA5A8	0.10%	0.11%	0.20%	0.11%	0.06%
16R	16RA5B	0.04%	0.05%	0.09%	0.05%	0.02%
16R	16RA5B1	0.04%	0.04%	0.08%	0.04%	0.02%
16R	16RA5B2	0.04%	0.04%	0.08%	0.04%	0.02%
16R	16RA5B3	0.02%	0.03%	0.05%	0.03%	0.01%
16R	16RA5B4	0.02%	0.03%	0.05%	0.03%	0.01%
16R	16RA5B5	0.01%	0.01%	0.02%	0.01%	0.01%
16R	16RA5B6	0.01%	0.01%	0.02%	0.01%	0.01%
16R	16RA5B7	0.00%	0.00%	0.01%	0.00%	0.00%
16R	16RA5B8	0.00%	0.00%	0.01%	0.00%	0.00%
34C	34CA2A	0.42%	0.42%	0.18%	0.42%	0.56%
34C	34CA2A1	0.27%	0.27%	0.11%	0.26%	0.35%
34C	34CA2A2	0.27%	0.27%	0.11%	0.26%	0.35%
34C	34CA2A3	0.07%	0.07%	0.03%	0.07%	0.09%
34C	34CA2A4	0.07%	0.07%	0.03%	0.07%	0.09%
34C	34CA2B	0.37%	0.37%	0.16%	0.36%	0.49%
34C	34CA2B1	0.23%	0.23%	0.10%	0.23%	0.31%
34C	34CA2B2	0.23%	0.23%	0.10%	0.23%	0.31%
34C	34CA2B3	0.06%	0.06%	0.02%	0.06%	0.08%
34C	34CA2B4	0.06%	0.06%	0.02%	0.06%	0.08%
34C	34CA2C	0.11%	0.11%	0.04%	0.10%	0.14%
34C	34CA2C1	0.07%	0.07%	0.03%	0.07%	0.09%
34C	34CA2C2	0.07%	0.07%	0.03%	0.07%	0.09%
34C	34CA2C3	0.02%	0.02%	0.01%	0.02%	0.02%
34C	34CA2C4	0.02%	0.02%	0.01%	0.02%	0.02%
34C	34CA2D	0.37%	0.37%	0.16%	0.36%	0.49%
34C	34CA2D1	0.23%	0.23%	0.10%	0.23%	0.31%
34C	34CA2D2	0.23%	0.23%	0.10%	0.23%	0.31%
34C	34CA2D3	0.06%	0.06%	0.02%	0.06%	0.08%
34C	34CA2D4	0.06%	0.06%	0.02%	0.06%	0.08%
34C	34CA3A	0.96%	0.95%	0.40%	0.94%	1.25%
34C	34CA3A1	0.60%	0.60%	0.25%	0.59%	0.79%

Table 3-12, *Continued*
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34C	34CA3A2	0.60%	0.60%	0.25%	0.59%	0.79%
34C	34CA3A3	0.16%	0.16%	0.06%	0.15%	0.20%
34C	34CA3A4	0.16%	0.16%	0.06%	0.15%	0.20%
34C	34CA3B	0.90%	0.90%	0.38%	0.89%	1.18%
34C	34CA3B1	0.57%	0.57%	0.24%	0.56%	0.75%
34C	34CA3B2	0.57%	0.57%	0.24%	0.56%	0.75%
34C	34CA3B3	0.15%	0.15%	0.06%	0.14%	0.19%
34C	34CA3B4	0.15%	0.15%	0.06%	0.14%	0.19%
34C	34CA3C	0.11%	0.11%	0.04%	0.10%	0.14%
34C	34CA3C1	0.07%	0.07%	0.03%	0.07%	0.09%
34C	34CA3C2	0.07%	0.07%	0.03%	0.07%	0.09%
34C	34CA3C3	0.02%	0.02%	0.01%	0.02%	0.02%
34C	34CA3C4	0.02%	0.02%	0.01%	0.02%	0.02%
34C	34CA4A	0.70%	0.70%	0.29%	0.66%	0.88%
34C	34CA4A1	0.60%	0.60%	0.25%	0.57%	0.76%
34C	34CA4A2	0.60%	0.60%	0.25%	0.57%	0.76%
34C	34CA4A3	0.38%	0.38%	0.16%	0.36%	0.48%
34C	34CA4A4	0.38%	0.38%	0.16%	0.36%	0.48%
34C	34CA4A5	0.18%	0.18%	0.07%	0.17%	0.23%
34C	34CA4A6	0.18%	0.18%	0.07%	0.17%	0.23%
34C	34CA4A7	0.06%	0.06%	0.02%	0.06%	0.08%
34C	34CA4A8	0.06%	0.06%	0.02%	0.06%	0.08%
34C	34CA5A	0.46%	0.46%	0.19%	0.45%	0.60%
34C	34CA5A1	0.39%	0.39%	0.17%	0.39%	0.52%
34C	34CA5A2	0.39%	0.39%	0.17%	0.39%	0.52%
34C	34CA5A3	0.25%	0.25%	0.10%	0.25%	0.33%
34C	34CA5A4	0.25%	0.25%	0.10%	0.25%	0.33%
34C	34CA5A5	0.12%	0.12%	0.05%	0.12%	0.15%
34C	34CA5A6	0.12%	0.12%	0.05%	0.12%	0.15%
34C	34CA5A7	0.04%	0.04%	0.02%	0.04%	0.05%
34C	34CA5A8	0.04%	0.04%	0.02%	0.04%	0.05%
34C	34CA5B	0.00%	0.00%	0.00%	0.09%	0.12%
34C	34CA5B1	0.00%	0.00%	0.00%	0.02%	0.03%
34C	34CA5B2	0.00%	0.00%	0.00%	0.02%	0.03%
34C	34CA5C	0.03%	0.03%	0.01%	0.03%	0.04%
34C	34CA5C1	0.03%	0.03%	0.01%	0.03%	0.03%
34C	34CA5C2	0.03%	0.03%	0.01%	0.03%	0.03%
34C	34CA5C3	0.02%	0.02%	0.01%	0.02%	0.02%
34C	34CA5C4	0.02%	0.02%	0.01%	0.02%	0.02%
34C	34CA5C5	0.01%	0.01%	0.00%	0.01%	0.01%
34C	34CA5C6	0.01%	0.01%	0.00%	0.01%	0.01%
34C	34CA5C7	0.00%	0.00%	0.00%	0.00%	0.00%
34C	34CA5C8	0.00%	0.00%	0.00%	0.00%	0.00%
34L	34LA2A	0.29%	0.28%	0.67%	0.33%	0.46%

Table 3-12, *Continued*
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34L	34LA2A1	0.18%	0.18%	0.43%	0.21%	0.29%
34L	34LA2A2	0.18%	0.18%	0.43%	0.21%	0.29%
34L	34LA2A3	0.05%	0.05%	0.11%	0.05%	0.08%
34L	34LA2A4	0.05%	0.05%	0.11%	0.05%	0.08%
34L	34LA2B	0.25%	0.25%	0.59%	0.29%	0.41%
34L	34LA2B1	0.16%	0.16%	0.37%	0.18%	0.26%
34L	34LA2B2	0.16%	0.16%	0.37%	0.18%	0.26%
34L	34LA2B3	0.04%	0.04%	0.10%	0.05%	0.07%
34L	34LA2B4	0.04%	0.04%	0.10%	0.05%	0.07%
34L	34LA2C	0.07%	0.07%	0.17%	0.08%	0.12%
34L	34LA2C1	0.05%	0.04%	0.11%	0.05%	0.07%
34L	34LA2C2	0.05%	0.04%	0.11%	0.05%	0.07%
34L	34LA2C3	0.01%	0.01%	0.03%	0.01%	0.02%
34L	34LA2C4	0.01%	0.01%	0.03%	0.01%	0.02%
34L	34LA2D	0.25%	0.25%	0.59%	0.29%	0.41%
34L	34LA2D1	0.16%	0.16%	0.37%	0.18%	0.26%
34L	34LA2D2	0.16%	0.16%	0.37%	0.18%	0.26%
34L	34LA2D3	0.04%	0.04%	0.10%	0.05%	0.07%
34L	34LA2D4	0.04%	0.04%	0.10%	0.05%	0.07%
34L	34LA3A	0.65%	0.63%	1.52%	0.73%	1.04%
34L	34LA3A1	0.41%	0.40%	0.96%	0.46%	0.66%
34L	34LA3A2	0.41%	0.40%	0.96%	0.46%	0.66%
34L	34LA3A3	0.11%	0.10%	0.25%	0.12%	0.17%
34L	34LA3A4	0.11%	0.10%	0.25%	0.12%	0.17%
34L	34LA3B	0.62%	0.60%	1.43%	0.69%	0.99%
34L	34LA3B1	0.39%	0.38%	0.91%	0.44%	0.62%
34L	34LA3B2	0.39%	0.38%	0.91%	0.44%	0.62%
34L	34LA3B3	0.10%	0.10%	0.23%	0.11%	0.16%
34L	34LA3B4	0.10%	0.10%	0.23%	0.11%	0.16%
34L	34LA3C	0.07%	0.07%	0.17%	0.08%	0.12%
34L	34LA3C1	0.05%	0.04%	0.11%	0.05%	0.07%
34L	34LA3C2	0.05%	0.04%	0.11%	0.05%	0.07%
34L	34LA3C3	0.01%	0.01%	0.03%	0.01%	0.02%
34L	34LA3C4	0.01%	0.01%	0.03%	0.01%	0.02%
34L	34LA4A	0.48%	0.47%	1.12%	0.52%	0.73%
34L	34LA4A1	0.41%	0.40%	0.96%	0.44%	0.63%
34L	34LA4A2	0.41%	0.40%	0.96%	0.44%	0.63%
34L	34LA4A3	0.26%	0.25%	0.61%	0.28%	0.40%
34L	34LA4A4	0.26%	0.25%	0.61%	0.28%	0.40%
34L	34LA4A5	0.12%	0.12%	0.29%	0.13%	0.19%
34L	34LA4A6	0.12%	0.12%	0.29%	0.13%	0.19%
34L	34LA4A7	0.04%	0.04%	0.10%	0.05%	0.07%
34L	34LA4A8	0.04%	0.04%	0.10%	0.05%	0.07%
34L	34LA5A	0.31%	0.30%	0.73%	0.35%	0.50%

