Paine Field Airport

Existing and Future Environmental Assessment, Initiation of Commercial Service Noise Analysis

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1.0 Introduction

The Snohomish County Airport Environmental Assessment (EA) noise analysis was conducted to determine the potential noise impacts associated with future commercial service operations at Paine Field (PAE). The Airport currently does not have commercial service.

This report forecasts the noise-related impacts of the proposed commercial service. This study evaluates potential changes in noise. The study evaluated the existing 2008 baseline conditions (actual operations) and the future years 2010 and 2016, based on the FAA approved forecast for this Assessment. The future conditions were studied both with and without the commercial operations to determine the noise impact. The noise analysis was conducted using the Day/Night Noise Level (DNL) noise metric. The fleet mix and operations totals used for this document can be found in Section 5 to this Appendix.

2.0 Proposed Alternatives

This document presents the No Action and Preferred Alternative future year scenarios that were evaluated. These alternatives were evaluated to determine how each would impact the noise environment at PAE.

- Future year No Action for 2010 and 2016
- Future year Preferred Alternative for 2010 and 2016

3.0 Alternatives DNL Analysis

3.1 <u>Existing Base Case and Future No Action & Preferred Alternative Noise Contours</u>

This section presents the results of the 65 DNL noise contour analysis for five scenarios: the existing 2008 base case and two future years, 2010 and 2016. Each future year was analyzed using two scenarios, No Action and Preferred Alternative, which is with the commercial service.

For each scenario, the runway use was based on the Noise Exposure Map Update approved by the FAA on January 8, 2004; the runway use remains the same for each of the five scenarios.

3.1.1 <u>2008 Base Case</u>

The 2008 base case DNL noise contour was derived from actual operations that occurred at the Airport during 2008; air carrier operations were taken from August 2007 – July 2008 due to the Boeing work stoppage in September through October, 2008. A full year of airport control tower counts were used in the development of the 2008 base case noise contour. For 2008, there were a total of 143,722 operations, or 394 operations per day. A breakdown of operations by aircraft category can be found in Appendix A, Table 1. **Figure C6** in the Affected Environment Chapter presents a view of the 65–70 DNL noise contours for the base case. These contours will be used as a reference to provide context regarding the existing noise environment. All of the contours are overlaid on an aerial photograph base map that indicates the various land uses within the vicinity of the Airport. A comparison of the housing and population numbers for each alternative is presented in Section 4, Table 1.

3.1.2 Future Year 2010 No Action Alternative

Assumptions: The Future Year 2010 No Action assumes that the Airport would continue to operate using the current airfield configuration with a forecast of 150,866 annual operations, or 413 operations per day. This is an increase of 7,144 operations from the base year 2008. These operations were derived from forecasting methodology, a detailed breakdown of operations by aircraft category can be found in Section 5, Table 2. The runway use assumptions are the same as the base case 2008 conditions. Table 5 shows the runway use for existing and all future year scenarios.

DNL Modeling Results: **Figure D4** in the Environmental Consequences Chapter presents a view of the 65–70 DNL noise contours for the Future Year 2010 No Action. The total acres in the 65 DNL noise contour are 654.7 acres. This contour will be used as a baseline to compare Future Year 2010 Preferred Alternative noise contours.

3.1.3 Future Year 2010 Preferred Alternative

Assumptions: The Future Year 2010 Preferred Alternative assumes that the Airport would continue to operate using the current airfield configuration with a forecast of 155,454 annual operations, approximately 426 operations per day. This annual total includes 4,588 scheduled commercial operations, approximately 13 commercial operations per day of the 426 daily operations. These operations were derived from forecasting methodology; a breakdown of operations by aircraft category can be found in Section 5, Table 2. The runway use assumptions by aircraft category are the same as the base case 2008 conditions.

DNL Modeling Results: **Figure D6** in the Environmental Consequences Chapter presents a view of the 65–70 DNL noise contours for the Future Year 2010 Preferred Alternative. A comparison of the Future Year 2010 No Action DNL noise contours with the 2010 Preferred Alternative DNL noise contours shows that there is less than a 1.5 dB increase in the 65 DNL noise contour and less than a 3 dB increase in the 60 DNL noise contour. There are no residential structures in the 65 DNL. The FAA defines a change in noise as significant if there is greater than a 1.5 dB increase at the 65 DNL level to noise-sensitive land uses. Therefore, there is no significant change to noise sensitive uses as a result of this alternative.

The DNL noise contours show that the 2010 Preferred Alternative contours are similar in shape and size to the 2010 No Action contours. The total acres of the noise contour are increased by 4 acres to 658.7 acres.

