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FINAL MEMORANDUM

To:	Daren Griffin - State Airports Manager Oregon Department of Aviation 3040 25th Street SE Salem, Oregon 97302-1125
From:	Eugene M. Reindel Robert D. Behr
Date:	May 31, 2002
Subject:	Aurora State Airport Noise Mitigation Program
Reference:	HMMH Job No. 297750

Harris Miller Miller & Hanson Inc. (HMMH) has completed the noise mitigation task for the Aurora State Airport (ASA) Noise Mitigation Study for the Oregon Department of Aviation (ODA). This memorandum introduces the noise mitigation process and assesses existing and potential new noise abatement measures at ASA. The final recommended mitigation package is then modeled and compared to the unabated case for years 2007 and 2017. The package represents the combined effort of HMMH, ODA, and the ASA DECIBEL Committee. This memorandum is the final HMMH deliverable of this study and incorporates the comments from the DECIBEL meeting on May 29, 2002.

BACKGROUND

When developing and evaluating noise mitigation actions, the following principles should be considered. Does the action:

- Reduce existing incompatible uses and prevent or reduce the probability of the establishment of additional incompatible uses?
- Not impose an undue burden on interstate and foreign commerce?
- Not unjustly discriminate?
- Not degrade safety or adversely affect the safe and efficient use of airspace?
- To the extent possible, meet both local needs and needs of the national air transportation system, considering tradeoffs between economic benefits derived from the airport and the noise impact?
- Allow implementation in a manner consistent with all the powers and duties of the Administrator of FAA?

Federal Land Use Compatibility Guidelines

A standard of land uses normally compatible, or non-compatible, with various exposures of individuals to airport-related noise is essential to providing a minimum uniform treatment of both airport operations and noise-sensitive land uses or activities. Reproduced directly from Appendix A of 14 CFR Part 150, Table 1 contains the federal guidelines or standards for land use compatible with aircraft noise. According to Table 1, all land uses are compatible with aircraft operations when the aircraft Day-Night Average Sound Level (DNL) is less than 65 dB.

Table 1: FAR Part 150 Noise / Land Use Compatibility Guidelines
Source: FAR Part 150, Table 1

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

Key to Table 1

SLUCM	Standard Land Use Coding Manual.
Y (Yes)	Land use and related structures are compatible without restrictions.
N (No)	Land use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35	Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Notes for Table 1

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

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(4) Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(5) Land use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

Noise mitigation studies quantify incompatibilities by counting the number of homes, schools, and churches within the incompatible DNL areas. Therefore, the basis of evaluating the benefits of proposed noise abatement measures is to compare the number of dwellings impacted under the abated DNL contours to the number of dwellings impacted under the base-case noise contours. Efforts to reduce the number of impacted people/dwellings usually focus on reducing the people in highest noise levels first.

State of Oregon Noise Control Regulations

The Oregon State Department of Environmental Quality (DEQ) finds that noise pollution caused by Oregon airports threatens the public health and welfare of citizens residing in the vicinity of airports. The DEQ has established that the criterion for airport noise is a DNL of 55 dB. The airport noise criterion is not designed to be a standard for imposing liability or any other legal obligation except as specifically designated in the Division 35 Noise Control Regulations for Airports.[1] The DEQ does not set guidelines for compatible or incompatible land use.

FAR Part 150, which governs the development of aircraft noise exposure contours, requires the development of DNL contours of 65 dB, 70 dB, and 75 dB. Given the DEQ Noise Control Regulations, this noise mitigation study will generate the noise exposure contours as required by FAR Part 150 *plus* the 55 dB and 60 dB DNL contours.

Development of Noise Mitigation Measures

In general, when developing noise mitigation measures under FAR Part 150, airports must consider at least the following seven categories of alternatives[2]:

1) Land acquisition and interest therein
2) Barriers, shielding, public building soundproofing
3) Preferential runway system
4) Flight procedures
5) Restrictions on type/class of aircraft
6) Other actions with beneficial impact
7) Other FAA recommendations

Categories 1 and 2 address only land use measures. Categories 3, 4, and 5 address only noise abatement measures. Categories 6 and 7 are other measures not covered in the first five categories.

[1] Paragraph 340-035-0045, Division 35 Noise Control Regulations, Department of Environmental Quality, Oregon Administrative Rules, April 15, 2002.
[2] Paragraphs B150.7(b) (1) through (7) of FAR Part 150 list these seven categories.