Table 3-12, *Continued*
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34L	34LA5A1	0.27%	0.26%	0.63%	0.30%	0.43%
34L	34LA5A2	0.27%	0.26%	0.63%	0.30%	0.43%
34L	34LA5A3	0.17%	0.17%	0.40%	0.19%	0.27%
34L	34LA5A4	0.17%	0.17%	0.40%	0.19%	0.27%
34L	34LA5A5	0.08%	0.08%	0.19%	0.09%	0.13%
34L	34LA5A6	0.08%	0.08%	0.19%	0.09%	0.13%
34L	34LA5A7	0.03%	0.03%	0.06%	0.03%	0.04%
34L	34LA5A8	0.03%	0.03%	0.06%	0.03%	0.04%
34L	34LA5B	0.00%	0.00%	0.00%	0.07%	0.10%
34L	34LA5B1	0.00%	0.00%	0.00%	0.02%	0.02%
34L	34LA5B2	0.00%	0.00%	0.00%	0.02%	0.02%
34L	34LA5C	0.02%	0.02%	0.05%	0.02%	0.03%
34L	34LA5C1	0.02%	0.02%	0.04%	0.02%	0.03%
34L	34LA5C2	0.02%	0.02%	0.04%	0.02%	0.03%
34L	34LA5C3	0.01%	0.01%	0.02%	0.01%	0.02%
34L	34LA5C4	0.01%	0.01%	0.02%	0.01%	0.02%
34L	34LA5C5	0.01%	0.01%	0.01%	0.01%	0.01%
34L	34LA5C6	0.01%	0.01%	0.01%	0.01%	0.01%
34L	34LA5C7	0.00%	0.00%	0.00%	0.00%	0.00%
34L	34LA5C8	0.00%	0.00%	0.00%	0.00%	0.00%
34R	34RA2A	0.40%	0.35%	0.21%	0.31%	0.28%
34R	34RA2A1	0.25%	0.22%	0.13%	0.19%	0.18%
34R	34RA2A2	0.25%	0.22%	0.13%	0.19%	0.18%
34R	34RA2A3	0.07%	0.06%	0.03%	0.05%	0.04%
34R	34RA2A4	0.07%	0.06%	0.03%	0.05%	0.04%
34R	34RA2B	0.35%	0.30%	0.19%	0.27%	0.24%
34R	34RA2B1	0.22%	0.19%	0.12%	0.17%	0.15%
34R	34RA2B2	0.22%	0.19%	0.12%	0.17%	0.15%
34R	34RA2B3	0.06%	0.05%	0.03%	0.04%	0.04%
34R	34RA2B4	0.06%	0.05%	0.03%	0.04%	0.04%
34R	34RA2C	0.10%	0.09%	0.05%	0.08%	0.07%
34R	34RA2C1	0.06%	0.05%	0.03%	0.05%	0.04%
34R	34RA2C2	0.06%	0.05%	0.03%	0.05%	0.04%
34R	34RA2C3	0.02%	0.01%	0.01%	0.01%	0.01%
34R	34RA2C4	0.02%	0.01%	0.01%	0.01%	0.01%
34R	34RA2D	0.35%	0.30%	0.19%	0.27%	0.24%
34R	34RA2D1	0.22%	0.19%	0.12%	0.17%	0.15%
34R	34RA2D2	0.22%	0.19%	0.12%	0.17%	0.15%
34R	34RA2D3	0.06%	0.05%	0.03%	0.04%	0.04%
34R	34RA2D4	0.06%	0.05%	0.03%	0.04%	0.04%
34R	34RA3A	0.91%	0.78%	0.48%	0.69%	0.63%
34R	34RA3A1	0.57%	0.49%	0.30%	0.44%	0.40%
34R	34RA3A2	0.57%	0.49%	0.30%	0.44%	0.40%
34R	34RA3A3	0.15%	0.13%	0.08%	0.11%	0.10%

Table 3-12, *Continued*
INM ARRIVAL FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34R	34RA3A4	0.15%	0.13%	0.08%	0.11%	0.10%
34R	34RA3B	0.86%	0.74%	0.45%	0.65%	0.59%
34R	34RA3B1	0.54%	0.47%	0.29%	0.41%	0.37%
34R	34RA3B2	0.54%	0.47%	0.29%	0.41%	0.37%
34R	34RA3B3	0.14%	0.12%	0.07%	0.11%	0.10%
34R	34RA3B4	0.14%	0.12%	0.07%	0.11%	0.10%
34R	34RA3C	0.10%	0.09%	0.05%	0.08%	0.07%
34R	34RA3C1	0.06%	0.05%	0.03%	0.05%	0.04%
34R	34RA3C2	0.06%	0.05%	0.03%	0.05%	0.04%
34R	34RA3C3	0.02%	0.01%	0.01%	0.01%	0.01%
34R	34RA3C4	0.02%	0.01%	0.01%	0.01%	0.01%
34R	34RA4A	0.67%	0.57%	0.35%	0.49%	0.44%
34R	34RA4A1	0.57%	0.49%	0.30%	0.42%	0.38%
34R	34RA4A2	0.57%	0.49%	0.30%	0.42%	0.38%
34R	34RA4A3	0.36%	0.31%	0.19%	0.27%	0.24%
34R	34RA4A4	0.36%	0.31%	0.19%	0.27%	0.24%
34R	34RA4A5	0.17%	0.15%	0.09%	0.12%	0.11%
34R	34RA4A6	0.17%	0.15%	0.09%	0.12%	0.11%
34R	34RA4A7	0.06%	0.05%	0.03%	0.04%	0.04%
34R	34RA4A8	0.06%	0.05%	0.03%	0.04%	0.04%
34R	34RA5A	0.43%	0.37%	0.23%	0.33%	0.30%
34R	34RA5A1	0.37%	0.32%	0.20%	0.29%	0.26%
34R	34RA5A2	0.37%	0.32%	0.20%	0.29%	0.26%
34R	34RA5A3	0.24%	0.20%	0.12%	0.18%	0.16%
34R	34RA5A4	0.24%	0.20%	0.12%	0.18%	0.16%
34R	34RA5A5	0.11%	0.10%	0.06%	0.09%	0.08%
34R	34RA5A6	0.11%	0.10%	0.06%	0.09%	0.08%
34R	34RA5A7	0.04%	0.03%	0.02%	0.03%	0.02%
34R	34RA5A8	0.04%	0.03%	0.02%	0.03%	0.02%
34R	34RA5B	0.00%	0.00%	0.00%	0.07%	0.06%
34R	34RA5B1	0.00%	0.00%	0.00%	0.02%	0.01%
34R	34RA5B2	0.00%	0.00%	0.00%	0.02%	0.01%
34R	34RA5C	0.03%	0.02%	0.01%	0.02%	0.02%
34R	34RA5C1	0.02%	0.02%	0.01%	0.02%	0.02%
34R	34RA5C2	0.02%	0.02%	0.01%	0.02%	0.02%
34R	34RA5C3	0.02%	0.01%	0.01%	0.01%	0.01%
34R	34RA5C4	0.02%	0.01%	0.01%	0.01%	0.01%
34R	34RA5C5	0.01%	0.01%	0.00%	0.01%	0.00%
34R	34RA5C6	0.01%	0.01%	0.00%	0.01%	0.00%
34R	34RA5C7	0.00%	0.00%	0.00%	0.00%	0.00%
34R	34RA5C8	0.00%	0.00%	0.00%	0.00%	0.00%

Note: Sum of totals may not equal 100 percent due to rounding; some tracks were modeled with less than 0.00 percent of operations.

Source: Seattle-Tacoma International Airport ANOMS Data, 2009-2012; Landrum & Brown, 2013.