3.1.4 Future Year 2016 No Action

Assumptions: The Future Year 2016 No Action assumes that the Airport would continue to operate using the current airfield configuration with a forecast of 162,418 annual operations, approximately 445 operations per day. This in an increase of 18,696 operations from the base case 2008 operations. These operations were derived from forecasting methodology, a breakdown of operations by aircraft category can be found in Section 5, Table 3. The runway use assumptions by aircraft category are the same as the base case 2008 conditions.

DNL Modeling Results: **Figure D5** in the Environmental Consequences Chapter presents a view of the 65–70 DNL noise contours for the Future Year 2016 No Action. The total acres in the 65 DNL noise contour are 687.8 acres. This contour will be used as a baseline to compare Future Year 2016 Preferred Alternative noise contours.

3.1.5 Future Year 2016 Preferred Alternative

Assumptions: The Future Year 2016 Preferred Alternative assumes that the Airport would continue to operate using the current airfield configuration with a forecast of 170,758 annual operations, approximately 468 daily operations which includes commercial flights. Commercial flights account for approximately 8,340 annual operations, or 23 daily operations. These operations were derived from forecasting methodology, a breakdown of operations by aircraft category can be found in Section 5, Table 4. The runway use assumptions are the same as the base case 2008 conditions.

DNL Modeling Results: **Figure D7** in the Environmental Consequences Chapter presents a view of the 65–70 DNL noise contours. A comparison of the housing and population numbers for Preferred Alternative is presented in Section 4, Table 1. A comparison of the No Action DNL noise contours to the Preferred Alternative DNL noise contours shows that there is less than a 1.5 dB increase in the 65 DNL noise contour. There are no residential structures in the 65 DNL. The FAA defines a change in noise as significant if there is greater than a 1.5 dB increase at the 65 DNL level to noise-sensitive land uses. Therefore, there is no significant change to noise sensitive uses as a result of this alternative.

The DNL noise contours show that the 2016 Preferred Alternative contours are similar in shape and size to the 2016 No Action contours. The total acres of the noise contour are increased by 17.0 acres to 704.8 acres.

4.0 Summary

This report analyzed the Base Case 2008 and future years 2010 and 2016 "No Action" and "Preferred Alternative" DNL noise contours.

Table 1 provides an analysis of housing units and population numbers for the "No Action" and "Preferred Alternative" for the 65 DNL noise contour. As the table shows, there are no noise sensitive areas, people, housing units or schools in any of the 65 DNL noise contours for existing or future No Action or Preferred Alternatives. The noise contours remain on airport property except for small areas to the southwest, east, and north of the airport. In these areas the noise contours are within compatible land use, which is road, industrial and office park.

The results show that generally, the future-year contours are slightly elongated to the north and south of the main runway, Runway 16R/34L. This is generally due to an overall increase of operations from the base case; the future year contours retain the same shape for the No Action and Preferred Alternative for both 2010 an 2016. All increases in noise levels would be well below the 1.5 DNL significance threshold set by the FAA; therefore, none of the alternatives would result in a significant increase to noise sensitive uses and the threshold of significance will not be exceeded.

Table 1
HOUSING AND POPULATION COMPARISON OF "NO ACTION" AND "PREFERRED ALTERNATIVE", 65 DNL
Snohomish County Airport Environmental Assessment

Land Use	2008 Existing Base Case	2010 No Project	2010 Preferred Alternative	2016 No Project	2016 Preferred Alternative
Noise Sensitive Areas	0	0	0	0	0
People*	0	0	0	0	0
Housing Units*	0	0	0	0	0
Schools	0	0	0	0	0
Total Acres	656.2	654.7	658.7	687.8	704.8

Source: *2000 U.S. Census data.* The 65 figures are cumulative. The contours contain the area within all smaller contours.
*People and housing units are rounded to the nearest ten.

Section 5

Operational Data, Current and Forecast

5.1 Noise Background

The methods used here for estimating the future noise environment rely on computer noise modeling. The noise environment is commonly depicted in terms of lines of equal noise levels, or noise contours. These noise contours are supplemented in this study with calculated noise levels for selected points on the ground. Key aspects of the computer noise model are described in the following section.

5.2 Computer Modeling

The FAA's Integrated Noise Model (INM), version 7.0a, was used to model civilian and military aircraft operations at Paine Field (PAE). The INM is a program developed to plot noise contours for airports, and is required by the FAA to be used on federally-funded projects involving noise analysis. The program is provided with standard aircraft noise and performance data for over 100 aircraft types that can be tailored to the characteristics of an airport. It also includes comprehensive and flexible contour-plotting capabilities. Also included in the INM model are thrust reverse computations; INM automatically calculates thrust reverse as part of an arrival operation.