POTENTIAL NOISE MITIGATION

At the ASA noise mitigation workshop on January 29, 2002, ODA, the ASA DECIBEL Committee, and HMMH developed the following list of potential measures for consideration:

Noise abatement alternatives to model separately for further analysis

- Establish Runway 35 as the preferential/calm-wind runway.
- Change the traffic pattern for Runway 17 to a right-traffic pattern.
- Prohibit left turns when departing Runway 17.
- Eliminate/restrict touch-and-go operations on Runway 17.

Based on funding constraints and the ability to derive desired results from the other alternatives, the final alternative was not considered as a separate mitigation measure. The other three alternatives were modeled and the results reported to ODA in the "Noise Mitigation Measure Evaluations Results" memorandum, dated March 18, 2002.

Other noise abatement alternatives

- Establish an additional departure procedure for Runway 35 departures, which would allow a 90° right turn at 900' Above Mean Sea Level (MSL).
- Change the altitude limit on left turns when departing Runway 35, which would allow turns at 900' MSL rather than the existing 1200' MSL.
- Investigate the potential to allow a back-course approach to Runway 35 and encourage the FAA to publish this procedure.
- Install a sound barrier between the airport and mobile home park located west of midfield.

Land use mitigation alternatives

- Require the inclusion of Noise Disclosure Statements on real estate sale documents for properties inside the 55, 60, or 65 dB noise exposure contour.
- Provide sound insulation for homes inside the 65 dB contour.
- Relocate all mobile homes inside the 65 dB contour.

Implementation program

- Establish a continuing education program for pilots and tenants that includes:
  - Pilot education committee
  - NBAA and AOPA noise abatement training, which includes use of helicopter flight patterns
  - Low-level approaches
  - Prop controls
- Replace existing on-airport noise abatement informational signs with larger and clearer signs. The new signs should depict noise sensitive land use

areas and appropriate arrival and departure paths and procedures. Eliminate all unnecessary signs from the field.

- Establish an airport noise monitoring committee that meets quarterly to evaluate pilot compliance with established noise abatement procedures. The committee should be comprised of pilots, tenants, community members, and the ODA.
- Install Distance Measuring Equipment (DME/localizer) or Instrument Landing System (ILS) for Runway 35. According to the DECIBEL Committee and ODA either a DME or an ILS will be required before the FAA will allow Runway 35 to be used as the calm wind runway.
- Upgrade the existing Runway 17 DME. According to the DECIBEL Committee and ODA, an upgrade is required prior to instituting a back-course Runway 35 approach.

SEPARATE NOISE MITIGATION MODELING RESULTS

Upon reviewing the modeling results[3], we determined that two of the measures shifted some of the noise to another residential area, and, therefore, those measures were subsequently dropped from consideration. Changing the preferential and calm-wind runway from Runway 17 to Runway 35 provided the greatest noise reduction in all areas.

Changing the calm wind runway at ASA to Runway 35 significantly reduced the aircraft noise exposure for residential areas surrounding ASA without restricting aircraft operations. ODA and the DECIBEL Committee agreed to pursue changing the calm wind runway before taking further action to reduce aircraft noise exposure around ASA.

[3] Aurora State Airport Noise Mitigation Measure Evaluations Results, Memorandum to Daren Griffin – State Airports Manager, HMMH Job No. 297750, dated March 18, 2002.

RECOMMENDED NOISE MITIGATION PACKAGE

The following list details the recommended noise mitigation package for ASA. The main change for ASA is adopting Runway 35 as the preferred and calm-wind runway.

Noise Abatement Procedures

- ***Establish*** Runway 35 as the preferential/calm-wind runway.
- ***Establish*** an additional departure procedure for Runway 35 departures, which would allow a 90° right turn at 900' MSL.
- ***Change*** the altitude limit on left turns when departing Runway 35, which would allow turns at 900' MSL rather than the existing 1200' MSL.
- ***Investigate*** the potential to allow a back-course approach to Runway 35 and encourage the FAA to publish this procedure.

Land Use Program

- ***No Recommendation at this time.***

Implementation Program

- ***Establish*** a continuing education program for pilots and tenants that includes:
  - Pilot education committee
  - NBAA and AOPA noise abatement training, which includes use of helicopter flight patterns
  - Low-level approaches
  - Prop controls
- ***Replace*** existing on-airport noise abatement informational signs with larger and clearer signs. The new signs should depict noise sensitive land use areas and appropriate arrival and departure paths and procedures. Eliminate all unnecessary signs from the field.
- ***Establish*** an airport noise monitoring committee that meets quarterly to evaluate pilot compliance with established noise abatement procedures. The committee should be comprised of pilots, tenants, community members, and the ODA.
- ***Install*** Distance Measuring Equipment (DME/localizer) or Instrument Landing System (ILS) for Runway 35. According to the DECIBEL Committee and ODA either a DME or an ILS will be required before the FAA will allow Runway 35 to be used as the calm wind runway.
- ***Upgrade*** the existing Runway 17 DME. According to the DECIBEL Committee and ODA, an upgrade is required prior to instituting a back-course Runway 35 approach.