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Table 3-13
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16C	16CD1A	2.10%	2.65%	3.45%	0.00%	0.00%
16C	16CD1A1	1.33%	1.67%	2.18%	0.00%	0.00%
16C	16CD1A2	1.33%	1.67%	2.18%	0.00%	0.00%
16C	16CD1A3	0.34%	0.43%	0.56%	0.00%	0.00%
16C	16CD1A4	0.34%	0.43%	0.56%	0.00%	0.00%
16C	16CD1B	0.52%	0.66%	0.86%	0.69%	0.56%
16C	16CD1B1	0.33%	0.42%	0.54%	0.44%	0.36%
16C	16CD1B2	0.33%	0.42%	0.54%	0.44%	0.36%
16C	16CD1B3	0.09%	0.11%	0.14%	0.11%	0.09%
16C	16CD1B4	0.09%	0.11%	0.14%	0.11%	0.09%
16C	16CD1C	0.00%	0.00%	0.00%	0.35%	0.28%
16C	16CD1C1	0.00%	0.00%	0.00%	0.22%	0.18%
16C	16CD1C2	0.00%	0.00%	0.00%	0.22%	0.18%
16C	16CD1C3	0.00%	0.00%	0.00%	0.06%	0.04%
16C	16CD1C4	0.00%	0.00%	0.00%	0.06%	0.04%
16C	16CD1D	0.13%	0.17%	0.22%	0.00%	0.00%
16C	16CD1D1	0.08%	0.10%	0.14%	0.00%	0.00%
16C	16CD1D2	0.08%	0.10%	0.14%	0.00%	0.00%
16C	16CD1D3	0.02%	0.03%	0.03%	0.00%	0.00%
16C	16CD1D4	0.02%	0.03%	0.03%	0.00%	0.00%
16C	16CD2A	0.33%	0.41%	0.54%	0.00%	0.00%
16C	16CD2A1	0.21%	0.26%	0.34%	0.00%	0.00%
16C	16CD2A2	0.21%	0.26%	0.34%	0.00%	0.00%
16C	16CD2A3	0.05%	0.07%	0.09%	0.00%	0.00%
16C	16CD2A4	0.05%	0.07%	0.09%	0.00%	0.00%
16C	16CD2B	2.10%	2.65%	3.45%	0.00%	0.00%
16C	16CD2B1	1.33%	1.67%	2.18%	0.00%	0.00%
16C	16CD2B2	1.33%	1.67%	2.18%	0.00%	0.00%
16C	16CD2B3	0.34%	0.43%	0.56%	0.00%	0.00%
16C	16CD2B4	0.34%	0.43%	0.56%	0.00%	0.00%
16C	16CD3A	0.98%	1.24%	1.62%	0.00%	0.00%
16C	16CD3A1	0.62%	0.78%	1.02%	0.00%	0.00%
16C	16CD3A2	0.62%	0.78%	1.02%	0.00%	0.00%
16C	16CD3A3	0.16%	0.20%	0.26%	0.00%	0.00%
16C	16CD3A4	0.16%	0.20%	0.26%	0.00%	0.00%
16C	16CD3B	0.39%	0.50%	0.65%	0.00%	0.00%
16C	16CD3B1	0.25%	0.31%	0.41%	0.00%	0.00%
16C	16CD3B2	0.25%	0.31%	0.41%	0.00%	0.00%
16C	16CD3B3	0.06%	0.08%	0.10%	0.00%	0.00%
16C	16CD3B4	0.06%	0.08%	0.10%	0.00%	0.00%
16C	16CD4A	0.00%	0.00%	0.00%	1.73%	1.41%
16C	16CD4A1	0.00%	0.00%	0.00%	1.10%	0.89%
16C	16CD4A2	0.00%	0.00%	0.00%	1.10%	0.89%
16C	16CD4A3	0.00%	0.00%	0.00%	0.28%	0.23%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16C	16CD4A4	0.00%	0.00%	0.00%	0.28%	0.23%
16C	16CD4B	0.00%	0.00%	0.00%	1.73%	1.41%
16C	16CD4B1	0.00%	0.00%	0.00%	1.10%	0.89%
16C	16CD4B2	0.00%	0.00%	0.00%	1.10%	0.89%
16C	16CD4B3	0.00%	0.00%	0.00%	0.28%	0.23%
16C	16CD4B4	0.00%	0.00%	0.00%	0.28%	0.23%
16C	16CD4C	0.00%	0.00%	0.00%	0.35%	0.28%
16C	16CD4C1	0.00%	0.00%	0.00%	0.22%	0.18%
16C	16CD4C2	0.00%	0.00%	0.00%	0.22%	0.18%
16C	16CD4C3	0.00%	0.00%	0.00%	0.06%	0.04%
16C	16CD4C4	0.00%	0.00%	0.00%	0.06%	0.04%
16C	16CD5A	0.00%	0.00%	0.00%	0.69%	0.56%
16C	16CD5A1	0.00%	0.00%	0.00%	0.44%	0.36%
16C	16CD5A2	0.00%	0.00%	0.00%	0.44%	0.36%
16C	16CD5A3	0.00%	0.00%	0.00%	0.11%	0.09%
16C	16CD5A4	0.00%	0.00%	0.00%	0.11%	0.09%
16C	16CD5B	0.00%	0.00%	0.00%	0.69%	0.56%
16C	16CD5B1	0.00%	0.00%	0.00%	0.44%	0.36%
16C	16CD5B2	0.00%	0.00%	0.00%	0.44%	0.36%
16C	16CD5B3	0.00%	0.00%	0.00%	0.11%	0.09%
16C	16CD5B4	0.00%	0.00%	0.00%	0.11%	0.09%
16C	16CD5C	0.00%	0.00%	0.00%	0.69%	0.56%
16C	16CD5C1	0.00%	0.00%	0.00%	0.44%	0.36%
16C	16CD5C2	0.00%	0.00%	0.00%	0.44%	0.36%
16C	16CD5C3	0.00%	0.00%	0.00%	0.11%	0.09%
16C	16CD5C4	0.00%	0.00%	0.00%	0.11%	0.09%
16L	16LD1A	6.04%	5.55%	2.65%	0.00%	0.00%
16L	16LD1A1	3.82%	3.51%	1.68%	0.00%	0.00%
16L	16LD1A2	3.82%	3.51%	1.68%	0.00%	0.00%
16L	16LD1A3	0.98%	0.91%	0.43%	0.00%	0.00%
16L	16LD1A4	0.98%	0.91%	0.43%	0.00%	0.00%
16L	16LD1B	1.51%	1.39%	0.66%	1.74%	0.56%
16L	16LD1B1	0.95%	0.88%	0.42%	1.10%	0.36%
16L	16LD1B2	0.95%	0.88%	0.42%	1.10%	0.36%
16L	16LD1B3	0.25%	0.23%	0.11%	0.28%	0.09%
16L	16LD1B4	0.25%	0.23%	0.11%	0.28%	0.09%
16L	16LD1C	0.00%	0.00%	0.00%	0.87%	0.28%
16L	16LD1C1	0.00%	0.00%	0.00%	0.55%	0.18%
16L	16LD1C2	0.00%	0.00%	0.00%	0.55%	0.18%
16L	16LD1C3	0.00%	0.00%	0.00%	0.14%	0.04%
16L	16LD1C4	0.00%	0.00%	0.00%	0.14%	0.04%
16L	16LD1D	0.38%	0.35%	0.17%	0.00%	0.00%
16L	16LD1D1	0.24%	0.22%	0.10%	0.00%	0.00%
16L	16LD1D2	0.24%	0.22%	0.10%	0.00%	0.00%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16L	16LD1D3	0.06%	0.06%	0.03%	0.00%	0.00%
16L	16LD1D4	0.06%	0.06%	0.03%	0.00%	0.00%
16L	16LD2A	0.94%	0.87%	0.41%	0.00%	0.00%
16L	16LD2A1	0.60%	0.55%	0.26%	0.00%	0.00%
16L	16LD2A2	0.60%	0.55%	0.26%	0.00%	0.00%
16L	16LD2A3	0.15%	0.14%	0.07%	0.00%	0.00%
16L	16LD2A4	0.15%	0.14%	0.07%	0.00%	0.00%
16L	16LD2B	6.04%	5.55%	2.65%	0.00%	0.00%
16L	16LD2B1	3.82%	3.51%	1.68%	0.00%	0.00%
16L	16LD2B2	3.82%	3.51%	1.68%	0.00%	0.00%
16L	16LD2B3	0.98%	0.91%	0.43%	0.00%	0.00%
16L	16LD2B4	0.98%	0.91%	0.43%	0.00%	0.00%
16L	16LD3A	2.83%	2.60%	1.24%	0.00%	0.00%
16L	16LD3A1	1.79%	1.65%	0.79%	0.00%	0.00%
16L	16LD3A2	1.79%	1.65%	0.79%	0.00%	0.00%
16L	16LD3A3	0.46%	0.42%	0.20%	0.00%	0.00%
16L	16LD3A4	0.46%	0.42%	0.20%	0.00%	0.00%
16L	16LD3B	1.13%	1.04%	0.50%	0.00%	0.00%
16L	16LD3B1	0.72%	0.66%	0.31%	0.00%	0.00%
16L	16LD3B2	0.72%	0.66%	0.31%	0.00%	0.00%
16L	16LD3B3	0.18%	0.17%	0.08%	0.00%	0.00%
16L	16LD3B4	0.18%	0.17%	0.08%	0.00%	0.00%
16L	16LD4A	0.00%	0.00%	0.00%	4.34%	1.40%
16L	16LD4A1	0.00%	0.00%	0.00%	2.74%	0.89%
16L	16LD4A2	0.00%	0.00%	0.00%	2.74%	0.89%
16L	16LD4A3	0.00%	0.00%	0.00%	0.71%	0.23%
16L	16LD4A4	0.00%	0.00%	0.00%	0.71%	0.23%
16L	16LD4B	0.00%	0.00%	0.00%	4.34%	1.40%
16L	16LD4B1	0.00%	0.00%	0.00%	2.74%	0.89%
16L	16LD4B2	0.00%	0.00%	0.00%	2.74%	0.89%
16L	16LD4B3	0.00%	0.00%	0.00%	0.71%	0.23%
16L	16LD4B4	0.00%	0.00%	0.00%	0.71%	0.23%
16L	16LD4C	0.00%	0.00%	0.00%	0.87%	0.28%
16L	16LD4C1	0.00%	0.00%	0.00%	0.55%	0.18%
16L	16LD4C2	0.00%	0.00%	0.00%	0.55%	0.18%
16L	16LD4C3	0.00%	0.00%	0.00%	0.14%	0.04%
16L	16LD4C4	0.00%	0.00%	0.00%	0.14%	0.04%
16L	16LD5A	0.00%	0.00%	0.00%	1.74%	0.56%
16L	16LD5A1	0.00%	0.00%	0.00%	1.10%	0.36%
16L	16LD5A2	0.00%	0.00%	0.00%	1.10%	0.36%
16L	16LD5A3	0.00%	0.00%	0.00%	0.28%	0.09%
16L	16LD5A4	0.00%	0.00%	0.00%	0.28%	0.09%
16L	16LD5B	0.00%	0.00%	0.00%	1.74%	0.56%
16L	16LD5B1	0.00%	0.00%	0.00%	1.10%	0.36%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16L	16LD5B2	0.00%	0.00%	0.00%	1.10%	0.36%
16L	16LD5B3	0.00%	0.00%	0.00%	0.28%	0.09%
16L	16LD5B4	0.00%	0.00%	0.00%	0.28%	0.09%
16L	16LD5C	0.00%	0.00%	0.00%	1.74%	0.56%
16L	16LD5C1	0.00%	0.00%	0.00%	1.10%	0.36%
16L	16LD5C2	0.00%	0.00%	0.00%	1.10%	0.36%
16L	16LD5C3	0.00%	0.00%	0.00%	0.28%	0.09%
16L	16LD5C4	0.00%	0.00%	0.00%	0.28%	0.09%
16R	16RD1A	0.00%	0.00%	1.75%	0.00%	0.00%
16R	16RD1A1	0.00%	0.00%	1.10%	0.00%	0.00%
16R	16RD1A2	0.00%	0.00%	1.10%	0.00%	0.00%
16R	16RD1A3	0.00%	0.00%	0.28%	0.00%	0.00%
16R	16RD1A4	0.00%	0.00%	0.28%	0.00%	0.00%
16R	16RD1B	0.00%	0.00%	0.44%	0.03%	0.00%
16R	16RD1B1	0.00%	0.00%	0.28%	0.02%	0.00%
16R	16RD1B2	0.00%	0.00%	0.28%	0.02%	0.00%
16R	16RD1B3	0.00%	0.00%	0.07%	0.01%	0.00%