The INM program requires the collection and input of the physical and operational characteristics of an airport. Physical characteristics include runway coordinates, airport altitude, temperature, and optional topographic data. Operational characteristics include not only the aircraft types and flight tracks, but also departure procedures, arrival procedures, and stage lengths (i.e., length of the trip, which impacts aircraft weight due to the amount of fuel carried) that are specific to the operations at an airport. A full year of 2008 FAA radar data was used to develop the operational assumptions in this report. Aircraft data needed to generate noise contours include:

- Number of aircraft operations by type
- Types of aircraft
- Day/nighttime distribution by type
- Flight tracks
- Flight track utilization by type
- Flight profiles
- Typical operational procedures
- Average meteorological conditions

Time of Day. In the DNL metric, any operations that occur after 10 p.m. and before 7 a.m. are considered more intrusive and are weighted by an additional 10 dBA. Therefore, accurately estimating the number of nighttime operations is very critical in determining the DNL noise contour. A more detailed description of DNL is provided below.

Fleet Mix. The mix of aircraft operating at an airport is one of the most important factors in determining the aircraft noise environment. Fleet mix data for the existing years were determined from tower counts and ASDi data (also known as Flight Explorer), and for future years from the TAF.

Runway Use. An important consideration in developing noise contours is the percentage of time each runway is utilized. The speed and direction of the wind dictate the flow direction (direction for aircraft to land and take off). For safety, aircraft arrive and depart into the wind; therefore, when the wind direction changes, the runway operations are shifted to the runway that favors the new wind direction. Generally speaking, the airfield operating configuration (runway utilized by aircraft) is based upon pilot request and the FAA's efforts to maximize operational efficiency of the airfield and noise abatement.

Flight Tracks and Flight Track Utilization. The FAA has established flight paths for aircraft arriving and departing from PAE. Flight tracks are established for each runway end, and the use of each flight track by aircraft type is used as an INM input. These flight paths are not precisely defined ground tracks, but represent a path along the ground over which aircraft generally fly.

5.3 DNL Noise Metric

The scenarios in this report were analyzed using the Day/Night Noise Level (DNL) metric, a cumulative metric. The DNL index measures the overall noise experienced during a day (24-hours). DNL calculations average the noise generated by all aircraft flights in and out of an airport and adds a penalty for nighttime operations. In the DNL scale, operations occurring between the hours of 10 p.m. to 7 a.m. are penalized by adding 10 dBA. This penalty is used to account for the higher sensitivity to noise at night and the decrease in background noise levels that typically occur at night. The FAA specifies that DNL be used for community and airport environmental noise assessments, and the FAA defined 65 DNL as the noise level which has a significant adverse impact on noise-sensitive land uses. A noise-sensitive land use is defined as residential, schools, churches, and hospitals.

There are five fleet mixes presented in this document, for the years 2008, 2010, and 2016. The future fleet mix and operations are different for the No Action and Preferred Alternative; this project will alter airport operations with the introduction of commercial service. **Table 2** in this section shows the aircraft operations by aircraft category, while **Tables 3** and **4** show the detailed aircraft fleet mix for 2008, 2010 and 2016, No Action and Preferred Alternative. Note that the fleet mix tables use INM-type aircraft. Because some aircraft are not in the INM database, the INM model will reflect a substitute aircraft that is a close approximation in terms of noise. The data show that the majority of the increase in operations involves new-generation aircraft that are still in production or will enter service in the next few years.

Table 1.
ANNUAL AIRCRAFT OPERATIONS BY AIRCRAFT CATEGORY
Snohomish County Airport Environmental Assessment

Category	2008 Operations (actual)	2010 Operations	2016 Operations
Air Carrier	3,132	2,663	3,358
Air Taxi	2,782	2,833	2,833
General Aviation	136,900	144,505	155,333
Military	908	865	894
Total, No Action	**143,722**	**150,866**	**162,418**
Preferred Alternative Operations	-	4,588	8,340
Total, With Preferred Alternative	**143,722**	**155,454**	**170,758**