MODELING THE RECOMMENDED NOISE MITIGATION PACKAGE

This study used the Federal Aviation Administration's (FAA) Integrated Noise Model (INM), version 6.0c, to prepare noise contours for annual aircraft exposure, in terms of the Day-Night Average Sound Level (DNL). The inputs to the INM remained the same as in the unabated cases (Years 2007 and 2017) except for:

- Change in runway use based on the change in preferential runway to Runway 35,
- Addition of a 90° right turn for Runway 35 departures, and
- Change in required altitude prior to initiating turn from 1200' to 900' MSL.

HMMH developed DNL noise contours, made estimates of current housing units within the DNL contour intervals, and made comparisons of the modeled DNL values at four residential sites. Table 2 lists these sites, which correspond to the locations of our residential noise measurement sites.

Table 2. Residential Site Locations for DNL Comparison

Site No.	Location
3	32575 SW Riviera Lane – Charbonneau Community
4	14635 Kasel Court – Aurora Community
5	21320/21331 Main Street – Aurora Community
6	22037 Carissa Avenue – Deer Creek Community

Modeling Inputs

The INM requires inputs in the following categories:

- Physical description of the airport layout,
- Annual-average weather information,
- Number and mix of aircraft operations,
- Day-night split of operations (by aircraft type),
- Noise and performance characteristics of aircraft types,
- Runway utilization rates,
- Prototypical flight track descriptions, and
- Flight track utilization rates.

Airport Physical Parameters[4]

ASA is located approximately mid-way between the Portland metropolitan area and the state capital at Salem. ASA is located on the I-5 corridor on the border between Marion County and Clackamas County. ASA is one of seven airports in the Portland area with published instrument approach procedures. ASA is currently without an Air Traffic Control Tower (ATCT). However, Portland International Airport (PDX) Terminal Radar Approach Control (TRACON) provides radar service, the ASA radio UNICOM provides voice communication,

[4] Aurora State Airport Master Plan Update, October 2000.

and an Automatic Weather Observation Station (AWOS) provides meteorological information for aircraft using ASA.

ASA has one runway, Runway 17/35. The runway is 5,000 feet long by 100 feet wide. The full runway length is available for takeoff in both directions. The airport elevation is 196 feet above Mean Sea Level (MSL). Figure 1 presents the airport layout plan produced by W&H Pacific of Beaverton, Oregon.

Meteorological Parameters

Annual-average meteorological conditions are important for the calculation of atmospheric absorption that affects the noise-power-distance curves in the INM used to determine aircraft noise exposure levels. Input meteorological parameters were temperature (52.4°F), pressure (30.03 in. Hg), relative humidity (70%), and headwind (standard 8 knots).[5]

Aircraft Operations

For the future years of 2007 and 2017, the mix of aircraft was assumed to remain the same and the level of operations of those aircraft was obtained from the Master Plan Update. For the year 2007 the total fixed-wing operations were forecast to be 97,714 (+6.1%), and for the year 2017 the total fixed-wing operations were forecast to be 108,204 (+17.5%). The Master Plan Update did not provide information on helicopter operations. There is no reason to believe that helicopter growth will follow general aviation growth. From discussions with Columbia Helicopters, no growth in helicopter activity is projected in the future years.

The INM requires detailed information on specific aircraft types. The INM includes a database of over 100 aircraft types. While this is only a fraction of the actual number of discrete aircraft types operating at U.S. airports, it is extensive enough to include reasonable modeling surrogates for most aircraft. The FAA provides guidelines for selecting which INM aircraft type to use as a "substitute" for aircraft not specifically included in the database.

Tables 3 and 4 provide fleet mixes for annual-average daily activity (annual operations divided by 365) for 2007, and 2017, respectively. The fleet mixes are presented for specific aircraft types available in the INM database, and for the daytime and nighttime periods.

[5] WorldClimate .com, weather station averages in proximity to Aurora, Oregon.