16R	16RD1B4	0.00%	0.00%	0.07%	0.01%	0.00%
16R	16RD1C	0.00%	0.00%	0.00%	0.02%	0.00%
16R	16RD1C1	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD1C2	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD1C3	0.00%	0.00%	0.00%	0.00%	0.00%
16R	16RD1C4	0.00%	0.00%	0.00%	0.00%	0.00%
16R	16RD1D	0.00%	0.00%	0.11%	0.00%	0.00%
16R	16RD1D1	0.00%	0.00%	0.07%	0.00%	0.00%
16R	16RD1D2	0.00%	0.00%	0.07%	0.00%	0.00%
16R	16RD1D3	0.00%	0.00%	0.02%	0.00%	0.00%
16R	16RD1D4	0.00%	0.00%	0.02%	0.00%	0.00%
16R	16RD2A	0.00%	0.00%	0.27%	0.00%	0.00%
16R	16RD2A1	0.00%	0.00%	0.17%	0.00%	0.00%
16R	16RD2A2	0.00%	0.00%	0.17%	0.00%	0.00%
16R	16RD2A3	0.00%	0.00%	0.04%	0.00%	0.00%
16R	16RD2A4	0.00%	0.00%	0.04%	0.00%	0.00%
16R	16RD2B	0.00%	0.00%	1.75%	0.00%	0.00%
16R	16RD2B1	0.00%	0.00%	1.10%	0.00%	0.00%
16R	16RD2B2	0.00%	0.00%	1.10%	0.00%	0.00%
16R	16RD2B3	0.00%	0.00%	0.28%	0.00%	0.00%
16R	16RD2B4	0.00%	0.00%	0.28%	0.00%	0.00%
16R	16RD3A	0.00%	0.00%	0.82%	0.00%	0.00%
16R	16RD3A1	0.00%	0.00%	0.52%	0.00%	0.00%
16R	16RD3A2	0.00%	0.00%	0.52%	0.00%	0.00%
16R	16RD3A3	0.00%	0.00%	0.13%	0.00%	0.00%
16R	16RD3A4	0.00%	0.00%	0.13%	0.00%	0.00%
16R	16RD3B	0.00%	0.00%	0.33%	0.00%	0.00%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
16R	16RD3B1	0.00%	0.00%	0.21%	0.00%	0.00%
16R	16RD3B2	0.00%	0.00%	0.21%	0.00%	0.00%
16R	16RD3B3	0.00%	0.00%	0.05%	0.00%	0.00%
16R	16RD3B4	0.00%	0.00%	0.05%	0.00%	0.00%
16R	16RD4A	0.00%	0.00%	0.00%	0.09%	0.00%
16R	16RD4A1	0.00%	0.00%	0.00%	0.05%	0.00%
16R	16RD4A2	0.00%	0.00%	0.00%	0.05%	0.00%
16R	16RD4A3	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD4A4	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD4B	0.00%	0.00%	0.00%	0.09%	0.00%
16R	16RD4B1	0.00%	0.00%	0.00%	0.05%	0.00%
16R	16RD4B2	0.00%	0.00%	0.00%	0.05%	0.00%
16R	16RD4B3	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD4B4	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD4C	0.00%	0.00%	0.00%	0.02%	0.00%
16R	16RD4C1	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD4C2	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD4C3	0.00%	0.00%	0.00%	0.00%	0.00%
16R	16RD4C4	0.00%	0.00%	0.00%	0.00%	0.00%
16R	16RD5A	0.00%	0.00%	0.00%	0.03%	0.00%
16R	16RD5A1	0.00%	0.00%	0.00%	0.02%	0.00%
16R	16RD5A2	0.00%	0.00%	0.00%	0.02%	0.00%
16R	16RD5A3	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD5A4	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD5B	0.00%	0.00%	0.00%	0.03%	0.00%
16R	16RD5B1	0.00%	0.00%	0.00%	0.02%	0.00%
16R	16RD5B2	0.00%	0.00%	0.00%	0.02%	0.00%
16R	16RD5B3	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD5B4	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD5C	0.00%	0.00%	0.00%	0.03%	0.00%
16R	16RD5C1	0.00%	0.00%	0.00%	0.02%	0.00%
16R	16RD5C2	0.00%	0.00%	0.00%	0.02%	0.00%
16R	16RD5C3	0.00%	0.00%	0.00%	0.01%	0.00%
16R	16RD5C4	0.00%	0.00%	0.00%	0.01%	0.00%
34C	34CD1	1.17%	1.31%	2.15%	0.00%	0.00%
34C	34CD11	0.74%	0.83%	1.36%	0.00%	0.00%
34C	34CD12	0.74%	0.83%	1.36%	0.00%	0.00%
34C	34CD13	0.19%	0.21%	0.35%	0.00%	0.00%
34C	34CD14	0.19%	0.21%	0.35%	0.00%	0.00%
34C	34CD2A	0.58%	0.66%	1.07%	0.00%	0.00%
34C	34CD2A1	0.37%	0.41%	0.68%	0.00%	0.00%
34C	34CD2A2	0.37%	0.41%	0.68%	0.00%	0.00%
34C	34CD2A3	0.10%	0.11%	0.18%	0.00%	0.00%
34C	34CD2A4	0.10%	0.11%	0.18%	0.00%	0.00%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34C	34CD2B	0.35%	0.39%	0.64%	0.00%	0.00%
34C	34CD2B1	0.22%	0.25%	0.41%	0.00%	0.00%
34C	34CD2B2	0.22%	0.25%	0.41%	0.00%	0.00%
34C	34CD2B3	0.06%	0.06%	0.10%	0.00%	0.00%
34C	34CD2B4	0.06%	0.06%	0.10%	0.00%	0.00%
34C	34CD2C	0.35%	0.39%	0.64%	0.00%	0.00%
34C	34CD2C1	0.22%	0.25%	0.41%	0.00%	0.00%
34C	34CD2C2	0.22%	0.25%	0.41%	0.00%	0.00%
34C	34CD2C3	0.06%	0.06%	0.10%	0.00%	0.00%
34C	34CD2C4	0.06%	0.06%	0.10%	0.00%	0.00%
34C	34CD2D	0.47%	0.52%	0.86%	0.00%	0.00%
34C	34CD2D1	0.29%	0.33%	0.54%	0.00%	0.00%
34C	34CD2D2	0.29%	0.33%	0.54%	0.00%	0.00%
34C	34CD2D3	0.08%	0.09%	0.14%	0.00%	0.00%
34C	34CD2D4	0.08%	0.09%	0.14%	0.00%	0.00%
34C	34CD3A	1.17%	1.31%	2.15%	0.00%	0.00%
34C	34CD3A1	0.74%	0.83%	1.36%	0.00%	0.00%
34C	34CD3A2	0.74%	0.83%	1.36%	0.00%	0.00%
34C	34CD3A3	0.19%	0.21%	0.35%	0.00%	0.00%
34C	34CD3A4	0.19%	0.21%	0.35%	0.00%	0.00%
34C	34CD3B	0.70%	0.79%	1.29%	0.00%	0.00%
34C	34CD3B1	0.44%	0.50%	0.81%	0.00%	0.00%
34C	34CD3B2	0.44%	0.50%	0.81%	0.00%	0.00%
34C	34CD3B3	0.11%	0.13%	0.21%	0.00%	0.00%
34C	34CD3B4	0.11%	0.13%	0.21%	0.00%	0.00%
34C	34CD3C	0.35%	0.39%	0.64%	0.00%	0.00%
34C	34CD3C1	0.22%	0.25%	0.41%	0.00%	0.00%
34C	34CD3C2	0.22%	0.25%	0.41%	0.00%	0.00%
34C	34CD3C3	0.06%	0.06%	0.10%	0.00%	0.00%
34C	34CD3C4	0.06%	0.06%	0.10%	0.00%	0.00%
34C	34CD3D	0.29%	0.33%	0.54%	0.00%	0.00%
34C	34CD3D1	0.18%	0.21%	0.34%	0.00%	0.00%
34C	34CD3D2	0.18%	0.21%	0.34%	0.00%	0.00%
34C	34CD3D3	0.05%	0.05%	0.09%	0.00%	0.00%
34C	34CD3D4	0.05%	0.05%	0.09%	0.00%	0.00%
34C	34CD3E	0.29%	0.33%	0.54%	0.00%	0.00%
34C	34CD3E1	0.18%	0.21%	0.34%	0.00%	0.00%
34C	34CD3E2	0.18%	0.21%	0.34%	0.00%	0.00%
34C	34CD3E3	0.05%	0.05%	0.09%	0.00%	0.00%
34C	34CD3E4	0.05%	0.05%	0.09%	0.00%	0.00%
34C	34CD3F	0.12%	0.13%	0.21%	0.00%	0.00%
34C	34CD3F1	0.07%	0.08%	0.14%	0.00%	0.00%
34C	34CD3F2	0.07%	0.08%	0.14%	0.00%	0.00%
34C	34CD3F3	0.02%	0.02%	0.03%	0.00%	0.00%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34C	34CD3F4	0.02%	0.02%	0.03%	0.00%	0.00%
34C	34CD4A	0.00%	0.00%	0.00%	1.35%	1.97%
34C	34CD4A1	0.00%	0.00%	0.00%	0.85%	1.25%
34C	34CD4A2	0.00%	0.00%	0.00%	0.85%	1.25%
34C	34CD4A3	0.00%	0.00%	0.00%	0.22%	0.32%
34C	34CD4A4	0.00%	0.00%	0.00%	0.22%	0.32%
34C	34CD4B	0.00%	0.00%	0.00%	1.01%	1.48%
34C	34CD4B1	0.00%	0.00%	0.00%	0.64%	0.93%
34C	34CD4B2	0.00%	0.00%	0.00%	0.64%	0.93%
34C	34CD4B3	0.00%	0.00%	0.00%	0.17%	0.24%
34C	34CD4B4	0.00%	0.00%	0.00%	0.17%	0.24%
34C	34CD4C	0.00%	0.00%	0.00%	0.34%	0.49%
34C	34CD4C1	0.00%	0.00%	0.00%	0.21%	0.31%
34C	34CD4C2	0.00%	0.00%	0.00%	0.21%	0.31%
34C	34CD4C3	0.00%	0.00%	0.00%	0.05%	0.08%
34C	34CD4C4	0.00%	0.00%	0.00%	0.05%	0.08%
34C	34CD5A	0.00%	0.00%	0.00%	2.36%	3.45%
34C	34CD5A1	0.00%	0.00%	0.00%	1.49%	2.18%
34C	34CD5A2	0.00%	0.00%	0.00%	1.49%	2.18%
34C	34CD5A3	0.00%	0.00%	0.00%	0.39%	0.56%
34C	34CD5A4	0.00%	0.00%	0.00%	0.39%	0.56%
34C	34CD5B	0.00%	0.00%	0.00%	1.69%	2.46%
34C	34CD5B1	0.00%	0.00%	0.00%	1.07%	1.56%
34C	34CD5B2	0.00%	0.00%	0.00%	1.07%	1.56%
34C	34CD5B3	0.00%	0.00%	0.00%	0.28%	0.40%
34C	34CD5B4	0.00%	0.00%	0.00%	0.28%	0.40%
34L	34LD1	0.00%	0.01%	0.30%	0.00%	0.00%
34L	34LD11	0.00%	0.00%	0.19%	0.00%	0.00%
34L	34LD12	0.00%	0.00%	0.19%	0.00%	0.00%
34L	34LD13	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD14	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD2A	0.00%	0.00%	0.15%	0.00%	0.00%