Source: *BridgeNet International, 2009*

Table 2 Aircraft Fleet Mix by INM Type
Snohomish County Airport

INM Type	Operation Category	Daily 2008 Arrival Day	Daily 2008 Arrival Night	Daily 2008 Departure Day	Daily 2008 Departure Night	Annual Total Operations
GASEPF	Prop Single	127.53484	2.98900	127.53484	2.98900	95,282
GASEPV	Prop Single	32.25615	0.75590	32.25615	0.75590	24,099
CNA206	Prop Single	0.41693	0.01467	0.41693	0.01467	315
BEC58P	Prop Twin	13.21712	0.30945	13.21712	0.30945	9,874
CNA441	Prop Twin	3.73436	0.08737	3.73436	0.08737	2,790
1900D	Prop Twin	0.09249	0.00217	0.09249	0.00217	69
DHC6	Prop Twin	1.68093	0.03940	1.68093	0.03940	1,256
DHC8	Prop Twin	0.00134	0.00003	0.00134	0.00003	1
707QN	Large Jet	0.00812	0.00000	0.00812	0.00000	6
727EM2	Large Jet	0.03131	0.00313	0.03131	0.00313	25
727QF	Large Jet	0.01365	0.00209	0.01365	0.00209	11
737300	Large Jet	0.31396	0.04799	0.31396	0.04799	264
737400	Large Jet	0.00512	0.00078	0.00512	0.00078	4
737500	Large Jet	0.04436	0.00678	0.04436	0.00678	37
737700	Large Jet	0.47783	0.06808	0.47783	0.06808	399
737800	Large Jet	0.35151	0.05373	0.35151	0.05373	296
737N17	Large Jet	0.01536	0.00235	0.01536	0.00235	13
737QN	Large Jet	0.01083	0.00000	0.01083	0.00000	8
74720B	Large Jet	0.01708	0.00261	0.01708	0.00261	14
747400	Large Jet	0.80709	0.12338	0.80709	0.12338	679
757PW	Large Jet	0.10412	0.01343	0.10412	0.01343	86
757RR	Large Jet	0.10241	0.01317	0.10241	0.01317	84
767200	Large Jet	0.02901	0.00443	0.02901	0.00443	24
767300	Large Jet	0.36685	0.05608	0.36685	0.05608	309
767400	Large Jet	0.01194	0.00183	0.01194	0.00183	10
777200	Large Jet	0.33273	0.05087	0.33273	0.05087	280
777300	Large Jet	0.74908	0.11451	0.74908	0.11451	630
A330-343	Large Jet	0.00000	0.00000	0.00000	0.00000	0
DC95HW	Large Jet	0.00683	0.00104	0.00683	0.00104	6
F10062	Large Jet	0.00683	0.00104	0.00683	0.00104	6
C525	Corporate Jet	0.24390	0.00572	0.24390	0.00572	182
CIT3	Corporate Jet	0.27473	0.00644	0.27473	0.00644	205
CL600	Corporate Jet	0.88119	0.02060	0.88119	0.02060	658
CNA500	Corporate Jet	1.44181	0.03367	1.44181	0.03367	1,077
CNA750	Corporate Jet	0.21040	0.00493	0.21040	0.00493	157
FAL20	Corporate Jet	0.54275	0.01272	0.54275	0.01272	405
GIIB	Corporate Jet	0.39020	0.00911	0.39020	0.00911	291
GIV	Corporate Jet	0.41298	0.00965	0.41298	0.00965	309
GV	Corporate Jet	0.01024	0.00157	0.01024	0.00157	9
LEAR25	Corporate Jet	0.03350	0.00079	0.03350	0.00079	25
LEAR35	Corporate Jet	1.25168	0.02934	1.25168	0.02934	935
MU3001	Corporate Jet	0.93139	0.02183	0.93139	0.02183	696
C9A	Military Aircraft	0.28969	0.00000	0.28969	0.00000	211
E3A	Military Aircraft	0.01624	0.00000	0.01624	0.00000	12
EA6B	Military Aircraft	0.04469	0.00014	0.04469	0.00014	33
F-18	Military Aircraft	0.03246	0.00000	0.03246	0.00000	24
P3A	Military Aircraft	0.04469	0.00172	0.04469	0.00172	34
A109	Helicopter	0.13743	0.00322	0.13743	0.00322	103
B206	Helicopter	0.32067	0.00752	0.32067	0.00752	240
CH47D	Helicopter	0.03354	0.00000	0.03354	0.00000	24
R22	Helicopter	1.37430	0.03221	1.37430	0.03221	1,027
S70	Helicopter	0.13973	0.00000	0.13973	0.00000	102
SA365N	Helicopter	0.11458	0.00000	0.11458	0.00000	84
Daily Ops		**191.91297**	**4.96648**	**191.91297**	**4.96648**	
Annual Ops		**70,048**	**1,813**	**70,048**	**1,813**	**143,722**