Figure 1: Aurora State Airport Airport Layout Plan
Source: Aurora State Airport Master Plan, October 2000, W&H Pacific

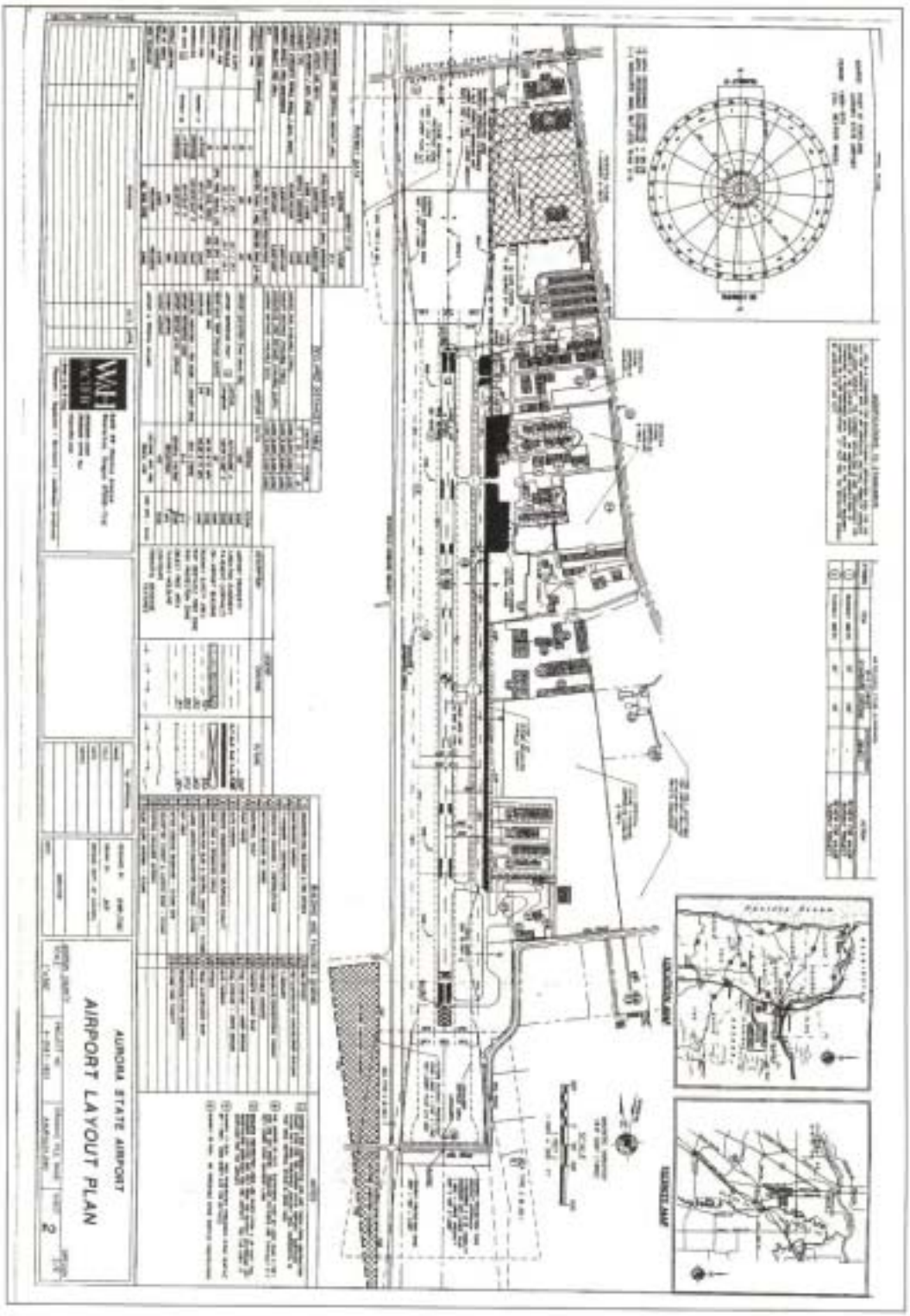


Table 3: Aurora State Airport Forecast Operations for 2007

Aircraft Category	Representative INM Aircraft Type	Departures		Arrivals		Touch & Go		Total
		Day	Night	Day	Night	Day	Night	
Single Piston	Fixed pitch	10.445	1.161	10.445	1.161	3.675	0.194	**27.081**
	Variable pitch	22.963	2.552	22.963	2.552	8.080	0.425	**59.535**
	Cessna 172	24.268	2.697	24.268	2.697	8.540	0.450	**62.920**
	Cessna 206H	19.123	2.125	19.123	2.125	6.729	0.354	**49.579**
Multiple Piston	Beech Baron 58P	7.228	0.803	7.228	0.803	2.543	0.134	**18.739**
Turbo-Propeller	Fixed pitch	4.518	0.502	4.518	0.502	1.589	0.084	**11.713**
Subtotal, non-jet fixed-wing		**88.545**	**9.840**	**88.545**	**9.840**	**31.156**	**1.641**	**229.567**
Jet	Cessna 500	0.121	0.014	0.121	0.014	0.000	0.000	**0.270**
	Cessna 550B	0.121	0.014	0.121	0.014	0.000	0.000	**0.270**
	Lear 25	0.723	0.081	0.723	0.081	0.000	0.000	**1.608**
	Lear 35	0.723	0.081	0.723	0.081	0.000	0.000	**1.608**
	Astra 1125	0.723	0.081	0.723	0.081	0.000	0.000	**1.608**
Subtotal, jets		**2.411**	**0.271**	**2.411**	**0.271**	**0.000**	**0.000**	**5.364**
Helicopters	Bell 206	0.448	0.038	0.448	0.038	0.000	0.000	**0.972**
	Bell 212	0.271	0.030	0.271	0.030	0.000	0.000	**0.603**
	Hughes 500	0.103	0.000	0.103	0.000	0.000	0.000	**0.205**
Subtotal, helicopters		**0.822**	**0.068**	**0.822**	**0.068**	**0.000**	**0.000**	**1.780**
Total		**91.778**	**10.179**	**91.778**	**10.179**	**31.156**	**1.641**	**236.711**

Notes: Day is 7:00 AM until 10:00 PM; Night is 10:00 PM until 7:00 AM.
Totals may not add due to rounding.