34L	34LD2A1	0.00%	0.00%	0.09%	0.00%	0.00%
34L	34LD2A2	0.00%	0.00%	0.09%	0.00%	0.00%
34L	34LD2A3	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD2A4	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD2B	0.00%	0.00%	0.09%	0.00%	0.00%
34L	34LD2B1	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD2B2	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD2B3	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD2B4	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD2C	0.00%	0.00%	0.09%	0.00%	0.00%
34L	34LD2C1	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD2C2	0.00%	0.00%	0.05%	0.00%	0.00%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34L	34LD2C3	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD2C4	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD2D	0.00%	0.00%	0.12%	0.00%	0.00%
34L	34LD2D1	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD2D2	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD2D3	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD2D4	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD3A	0.00%	0.01%	0.30%	0.00%	0.00%
34L	34LD3A1	0.00%	0.00%	0.19%	0.00%	0.00%
34L	34LD3A2	0.00%	0.00%	0.19%	0.00%	0.00%
34L	34LD3A3	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD3A4	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD3B	0.00%	0.00%	0.18%	0.00%	0.00%
34L	34LD3B1	0.00%	0.00%	0.11%	0.00%	0.00%
34L	34LD3B2	0.00%	0.00%	0.11%	0.00%	0.00%
34L	34LD3B3	0.00%	0.00%	0.03%	0.00%	0.00%
34L	34LD3B4	0.00%	0.00%	0.03%	0.00%	0.00%
34L	34LD3C	0.00%	0.00%	0.09%	0.00%	0.00%
34L	34LD3C1	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD3C2	0.00%	0.00%	0.05%	0.00%	0.00%
34L	34LD3C3	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3C4	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3D	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD3D1	0.00%	0.00%	0.04%	0.00%	0.00%
34L	34LD3D2	0.00%	0.00%	0.04%	0.00%	0.00%
34L	34LD3D3	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3D4	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3E	0.00%	0.00%	0.07%	0.00%	0.00%
34L	34LD3E1	0.00%	0.00%	0.04%	0.00%	0.00%
34L	34LD3E2	0.00%	0.00%	0.04%	0.00%	0.00%
34L	34LD3E3	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3E4	0.00%	0.00%	0.01%	0.00%	0.00%
34L	34LD3F	0.00%	0.00%	0.03%	0.00%	0.00%
34L	34LD3F1	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD3F2	0.00%	0.00%	0.02%	0.00%	0.00%
34L	34LD3F3	0.00%	0.00%	0.00%	0.00%	0.00%
34L	34LD3F4	0.00%	0.00%	0.00%	0.00%	0.00%
34L	34LD4A	0.00%	0.00%	0.00%	0.17%	0.00%
34L	34LD4A1	0.00%	0.00%	0.00%	0.11%	0.00%
34L	34LD4A2	0.00%	0.00%	0.00%	0.11%	0.00%
34L	34LD4A3	0.00%	0.00%	0.00%	0.03%	0.00%
34L	34LD4A4	0.00%	0.00%	0.00%	0.03%	0.00%
34L	34LD4B	0.00%	0.00%	0.00%	0.13%	0.00%
34L	34LD4B1	0.00%	0.00%	0.00%	0.08%	0.00%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34L	34LD4B2	0.00%	0.00%	0.00%	0.08%	0.00%
34L	34LD4B3	0.00%	0.00%	0.00%	0.02%	0.00%
34L	34LD4B4	0.00%	0.00%	0.00%	0.02%	0.00%
34L	34LD4C	0.00%	0.00%	0.00%	0.04%	0.00%
34L	34LD4C1	0.00%	0.00%	0.00%	0.03%	0.00%
34L	34LD4C2	0.00%	0.00%	0.00%	0.03%	0.00%
34L	34LD4C3	0.00%	0.00%	0.00%	0.01%	0.00%
34L	34LD4C4	0.00%	0.00%	0.00%	0.01%	0.00%
34L	34LD5A	0.00%	0.00%	0.00%	0.30%	0.00%
34L	34LD5A1	0.00%	0.00%	0.00%	0.19%	0.00%
34L	34LD5A2	0.00%	0.00%	0.00%	0.19%	0.00%
34L	34LD5A3	0.00%	0.00%	0.00%	0.05%	0.00%
34L	34LD5A4	0.00%	0.00%	0.00%	0.05%	0.00%
34L	34LD5B	0.00%	0.00%	0.00%	0.21%	0.00%
34L	34LD5B1	0.00%	0.00%	0.00%	0.13%	0.00%
34L	34LD5B2	0.00%	0.00%	0.00%	0.13%	0.00%
34L	34LD5B3	0.00%	0.00%	0.00%	0.03%	0.00%
34L	34LD5B4	0.00%	0.00%	0.00%	0.03%	0.00%
34R	34RD1	1.47%	1.28%	0.40%	0.00%	0.00%
34R	34RD11	0.93%	0.81%	0.25%	0.00%	0.00%
34R	34RD12	0.93%	0.81%	0.25%	0.00%	0.00%
34R	34RD13	0.24%	0.21%	0.06%	0.00%	0.00%
34R	34RD14	0.24%	0.21%	0.06%	0.00%	0.00%
34R	34RD2A	0.74%	0.64%	0.20%	0.00%	0.00%
34R	34RD2A1	0.46%	0.40%	0.12%	0.00%	0.00%
34R	34RD2A2	0.46%	0.40%	0.12%	0.00%	0.00%
34R	34RD2A3	0.12%	0.10%	0.03%	0.00%	0.00%
34R	34RD2A4	0.12%	0.10%	0.03%	0.00%	0.00%
34R	34RD2B	0.44%	0.38%	0.12%	0.00%	0.00%
34R	34RD2B1	0.28%	0.24%	0.07%	0.00%	0.00%
34R	34RD2B2	0.28%	0.24%	0.07%	0.00%	0.00%
34R	34RD2B3	0.07%	0.06%	0.02%	0.00%	0.00%
34R	34RD2B4	0.07%	0.06%	0.02%	0.00%	0.00%
34R	34RD2C	0.44%	0.38%	0.12%	0.00%	0.00%
34R	34RD2C1	0.28%	0.24%	0.07%	0.00%	0.00%
34R	34RD2C2	0.28%	0.24%	0.07%	0.00%	0.00%
34R	34RD2C3	0.07%	0.06%	0.02%	0.00%	0.00%
34R	34RD2C4	0.07%	0.06%	0.02%	0.00%	0.00%
34R	34RD2D	0.59%	0.51%	0.16%	0.00%	0.00%
34R	34RD2D1	0.37%	0.32%	0.10%	0.00%	0.00%
34R	34RD2D2	0.37%	0.32%	0.10%	0.00%	0.00%
34R	34RD2D3	0.10%	0.08%	0.02%	0.00%	0.00%
34R	34RD2D4	0.10%	0.08%	0.02%	0.00%	0.00%
34R	34RD3A	1.47%	1.28%	0.40%	0.00%	0.00%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34R	34RD3A1	0.93%	0.81%	0.25%	0.00%	0.00%
34R	34RD3A2	0.93%	0.81%	0.25%	0.00%	0.00%
34R	34RD3A3	0.24%	0.21%	0.06%	0.00%	0.00%
34R	34RD3A4	0.24%	0.21%	0.06%	0.00%	0.00%
34R	34RD3B	0.88%	0.77%	0.24%	0.00%	0.00%
34R	34RD3B1	0.56%	0.49%	0.15%	0.00%	0.00%
34R	34RD3B2	0.56%	0.49%	0.15%	0.00%	0.00%
34R	34RD3B3	0.14%	0.13%	0.04%	0.00%	0.00%
34R	34RD3B4	0.14%	0.13%	0.04%	0.00%	0.00%
34R	34RD3C	0.44%	0.38%	0.12%	0.00%	0.00%
34R	34RD3C1	0.28%	0.24%	0.07%	0.00%	0.00%
34R	34RD3C2	0.28%	0.24%	0.07%	0.00%	0.00%
34R	34RD3C3	0.07%	0.06%	0.02%	0.00%	0.00%
34R	34RD3C4	0.07%	0.06%	0.02%	0.00%	0.00%
34R	34RD3D	0.37%	0.32%	0.10%	0.00%	0.00%
34R	34RD3D1	0.23%	0.20%	0.06%	0.00%	0.00%
34R	34RD3D2	0.23%	0.20%	0.06%	0.00%	0.00%
34R	34RD3D3	0.06%	0.05%	0.01%	0.00%	0.00%
34R	34RD3D4	0.06%	0.05%	0.01%	0.00%	0.00%
34R	34RD3E	0.37%	0.32%	0.10%	0.00%	0.00%
34R	34RD3E1	0.23%	0.20%	0.06%	0.00%	0.00%
34R	34RD3E2	0.23%	0.20%	0.06%	0.00%	0.00%
34R	34RD3E3	0.06%	0.05%	0.01%	0.00%	0.00%
34R	34RD3E4	0.06%	0.05%	0.01%	0.00%	0.00%
34R	34RD3F	0.15%	0.13%	0.04%	0.00%	0.00%
34R	34RD3F1	0.09%	0.08%	0.02%	0.00%	0.00%
34R	34RD3F2	0.09%	0.08%	0.02%	0.00%	0.00%
34R	34RD3F3	0.02%	0.02%	0.00%	0.00%	0.00%
34R	34RD3F4	0.02%	0.02%	0.00%	0.00%	0.00%
34R	34RD4A	0.00%	0.00%	0.00%	1.27%	3.50%
34R	34RD4A1	0.00%	0.00%	0.00%	0.81%	2.21%
34R	34RD4A2	0.00%	0.00%	0.00%	0.81%	2.21%
34R	34RD4A3	0.00%	0.00%	0.00%	0.21%	0.57%
34R	34RD4A4	0.00%	0.00%	0.00%	0.21%	0.57%
34R	34RD4B	0.00%	0.00%	0.00%	0.96%	2.63%
34R	34RD4B1	0.00%	0.00%	0.00%	0.60%	1.66%
34R	34RD4B2	0.00%	0.00%	0.00%	0.60%	1.66%
34R	34RD4B3	0.00%	0.00%	0.00%	0.16%	0.43%
34R	34RD4B4	0.00%	0.00%	0.00%	0.16%	0.43%
34R	34RD4C	0.00%	0.00%	0.00%	0.32%	0.88%
34R	34RD4C1	0.00%	0.00%	0.00%	0.20%	0.55%
34R	34RD4C2	0.00%	0.00%	0.00%	0.20%	0.55%
34R	34RD4C3	0.00%	0.00%	0.00%	0.05%	0.14%
34R	34RD4C4	0.00%	0.00%	0.00%	0.05%	0.14%