Table 3 2010 Aircraft Fleet Mix by INM Type
Snohomish County Airport

INM Type	Operations Category	Daily Arrival Day	Daily Arrival Night	Daily Departure Day	Daily Departure Night	Annual Total Operations
GASEPF	Prop Single	134.61959	3.15504	134.61959	3.15504	100,575
GASEPV	Prop Single	34.03417	0.79757	34.03417	0.79757	25,427
CNA206	Prop Single	0.37062	0.03132	0.37062	0.03132	293
BEC58P	Prop Twin	13.89590	0.32536	13.89590	0.32536	10,382
CNA441	Prop Twin	3.91409	0.09157	3.91409	0.09157	2,924
1900D	Prop Twin	0.09763	0.00229	0.09763	0.00229	73
DHC6	Prop Twin	1.77430	0.04158	1.77430	0.04158	1,326
DHC8	Prop Twin	0.00141	0.00003	0.00141	0.00003	1
707QN	Large Jet	0.00783	0.00000	0.00783	0.00000	6
727EM2	Large Jet	0.02747	0.00260	0.02747	0.00260	22
727QF	Large Jet	0.01093	0.00167	0.01093	0.00167	9
737300	Large Jet	0.24658	0.03769	0.24658	0.03769	208
737400	Large Jet	0.00410	0.00063	0.00410	0.00063	3
737500	Large Jet	0.03553	0.00543	0.03553	0.00543	30
737700	Large Jet	0.37185	0.05206	0.37185	0.05206	309
737800	Large Jet	0.24408	0.03731	0.24408	0.03731	205
737N17	Large Jet	0.01293	0.00198	0.01293	0.00198	11
737QN	Large Jet	0.01305	0.00000	0.01305	0.00000	10
74720B	Large Jet	0.01620	0.00248	0.01620	0.00248	14
747400	Large Jet	0.82670	0.12638	0.86235	0.13183	711
757PW	Large Jet	0.08329	0.01034	0.08329	0.01034	68
757RR	Large Jet	0.08498	0.01060	0.08498	0.01060	70
767200	Large Jet	0.00000	0.00000	0.00000	0.00000	0
767300	Large Jet	0.23371	0.03573	0.23371	0.03573	197
767400	Large Jet	0.00000	0.00000	0.00000	0.00000	0
777200	Large Jet	0.17110	0.02616	0.22814	0.03488	168
777300	Large Jet	0.25666	0.03924	0.34221	0.05231	252
A330-343	Large Jet	0.42776	0.06539	0.57035	0.08719	420
DC95HW	Large Jet	0.00673	0.00103	0.00673	0.00103	6
F10062	Large Jet	0.00673	0.00103	0.00673	0.00103	6
C525	Corporate Jet	0.25745	0.00603	0.25745	0.00603	192
CIT3	Corporate Jet	0.28999	0.00680	0.28999	0.00680	217
CL600	Corporate Jet	0.92044	0.02152	0.92044	0.02152	688
CNA500	Corporate Jet	1.50111	0.03506	1.50111	0.03506	1,121
CNA750	Corporate Jet	0.22209	0.00521	0.22209	0.00521	166
FAL20	Corporate Jet	0.57290	0.01343	0.57290	0.01343	428
GIIB	Corporate Jet	0.40633	0.00949	0.40633	0.00949	304
GIV	Corporate Jet	0.43038	0.01005	0.43038	0.01005	322
GV	Corporate Jet	0.00820	0.00125	0.00820	0.00125	7
LEAR25	Corporate Jet	0.03536	0.00083	0.03536	0.00083	26
LEAR35	Corporate Jet	1.32121	0.03096	1.32121	0.03096	987
MU3001	Corporate Jet	0.98313	0.02304	0.98313	0.02304	735
C9A	Military Aircraft	0.27927	0.00000	0.27927	0.00000	204
E3A	Military Aircraft	0.01566	0.00000	0.01566	0.00000	11
EA6B	Military Aircraft	0.04306	0.00391	0.04306	0.00391	34
F-18	Military Aircraft	0.03132	0.00000	0.03132	0.00000	23
P3A	Military Aircraft	0.04306	0.00391	0.04306	0.00391	34
A109	Helicopter	0.14506	0.00340	0.14506	0.00340	108
B206	Helicopter	0.33848	0.00793	0.33848	0.00793	253
CH47D	Helicopter	0.03132	0.00000	0.03132	0.00000	23
R22	Helicopter	1.45064	0.03400	1.45064	0.03400	1,084
S70	Helicopter	0.13050	0.00000	0.13050	0.00000	95
SA365N	Helicopter	0.10701	0.00000	0.10701	0.00000	78
Daily Ops		**201.35991**	**5.11933**	**201.68073**	**5.16838**	
Annual Ops		**73,496**	**1,869**	**73,613**	**1,886**	**150,866**
DHC830	With Project	5.8212	0.1188	5.8212	0.1188	4,336
CL601	With Project	0.0588	0.0012	0.0588	0.0012	44
MD83	With Project	0.27923	0.00570	0.27923	0.00570	208
Annual Ops with Project						**155,454**