Each tough-and-go counts as two operations (one arrival and one departure).

Table 4: Aurora State Airport Forecast Operations for 2017

Aircraft Category	Representative INM Aircraft Type	Departures		Arrivals		Touch & Go		Total
		Day	Night	Day	Night	Day	Night	
Single Piston	Fixed pitch	11.566	1.285	11.566	1.285	4.070	0.215	**29.987**
	Variable pitch	25.429	2.826	25.429	2.826	8.948	0.471	**65.929**
	Cessna 172	26.874	2.986	26.874	2.986	9.456	0.498	**69.674**
	Cessna 206H	21.176	2.353	21.176	2.353	7.451	0.392	**54.901**
Multiple Piston	Beech Baron 58P	8.004	0.889	8.004	0.889	2.816	0.148	**20.750**
Turbo-Propeller	Fixed pitch	5.003	0.556	5.003	0.556	1.760	0.093	**12.971**
Subtotal, non-jet fixed-wing		**98.052**	**10.895**	**98.052**	**10.895**	**34.501**	**1.817**	**254.212**
Jet	Cessna 500	0.134	0.015	0.134	0.015	0.000	0.000	**0.298**
	Cessna 550B	0.134	0.015	0.134	0.015	0.000	0.000	**0.298**
	Lear 25	0.800	0.089	0.800	0.089	0.000	0.000	**1.778**
	Lear 35	0.800	0.089	0.800	0.089	0.000	0.000	**1.778**
	Astra 1125	0.800	0.089	0.800	0.089	0.000	0.000	**1.778**
Subtotal, jets		**2.668**	**0.296**	**2.668**	**0.296**	**0.000**	**0.000**	**5.930**
Helicopters	Bell 206	0.448	0.038	0.448	0.038	0.000	0.000	**0.972**
	Bell 212	0.271	0.030	0.271	0.030	0.000	0.000	**0.603**
	Hughes 500	0.103	0.000	0.103	0.000	0.000	0.000	**0.205**
Subtotal, helicopters		**0.822**	**0.068**	**0.822**	**0.068**	**0.000**	**0.000**	**1.780**
Total		**101.542**	**11.259**	**101.542**	**11.259**	**34.501**	**1.817**	**261.922**

Notes: Day is 7:00 AM until 10:00 PM; Night is 10:00 PM until 7:00 AM.
Totals may not add due to rounding.
Each tough-and-go counts as two operations (one arrival and one departure).