Table 3-13, *Continued*
INM DEPARTURE FLIGHT TRACKS – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

RUNWAY	FLIGHT TRACK	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBOPROPS	GA PROPS
34R	34RD5A	0.00%	0.00%	0.00%	2.23%	6.13%
34R	34RD5A1	0.00%	0.00%	0.00%	1.41%	3.87%
34R	34RD5A2	0.00%	0.00%	0.00%	1.41%	3.87%
34R	34RD5A3	0.00%	0.00%	0.00%	0.36%	1.00%
34R	34RD5A4	0.00%	0.00%	0.00%	0.36%	1.00%
34R	34RD5B	0.00%	0.00%	0.00%	1.59%	4.38%
34R	34RD5B1	0.00%	0.00%	0.00%	1.01%	2.77%
34R	34RD5B2	0.00%	0.00%	0.00%	1.01%	2.77%
34R	34RD5B3	0.00%	0.00%	0.00%	0.26%	0.71%
34R	34RD5B4	0.00%	0.00%	0.00%	0.26%	0.71%

Note: Sum of totals may not equal 100 percent due to rounding; some tracks were modeled with less than 0.00 percent of operations.

Source: Seattle-Tacoma International Airport ANOMS Data, 2009-2012; Landrum & Brown, 2013.

Aircraft Weight and Trip Length

Aircraft weight upon departure is a factor in the dispersion of noise because it impacts the rate at which an aircraft is able to climb. Generally, heavier aircraft have a slower rate of climb and a wider dispersion of noise along their flight routes. Where specific aircraft weights are unknown, the INM 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. The INM groups trip lengths into seven stage categories and assigns standard aircraft weights to each stage category. These categories are:

Stage Category	Stage Length
1	0-500 nautical miles
2	500-1,000 nautical miles
3	1,000-1,500 nautical miles
4	1,500-2,500 nautical miles
5	2,500-3,500 nautical miles
6	3,500-4,500 nautical miles
7	4,500+ nautical miles

The trip lengths modeled for the Existing (2013) Baseline condition are based upon the typical departure destinations from Sea-Tac Airport. **Table 3-14, *Departure Trip Length Distribution Existing (2013) Baseline*** indicates the proportion of the operations that fell within each of the seven trip length categories that were modeled for the Existing (2013) Baseline.

Table 3-14
DEPARTURE TRIP LENGTH DISTRIBUTION – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

STAGE LENGTH	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBO-PROPS	GA PROPS	TOTAL
1	3.6%	45.0%	100.0%	100.0%	100.0%	34.3%
2	44.1%	55.0%	0.0%	0.0%	0.0%	30.9%
3	22.0%	0.0%	0.0%	0.0%	0.0%	14.7%
4	26.7%	0.0%	0.0%	0.0%	0.0%	17.7%
5	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%
6	2.4%	0.0%	0.0%	0.0%	0.0%	1.6%
7	1.0%	0.0%	0.0%	0.0%	0.0%	0.7%

Source: Landrum & Brown, 2013.

Approximately 34.3 percent of all departures were modeled with a stage length of one (0-500 nautical miles). Typical destinations within these distances from Sea-Tac Airport include Boise, Idaho; Portland, Oregon; and Vancouver, British Columbia. Another 30.9 percent of all departures were modeled with a stage length of two (500-1,000 nautical miles). Typical destinations within these distances from Sea-Tac Airport include Denver, Colorado; Las Vegas, Nevada; and Los Angeles, California. Approximately 14.7 percent of all departures were modeled with a stage length of three (1,000-1,500 nautical miles). Typical destinations within these distances from Sea-Tac Airport include Chicago, Illinois; Dallas, Texas; and Minneapolis-St. Paul, Minnesota. Approximately 17.7 percent of all departures were modeled with a stage length of four (1,500-2,500 nautical miles). Typical destinations within these distances from Sea-Tac Airport include Atlanta, Georgia; New York City; and Toronto, Ontario. The remaining 2.4 percent of departures operated to destinations with a stage length of five or greater (2,500 or more nautical miles), which include destinations to Asia and Europe.

The majority of large jet departures (92.8 percent) were modeled with a stage length of two to four. All regional jet departures were modeled with a stage length of either one or two. All business jets and propeller aircraft departures were modeled with a stage length of one.

Departure destinations are expected to remain similar for the five-year future condition, with only minor variations. The trip length distribution modeled for the Future (2018) Baseline is shown in **Table 3-15, *Departure Trip Length Distribution Future (2018) Baseline***.

Table 3-15
DEPARTURE TRIP LENGTH DISTRIBUTION – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

STAGE LENGTH	LARGE JETS	REGIONAL JETS	BUSINESS JETS	TURBO-PROPS	GA PROPS	TOTAL
1	3.3%	45.0%	100.0%	100.0%	100.0%	32.2%
2	41.6%	55.0%	0.0%	0.0%	0.0%	30.6%
3	24.2%	0.0%	0.0%	0.0%	0.0%	16.4%
4	26.5%	0.0%	0.0%	0.0%	0.0%	17.9%
5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6	2.8%	0.0%	0.0%	0.0%	0.0%	1.9%
7	1.6%	0.0%	0.0%	0.0%	0.0%	1.1%

Source: Landrum & Brown, 2013.

Ground Run-Up Noise

Engine run-ups are typically performed at two primary and two secondary locations on the airfield at Sea-Tac Airport. The majority of run-ups (over 98 percent) are conducted at either the north primary location (on Taxiway B between Taxiways D and E), or the south primary location (on the hold pad east of the end of Runway 34R). According to data collected by the Port on run-up activity, approximately 10-11 run-ups are conducted per week at Sea-Tac Airport, including approximately 8-9 per week during daytime hours (7:00 a.m. to 9:59 p.m.) and 1-2 per week during nighttime hours (10:00 p.m. to 6:59 a.m.) Information on the number and types of run-ups that were modeled for the Existing (2013) and Future (2018) Baseline noise exposure contours is shown in **Table 3-16, *Ground Run-Up Activity Existing (2013) Baseline***.

Table 3-16
GROUND RUN-UP ACTIVITY – EXISTING (2013) BASELINE
Seattle-Tacoma International Airport

INM ID	RUN-UP LOCATION	AIRCRAFT HEADING (DEGREES)	AVERAGE WEEKLY RUN-UPS		AVERAGE DURATION (IN MINUTES)	POWER (THRUST) SETTING
			DAYTIME	NIGHTTIME		
737700	Taxiway B	359.9	2.11	0.38	10.0	24,000 lbs.
737700	Runway 34R Hold Pad	179.9	3.87	0.56	10.0	24,000 lbs.
767300	Taxiway B	359.9	0.09	0.02	10.0	60,000 lbs.
767300	Runway 34R Hold Pad	179.9	0.19	0.03	10.0	60,000 lbs.
CL601	Taxiway B	359.9	0.19	0.04	10.0	9,220 lbs.
CL601	Runway 34R Hold Pad	179.9	0.22	0.03	10.0	9,220 lbs.
DHC830	Taxiway B	359.9	0.65	0.12	10.0	100 percent
DHC830	Runway 34R Hold Pad	179.9	1.36	0.20	10.0	100 percent
TOTAL			**8.68**	**1.37**	**n/a**	**n/a**

Note: Daytime = 7:00 a.m. to 9:59 p.m., Nighttime = 10:00 p.m. to 6:59 a.m.
n/a = total value not applicable

Source: Port of Seattle, 2013.

Engine run-ups were modeled for future conditions based on the assumption that the number of run-ups would increase in relation to the forecasted increase in operations. Under baseline conditions, no change to the existing run-up procedures or locations are expected. **Table 3-17, *Ground Run-Up Activity Future (2018) Baseline***, shows the number of run-ups that was modeled for the Future (2018) Baseline conditions.

Table 3-17
GROUND RUN-UP ACTIVITY – FUTURE (2018) BASELINE
Seattle-Tacoma International Airport

INM ID	RUN-UP LOCATION	AIRCRAFT HEADING (DEGREES)	AVERAGE WEEKLY RUN-UPS		AVERAGE DURATION (IN MINUTES)	POWER (THRUST) SETTING
			DAYTIME	NIGHTTIME		
737700	Taxiway B	359.9	2.60	0.47	10.0	24,000 lbs.
737700	Runway 34R Hold Pad	179.9	4.76	0.69	10.0	24,000 lbs.
767300	Taxiway B	359.9	0.11	0.02	10.0	60,000 lbs.
767300	Runway 34R Hold Pad	179.9	0.24	0.03	10.0	60,000 lbs.
CL601	Taxiway B	359.9	0.24	0.04	10.0	9,220 lbs.
CL601	Runway 34R Hold Pad	179.9	0.27	0.04	10.0	9,220 lbs.
DHC830	Taxiway B	359.9	0.80	0.14	10.0	100 percent
DHC830	Runway 34R Hold Pad	179.9	1.67	0.24	10.0	100 percent
TOTAL			**8.68**	**1.37**	**10.67**	**1.69**

Note: Daytime = 7:00 a.m. to 9:59 p.m., Nighttime = 10:00 p.m. to 6:59 a.m.
Source: Port of Seattle, 2012.

3.6.2.2 Noise Modeling Results

As required by 14 CFR Part 150, noise exposure contours were prepared for Existing (2013) Baseline and Future (2018) Baseline conditions using the DNL noise metric. Noise contours are lines connecting points of equal noise exposure. Noise exposure contours are presented at levels of 65, 70, and 75 DNL. The FAA uses DNL 65 dBA as the noise level in which noise-sensitive land uses (residences, churches, schools, libraries, and nursing homes) are considered to be significantly impacted. Below DNL65 dBA, all land uses are determined to be compatible.

A DNL noise contour does not represent the noise levels present on any specific day, but, represents the energy-average of all 365 days of operation during the year. Noise contour patterns extend from an airport along each extended runway centerline, reflective of the flight tracks used by all aircraft. The relative distance of a contour from an airport along each route is a function of the frequency of use of each runway end for total arrivals and departures, as well as its use at night, and the type of aircraft assigned to it.

In addition to DNL noise exposure contours, a supplemental noise analysis was conducted for this Part 150 Study for informational purposes. Information

regarding this supplemental noise analysis is included in **Appendix F, *Supplemental Noise Analysis***.

EXISTING (2013) BASELINE NOISE EXPOSURE CONTOUR

Exhibit 3-14, *Existing (2013) Baseline Noise Exposure Contour,* graphically depicts the average-annual noise exposure pattern present at Sea-Tac Airport during the existing baseline period. The DNL 65 dBA of the Existing (2013) Baseline noise contour encompasses 5.9 total square miles within the cities of Burien, Des Moines and SeaTac. **Table 3-18, *Area Within Existing (2013) Baseline Noise Exposure Contour***, summarizes the area within each noise contour level by jurisdiction.