Table 4 Aircraft Fleet Mix by INM Type
Snohomish County
Average Daily Operations

INM	Description	2008	Daily 2010	2016
GASEPF	Prop Single	261.04767	275.54926	296.19662
GASEPV	Prop Single	66.02411	69.66348	74.82532
CNA206	Prop Single	0.86321	0.80387	0.83061
BEC58P	Prop Twin	27.05315	28.44252	30.34113
CNA441	Prop Twin	7.64346	8.01133	8.49531
1900D	Prop Twin	0.18932	0.19983	0.21481
DHC6	Prop Twin	3.44064	3.63178	3.90391
DHC8	Prop Twin	0.00274	0.00290	0.00311
707QN	Large Jet	0.01624	0.01566	0.01618
727EM2	Large Jet	0.06888	0.06015	0.06355
727QF	Large Jet	0.03147	0.02520	0.02737
737300	Large Jet	0.72390	0.56854	0.61671
737400	Large Jet	0.01180	0.00945	0.01026
737500	Large Jet	0.10229	0.08191	0.08895
737700	Large Jet	1.09182	0.84782	0.88345
737800	Large Jet	0.81048	0.56279	0.56279
737N17	Large Jet	0.03542	0.02982	0.03171
737QN	Large Jet	0.02166	0.02610	0.02697
74720B	Large Jet	0.03938	0.03735	0.03789
747400	Large Jet	1.86095	1.94726	2.77875
757PW	Large Jet	0.23510	0.18727	0.20170
757RR	Large Jet	0.23117	0.19115	0.20558
767200	Large Jet	0.06688	-	-
767300	Large Jet	0.84587	0.53888	0.56540
767400	Large Jet	0.02754	-	-
777200	Large Jet	0.76720	0.46342	0.69383
777300	Large Jet	1.72718	0.69041	0.92055
A330-343	Large Jet	-	1.15068	1.61096
DC95HW	Large Jet	0.01575	0.01553	0.01553
F10062	Large Jet	0.01575	0.01553	0.01553
C525	Corporate Jet	0.49924	0.52697	0.56646
CIT3	Corporate Jet	0.56233	0.59357	0.63804
CL600	Corporate Jet	1.80357	1.88391	1.98436
CNA500	Corporate Jet	2.95097	3.07235	3.21532
CNA750	Corporate Jet	0.43066	0.45459	0.48865
FAL20	Corporate Jet	1.11094	1.17266	1.26053
GIIB	Corporate Jet	0.79863	0.83165	0.87070
GIV	Corporate Jet	0.84526	0.88087	0.92361
GV	Corporate Jet	0.02361	0.01890	0.02053
LEAR25	Corporate Jet	0.06858	0.07239	0.07781
LEAR35	Corporate Jet	2.56202	2.70435	2.90699
MU3001	Corporate Jet	1.90643	2.01234	2.16312
C9A	Military Aircraft	0.57937	0.55854	0.57711
E3A	Military Aircraft	0.03249	0.03132	0.03236
EA6B	Military Aircraft	0.08966	0.09396	0.09708
F-18	Military Aircraft	0.06491	0.06264	0.06472
P3A	Military Aircraft	0.09281	0.09396	0.09708
A109	Helicopter	0.28130	0.29693	0.31918
B206	Helicopter	0.65637	0.69283	0.74475
CH47D	Helicopter	0.06707	0.06264	0.06480
R22	Helicopter	2.81301	2.96928	3.19177
S70	Helicopter	0.27947	0.26100	0.26998
SA365N	Helicopter	0.22916	0.21402	0.22139
Daily Ops		**393.75890**	**413.33151**	**444.98082**
Annual Ops		**143,722**	**150,866**	**162,418**
DHC830	With Project	0	11.8800	19.8000
CL601	With Project	0	0.1200	0.2000
MD83	With Project	0	0.5699	2.8493