Runway Utilization

ASA runway use is dependent on prevailing winds and the preferred calm wind runway. ODA obtained archived weather data information for the past year and, in conjunction with the DECIBEL Committee, determined the new runway use for Runway 35 as the preferred/calm-wind runway at:

- 20% - - Runway 17
- 80% - - Runway 35

Flight Track Geometry and Utilization

For the base case (Year 2000), fixed-wing aircraft flight tracks were developed based on observations during the noise measurement periods, assumptions related to Runway 35 operations or north flow, and published noise abatement procedures. During the observation periods, ground tracks of arrivals, departures, and traffic patterns were noted and discussions were held with local pilots regarding local flight operations. Since the primary flow observed was south flow or operations on Runway 17, arrivals, departures, and traffic patterns for north flow mirrored that of south flow taking into account the published noise abatement procedures for departure from Runway 35. Helicopter helipads, based on coordinates provided by the ODA, were developed for transient helicopters, airport-based helicopters, and helicopters undergoing maintenance at the Columbia Aviation maintenance hangar. Since there were no established standard procedures for helicopters, HMMH designed nominal profiles for helicopters arriving and departing the various helipads that avoided conflict with the fixed-wing flight tracks. These profiles are for modeling purposes and only reflect actual flight tracks in the vicinity of the airport.

For the abated case, all flight tracks and helicopter profiles remained unchanged except as follows:

- Runway 35 departures were changed to begin the turn at 900 feet MSL.
- A new Runway 35 departure was added with a 90° right turn after takeoff.

Figures 2, 3, and 4 depict the modeled abated flight tracks for fixed-wing arrivals, departures, and touch-and-gos. Aircraft do not all fly on a single flight track, but rather fly in "corridors". Figures 2 through 4 utilize solid lines to depict the "backbone" or middle of the corridor, and dashed lines to depict the dispersion about the backbone, which make up the corridor. Figure 5 depicts the modeled flight tracks for helicopter operations. A total of seven helicopter flight tracks were modeled in an attempt to reach a reasonable depiction of the very diverse nature of actual helicopter tracks. Tables 5 and 6 list the flight track use percentages, using the "backbone" track names indicated in the figures for the fixed-wing aircraft and the flight tracks for the helicopters.