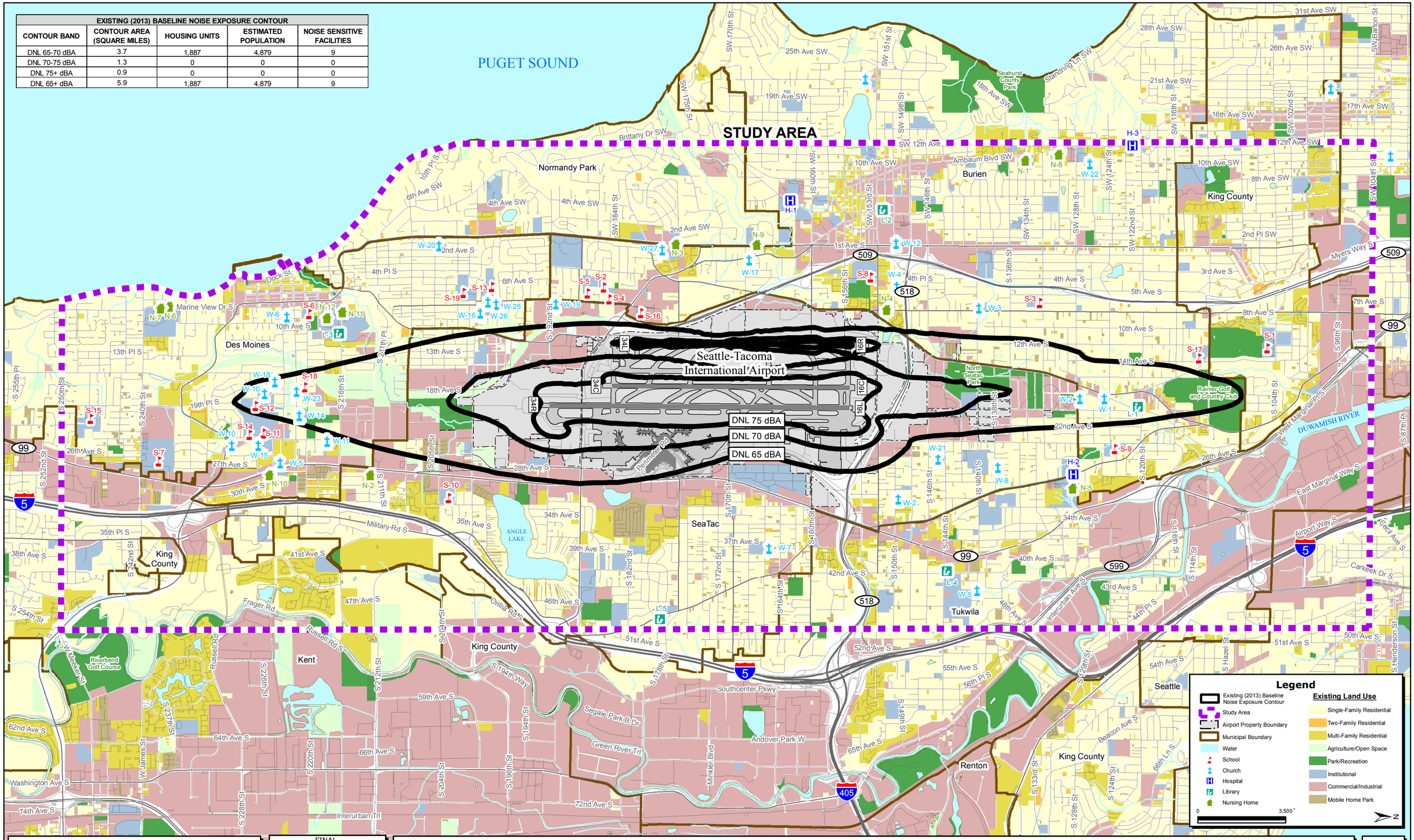
The size and shape of the noise exposure contours for Sea-Tac Airport are primarily a function of the combination of flight tracks and runway use. Wind direction is a primary factor in determining runway use. As discussed in Section 3.6.2.1, historically, the Airport has operated in south flow approximately 65 percent of the time, and in north flow approximately 35 percent of the time. However, radar data from the period from June 2011 through May 2012, upon which the Existing (2013) Baseline noise exposure contour is based, shows that Sea-Tac Airport operated in south flow approximately 77.5 percent of the time and in north flow approximately 22.5 percent of the time. Therefore, the Existing (2013) Baseline noise exposure contour is indicative of this more recent runway use pattern. The noise exposure contours are slightly longer and wider to the south of Sea-Tac Airport, which is indicative of the greater number of departures to south. The noise exposure contours are slightly shorter and thinner to the north of Sea-Tac Airport, which is indicative of the greater number of arrivals from the north.

Due to the spacing between the three parallel runways, the noise exposure pattern at DNL 65 dBA appears as one contiguous shape ending in single points to the north and south of the airport, rather than three distinct shapes, as would be the case if the runways had greater separation.

To the south of Sea-Tac Airport, the DNL 65 dBA of the Existing (2013) Baseline noise contour extends approximately 2.4 miles beyond the south end of Runway 16L/34R, extends approximately 2.7 miles beyond the south end of Runway 16C/34C, and extends approximately 1.6 miles beyond the south end of Runway 16R/34L. This area comprises a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

To the north of Sea-Tac Airport, the DNL 65 dBA of the Existing (2013) Baseline noise contour extends approximately 2.7 miles beyond the north end of Runway 16L/34R, extends approximately 2.9 miles beyond the north end of Runway 16C/34C, and extends approximately 1.6 miles beyond the north end of Runway 16R/34L. Like the area to the south of Sea-Tac Airport, the area to the north within DNL 65 dBA of the Existing (2013) Baseline noise contour is comprised of a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

EXISTING (2013) BASELINE NOISE EXPOSURE CONTOUR				
CONTOUR BAND	CONTOUR AREA (SQUARE MILES)	HOUSING UNITS	ESTIMATED POPULATION	NOISE SENSITIVE FACILITIES
DNL 65-70 dBA	3.7	1,887	4,879	9
DNL 70-75 dBA	1.3	0	0	0
DNL 75+ dBA	0.9	0	0	0
DNL 65+ dBA	5.9	1,887	4,879	9



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Contour: SEA2013Noise-Contours

Existing (2013) Baseline Noise Exposure Contour

Exhibit:
3-14

Table 3-18
AREA AND ESTIMATED POPULATION WITHIN EXISTING (2013) BASELINE NOISE EXPOSURE CONTOUR
Seattle-Tacoma International Airport

CONTOUR RANGE	EXISTING (2013) BASELINE	
	AREA (IN SQUARE MILES)	ESTIMATED POPULATION
AIRPORT PROPERTY		
DNL 65-70 dBA	1.0	0
DNL 70-75 dBA	1.1	0
DNL 75 + dBA	0.9	0
DNL 65 + dBA	3.0	0
CITY OF BURIEN		
DNL 65-70 dBA	0.7	2,884
DNL 70-75 dBA	0.0	0
DNL 75 + dBA	0.0	0
DNL 65 + dBA	0.7	2,884
CITY OF DES MOINES		
DNL 65-70 dBA	0.6	846
DNL 70-75 dBA	0.0	0
DNL 75 + dBA	0.0	0
DNL 65 + dBA	0.6	846
CITY OF SEATAC		
DNL 65-70 dBA	1.4	1,149
DNL 70-75 dBA	0.2	0
DNL 75 + dBA	0.0	0
DNL 65 + dBA	1.6	1,149
ALL AREAS		
DNL 65-70 dBA	3.7	4,879
DNL 70-75 dBA	1.3	0
DNL 75 + dBA	0.9	0
DNL 65 + dBA	5.9	4,879

Notes: Estimated population based on average household size by U.S. Census tract data. Additional information on land uses within the noise exposure contour is available in Chapter Four of this document.

Contour: SEA2013

Source: Landrum & Brown, 2013.

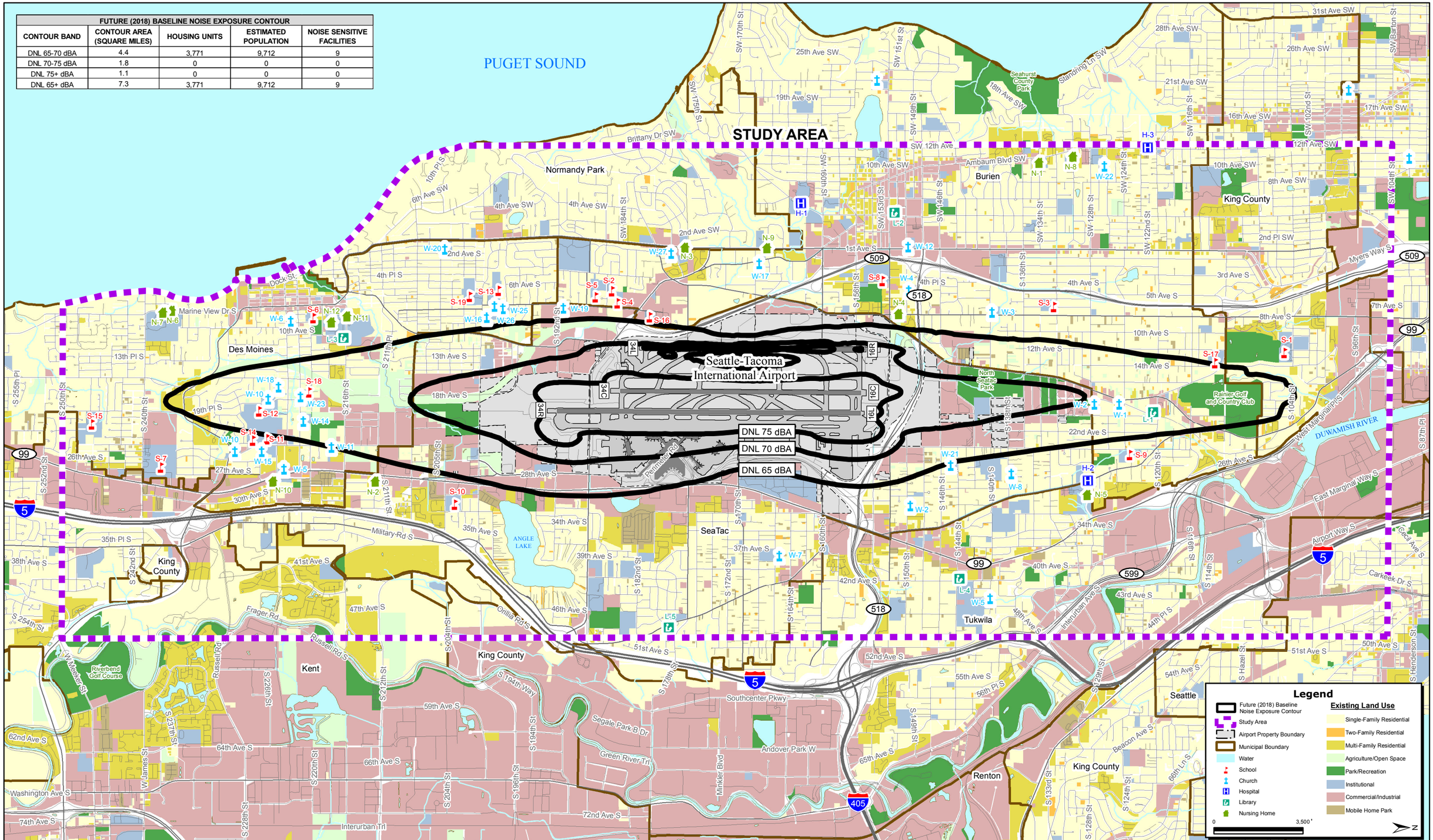
FUTURE (2018) BASELINE NOISE EXPOSURE CONTOUR