INM Type	Operations Category	2016 Daily Arrival Day	Arrival Night	Departure Day	Departure Night	Annual Total Operations
GASEPF	Prop Single	144.70686	3.39145	144.70686	3.39145	108,112
GASEPV	Prop Single	36.55599	0.85667	36.55599	0.85667	27,311
CNA206	Prop Single	0.38295	0.03236	0.38295	0.03236	303
BEC58P	Prop Twin	14.82347	0.34710	14.82347	0.34710	11,075
CNA441	Prop Twin	4.15054	0.09712	4.15054	0.09712	3,101
1900D	Prop Twin	0.10494	0.00246	0.10494	0.00246	78
DHC6	Prop Twin	1.90726	0.04470	1.90726	0.04470	1,425
DHC8	Prop Twin	0.00152	0.00004	0.00152	0.00004	1
707QN	Large Jet	0.00809	0.00000	0.00809	0.00000	6
727EM2	Large Jet	0.02899	0.00278	0.02899	0.00278	23
727QF	Large Jet	0.01187	0.00181	0.01187	0.00181	10
737300	Large Jet	0.26747	0.04089	0.26747	0.04089	225
737400	Large Jet	0.00445	0.00068	0.00445	0.00068	4
737500	Large Jet	0.03858	0.00590	0.03858	0.00590	32
737700	Large Jet	0.38744	0.05428	0.38744	0.05428	322
737800	Large Jet	0.24408	0.03731	0.24408	0.03731	205
737N17	Large Jet	0.01375	0.00210	0.01375	0.00210	12
737QN	Large Jet	0.01348	0.00000	0.01348	0.00000	10
74720B	Large Jet	0.01643	0.00251	0.01643	0.00251	14
747400	Large Jet	1.17663	0.17987	1.23366	0.18859	1,014
757PW	Large Jet	0.08962	0.01123	0.08962	0.01123	74
757RR	Large Jet	0.09131	0.01148	0.09131	0.01148	75
767200	Large Jet	0.00000	0.00000	0.00000	0.00000	0
767300	Large Jet	0.24521	0.03749	0.24521	0.03749	206
767400	Large Jet	0.00000	0.00000	0.00000	0.00000	0
777200	Large Jet	0.25666	0.03924	0.34221	0.05231	252
777300	Large Jet	0.34221	0.05231	0.45628	0.06975	336
A330-343	Large Jet	0.59886	0.09155	0.79848	0.12206	588
DC95HW	Large Jet	0.00673	0.00103	0.00673	0.00103	6
F10062	Large Jet	0.00673	0.00103	0.00673	0.00103	6
C525	Corporate Jet	0.27674	0.00649	0.27674	0.00649	207
CIT3	Corporate Jet	0.31172	0.00731	0.31172	0.00731	233
CL600	Corporate Jet	0.96951	0.02267	0.96951	0.02267	724
CNA500	Corporate Jet	1.57096	0.03670	1.57096	0.03670	1,174
CNA750	Corporate Jet	0.23873	0.00560	0.23873	0.00560	178
FAL20	Corporate Jet	0.61583	0.01443	0.61583	0.01443	460
GIIB	Corporate Jet	0.42541	0.00994	0.42541	0.00994	318
GIV	Corporate Jet	0.45126	0.01054	0.45126	0.01054	337
GV	Corporate Jet	0.00890	0.00136	0.00890	0.00136	7
LEAR25	Corporate Jet	0.03801	0.00089	0.03801	0.00089	28
LEAR35	Corporate Jet	1.42021	0.03329	1.42021	0.03329	1,061
MU3001	Corporate Jet	1.05679	0.02477	1.05679	0.02477	790
C9A	Military Aircraft	0.28856	0.00000	0.28856	0.00000	211
E3A	Military Aircraft	0.01618	0.00000	0.01618	0.00000	12
EA6B	Military Aircraft	0.04450	0.00405	0.04450	0.00405	35
F-18	Military Aircraft	0.03236	0.00000	0.03236	0.00000	24
P3A	Military Aircraft	0.04450	0.00405	0.04450	0.00405	35
A109	Helicopter	0.15593	0.00365	0.15593	0.00365	116
B206	Helicopter	0.36385	0.00853	0.36385	0.00853	272
CH47D	Helicopter	0.03240	0.00000	0.03240	0.00000	24
R22	Helicopter	1.55934	0.03655	1.55934	0.03655	1,165
S70	Helicopter	0.13499	0.00000	0.13499	0.00000	99
SA365N	Helicopter	0.11069	0.00000	0.11069	0.00000	81
Daily Ops		**216.64951**	**5.57618**	**217.10578**	**5.64593**	
Annual Ops		**79,077**	**2,035**	**79,244**	**2,061**	**162,418**
DHC830	With Project	9.702	0.198	9.702	0.198	7,227
CL601	With Project	0.098	0.002	0.098	0.002	73
MD83	With Project	1.39616	0.02849	1.39616	0.02849	1,040
Annual Ops with Project						**170,758**

5.4 Runway Use

An additional important consideration in developing the DNL contours is the percentage of time each runway is used for either arrival operations or departure operations. The speed and direction of the wind dictate the direction in which the runways are operated (north versus south). In general, aircraft operate into the wind – landing into the wind and departing into the wind. When the wind direction changes, the operations are shifted to the runway end that favors the new wind direction.