Figure 2: Modeled Fixed-Wing Arrival Flight Tracks for Noise Abatement

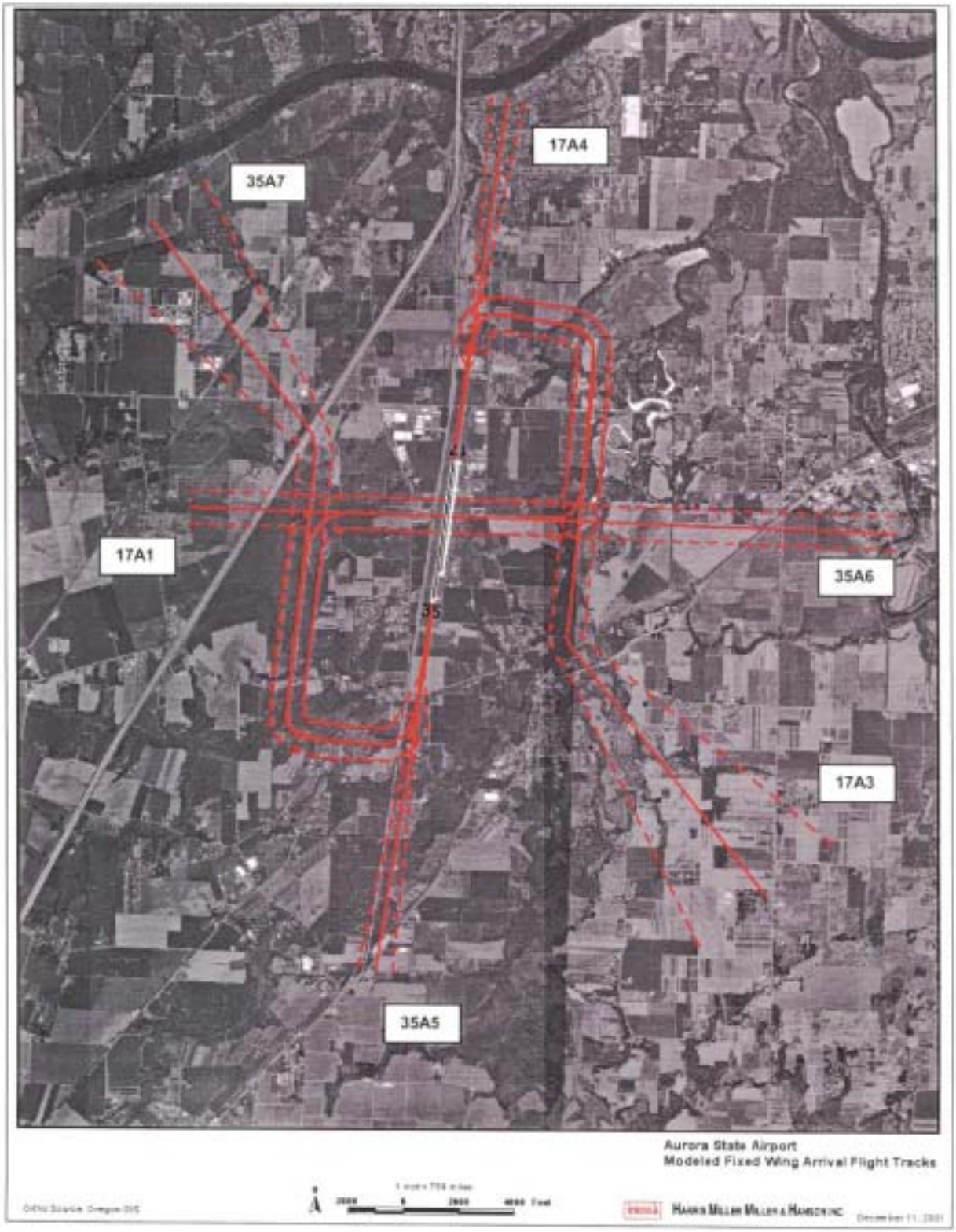


Figure 3: Modeled Fixed-Wing Departure Flight Tracks for Noise Abatement

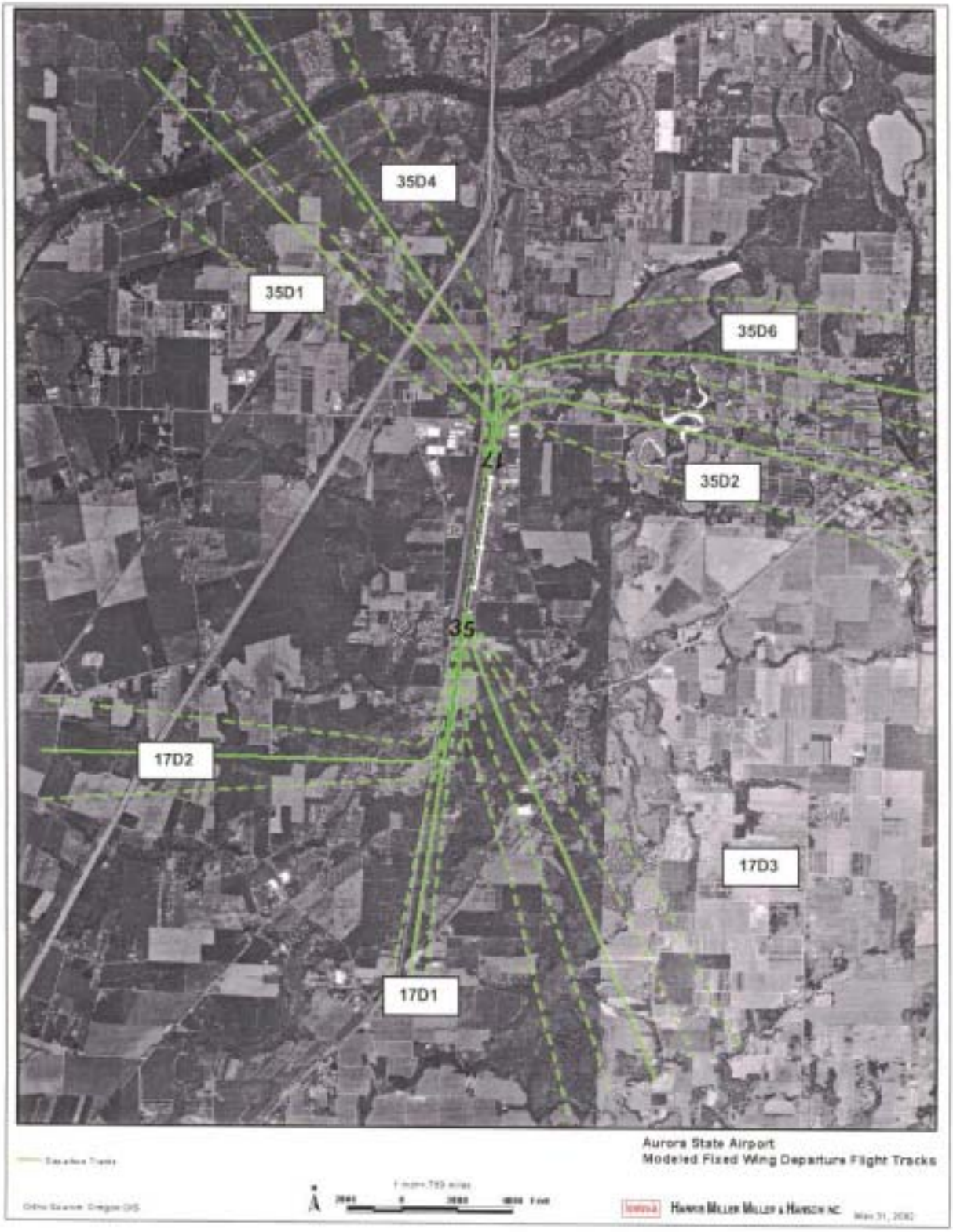