The Future (2018) Baseline noise exposure contour reflects projected noise levels expected for the year 2018. This projected contour assumes growth as forecasted in the Aviation Activity Forecast discussed in Chapter Two of this document, with no changes to the existing NCP measures at Sea-Tac Airport. The size and shape of the Future (2018) Baseline noise exposure contour for Sea-Tac Airport is similar to that of the Existing (2013) Baseline noise exposure contour. The Future (2018) Baseline noise exposure contour reflects the historic south flow to north flow split of 65 percent south flow and 35 percent north flow. As a result, the DNL 65 dBA of the Future (2018) Baseline noise exposure contour noise exposure contours are slightly longer and wider to the south of Sea-Tac Airport, which is indicative of the greater number of departures to south. The noise exposure contours are slightly shorter and thinner to the north of Sea-Tac Airport, which is indicative of the greater number of arrivals from the north. As discussed in Section 3.6.2.1, runway use patterns modeled for the Future (2018) Baseline are based on historic wind patterns over the last ten years. **Exhibit 3-15, *Future (2018) Baseline Noise Exposure Contour*,** graphically depicts the average-annual noise exposure pattern expected to occur at Sea-Tac Airport in 2018. **Exhibit 3-16, *Existing (2013) Baseline Compared to Future (2018) Baseline Noise Exposure Contours***, shows a comparison of the noise contour areas for existing and future conditions.
To the south of Sea-Tac Airport, the DNL 65 dBA of the Future (2018) Baseline noise contour extends approximately 2.9 miles beyond the south end of Runway 16L/34R and extends approximately 3.3 miles beyond the south end of Runway 16C/34C. This area comprises a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

To the north of Sea-Tac Airport, the DNL 65 dBA of the Future (2018) Baseline noise contour extends approximately 3.1 miles beyond the north end of Runway 16L/34R and extends approximately 3.2 miles beyond the north end of Runway 16C/34C. Like the area to the south of Sea-Tac Airport, the area to the north within the DNL 65 dBA of the Future (2018) Baseline noise contour is comprised of a mix of single-family residential, multi-family residential, commercial, and industrial land uses.

Table 3-19, *Comparison of Areas Within Future (2018) and Existing (2013) Baseline Noise Exposure Contours*, summarizes the area within each noise contour level by jurisdiction. The DNL 65 dBA of the Future (2018) Baseline noise contour encompasses 7.4 total square miles within the cities of Burien, Des Moines and SeaTac and King County. The DNL 65 dBA of the Future (2018) Baseline noise exposure contour is larger than the Existing (2013) Baseline due to the forecasted growth in operations at Sea-Tac Airport.

FUTURE (2018) BASELINE NOISE EXPOSURE CONTOUR				
CONTOUR BAND	CONTOUR AREA (SQUARE MILES)	HOUSING UNITS	ESTIMATED POPULATION	NOISE SENSITIVE FACILITIES
DNL 65-70 dBA	4.4	3,771	9,712	9
DNL 70-75 dBA	1.8	0	0	0
DNL 75+ dBA	1.1	0	0	0
DNL 65+ dBA	7.3	3,771	9,712	9



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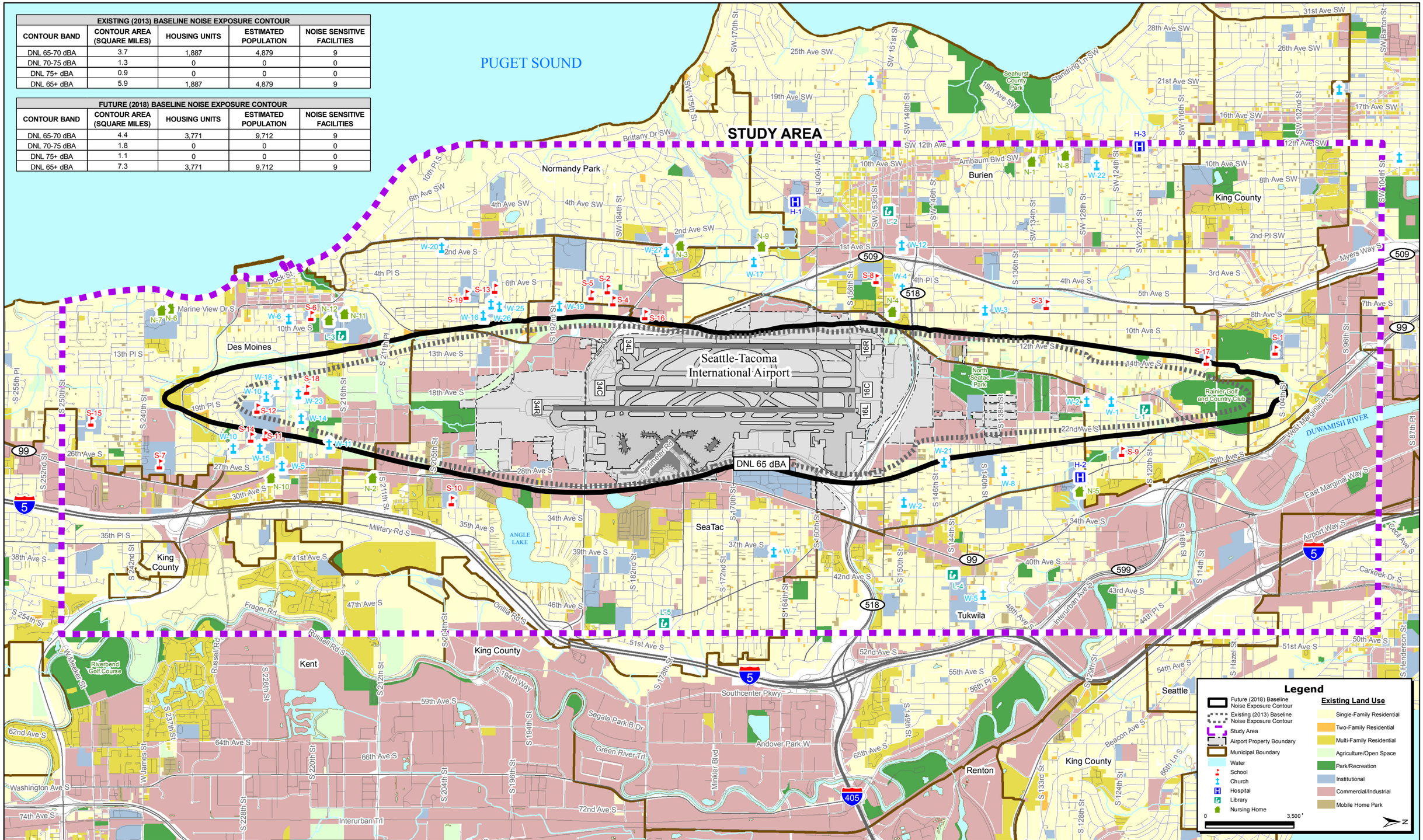
Future (2018) Baseline Noise Exposure Contour

Exhibit: **3-15**

EXISTING (2013) BASELINE NOISE EXPOSURE CONTOUR				
CONTOUR BAND	CONTOUR AREA (SQUARE MILES)	HOUSING UNITS	ESTIMATED POPULATION	NOISE SENSITIVE FACILITIES
DNL 65-70 dBA	3.7	1,887	4,879	9
DNL 70-75 dBA	1.3	0	0	0
DNL 75+ dBA	0.9	0	0	0
DNL 65+ dBA	5.9	1,887	4,879	9

FUTURE (2018) BASELINE NOISE EXPOSURE CONTOUR				
CONTOUR BAND	CONTOUR AREA (SQUARE MILES)	HOUSING UNITS	ESTIMATED POPULATION	NOISE SENSITIVE FACILITIES
DNL 65-70 dBA	4.4	3,771	9,712	9
DNL 70-75 dBA	1.8	0	0	0
DNL 75+ dBA	1.1	0	0	0
DNL 65+ dBA	7.3	3,771	9,712	9



Port of Seattle — *14 CFR Part 150 Study* — *Seattle-Tacoma International Airport* — L&B

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Existing (2013) Baseline Compared to Future (2018) Baseline Noise Exposure Contour

Exhibit: **3-16**

Table 3-19
COMPARISON OF AREA AND POPULATION WITHIN FUTURE (2018) AND EXISTING (2013) BASELINE NOISE EXPOSURE CONTOURS
Seattle-Tacoma International Airport

CONTOUR RANGE	EXISTING (2013) BASELINE		FUTURE (2018) BASELINE		DIFFERENCE	
	AREA (IN SQUARE MILES)	ESTIMATED POPULATION	AREA (IN SQUARE MILES)	ESTIMATED POPULATION	AREA (IN SQUARE MILES)	ESTIMATED POPULATION
AIRPORT PROPERTY						
65-70 DNL	1.0	0	0.7	0	-0.3	0
70-75 DNL	1.1	0	1.2	0	0.1	0
75 + DNL	0.9	0	1.1	0	0.2	0
65 + DNL	3.0	0	3.0	0	0.0	0
CITY OF BURIEN						
65-70 DNL	0.7	2,884	1.0	3,898	0.3	1,014
70-75 DNL	0.0	0	0.0	0	0.0	0
75 + DNL	0.0	0	0.0	0	0.0	0
65 + DNL	0.7	2,884	1.0	3,898	0.3	1,014
CITY OF DES MOINES						
65-70 DNL	0.6	846	1.1	3,216	0.5	2,370
70-75 DNL	0.0	0	0.0	0	0.0	0
75 + DNL	0.0	0	0.0	0	0.0	0
65 + DNL	0.6	846	1.1	3,216	0.5	2,370
CITY OF SEATAC						
65-70 DNL	1.4	1,149	1.5	2,267	0.1	1,118
70-75 DNL	0.2	0	0.6	0	0.4	0
75 + DNL	0.0	0	0.0	0	0.0	0
65 + DNL	1.6	1,149	2.1	2,267	0.5	1,118
KING COUNTY						
65-70 DNL	0.0	0	0.1	331	0.1	331
70-75 DNL	0.0	0	0.0	0	0.0	0
75 + DNL	0.0	0	0.0	0	0.0	0
65 + DNL	0.0	0	0.1	331	0.1	331
ALL AREAS						
65-70 DNL	3.7	4,879	4.4	9,712	0.7	4,834
70-75 DNL	1.3	0	1.8	0	0.5	0
75 + DNL	0.9	0	1.1	0	0.2	0
65 + DNL	5.9	4,879	7.3	9,712	1.4	4,834

Notes: Estimated population based on average household size by U.S. Census tract data. Additional information on land uses within the noise exposure contour is available in Chapter Four of this document.

Contours: SEA2013 & SEA2018

Source: Landrum & Brown, 2013.

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