The runway use percentages presented in Table 5, titled *PERCENTAGE RUNWAY UTILIZATION* are based upon estimates from airport staff that were reviewed by the FAA Airport Traffic Control Tower. The table presents the percentage that each runway was used for departures and arrivals separately during the daytime and nighttime hours.

The data shows that the Airport is in south flow (departing to the south and arriving from the north) about 50% of the time and north flow (departing to the north and arriving from the south) about 50% of the time.

Runway 16R/34L is the primary runway, with aircraft operating on it approximately 57% of the time. Larger aircraft, such as commercial and military jets exclusively use Runway 16R/34L; general aviation aircraft including single-, and small twin-engine aircraft and turbo propeller aircraft use both primary Runway 16R/34L, parallel Runway 16L/34R and crosswind Runway 11/29. Runways 11/29 and 16L/34R are only used by small, propeller aircraft; Runway 11/29 is used less than 2% of the time. There are two helicopter operating areas at the airport, one on the west side and on the east side of the airfield; these two locations represented as HPW and HPE, respectively.

Table 5
PERCENTAGE RUNWAY UTLIZATION
Snohomish County Airport Environmental Assessment

Runway	Arrival Daytime	Arrival Nighttime	Departure Daytime	Departure Nighttime
16R	31.0%	57.5%	31.0%	51.5%
34L	25.5%	41.6%	25.5%	47.6%
16L	22.1%	0.0%	22.1%	0.0%
34R	18.6%	0.0%	18.6%	0.0%
11	0.8%	0.0%	0.8%	0.0%
29L	1.7%	0.0%	1.7%	0.0%
HPE	0.4%	0.3%	0.4%	0.3%
HPW	0.7%	0.6%	0.7%	0.6%

Source: BridgeNet International
Nighttime refers to 10 p.m.-7a.m.; daytime refers to 7a.m.-10 p.m.
* Due to internal rounding, the total is rounded to the nearest tenth.

The runway use information, obtained from the previously identified sources, enables the identification of each runway used by each operation. Therefore, runway use can be aircraft-type specific. Different aircraft have different runway uses based upon aircraft size, performance, and operation type (e.g. touch and go).

The more detailed breakdown of runway use by category of aircraft is presented in Table 6, *RUNWAY UTILIZATION BY CATEGORY OF AIRCRAFT, DAYTIME.* Table 7 shows the breakdown of runway utilization for nighttime. The table also has information for helicopter operations, HPE and HPW, representing the east and west helicopter operating areas, respectively. The table includes the percentage of operations by aircraft category using each of the runways.

Table 6
PERCENTAGE RUNWAY UTLIZATION BY CATEGORY OF AICRAFT, DAYTIME
Snohomish County Airport Environmental Assessment

Aircraft Class	16R	34L	16L	34L	11	29	HPE	HPW
ARRIVALS								
Air Carrier	55%	45%						
Air Taxi - Jet	55%	45%						
Business Jet	55%	45%						
Air Taxi - Prop	44%	36%	11%	9%				
Single Engine Prop	28%	23%	25%	21%	1%	2%		
Twin Engine Prop	44%	36%	11%	9%				
Turbo Propeller	44%	36%	11%	9%				
Military	55%	45%						
Helicopter							33%	67%
DEPARTURES								
Air Carrier	55%	45%						
Air Taxi - Jet	55%	45%						
Business Jet	55%	45%						
Air Taxi - Prop	44%	36%	11%	9%				
Single Engine Prop	28%	23%	25%	21%	1%	2%		
Twin Engine Prop	44%	36%	11%	9%				
Turbo Propeller	44%	36%	11%	9%				
Military	55%	45%						
Helicopter							33%	67%

Source: BridgeNet International
*Note: Data might not add to exactly 100% due to rounding

Table 7
PERCENTAGE RUNWAY UTLIZATION BY CATEGORY OF AICRAFT, NIGHTTIME
Snohomish County Airport Environmental Assessment

Aircraft Class	16R	34L	16L	34L	11	29	HPE	HPW
ARRIVALS								
Air Carrier	75%	25%						
Air Taxi - Jet	75%	25%						
Business Jet	75%	25%						
Air Taxi - Prop	75%	25%						
Single Engine Prop	55%	45%						
Twin Engine Prop	55%	45%						
Turbo Propeller	55%	45%						
Military	75%	25%						
Helicopter							33%	67%
DEPARTURES								
Air Carrier	35%	65%						
Air Taxi - Jet	35%	65%						
Business Jet	35%	65%						
Air Taxi - Prop	55%	45%						
Single Engine Prop	55%	45%						
Twin Engine Prop	55%	45%						
Turbo Propeller	55%	45%						
Military	35%	65%						
Helicopter							33%	67%

Source: BridgeNet International
*Note: Data might not add to exactly 100% due to rounding