Figure 4: Modeled Fixed-Wing Touch-and-Go Flight Tracks for Noise Abatement

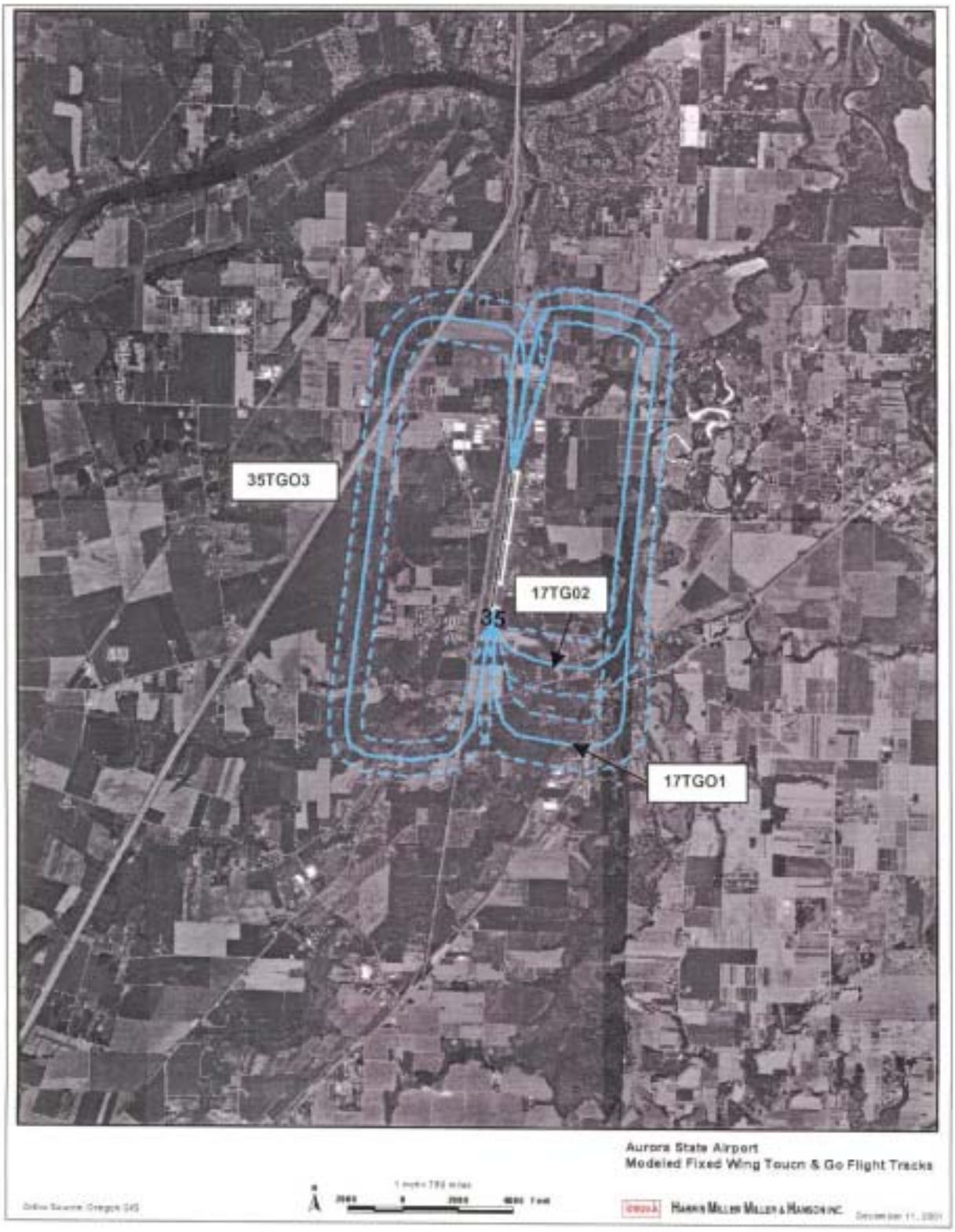


Figure 5: Modeled Helicopter Operation Flight Tracks for Noise Abatement

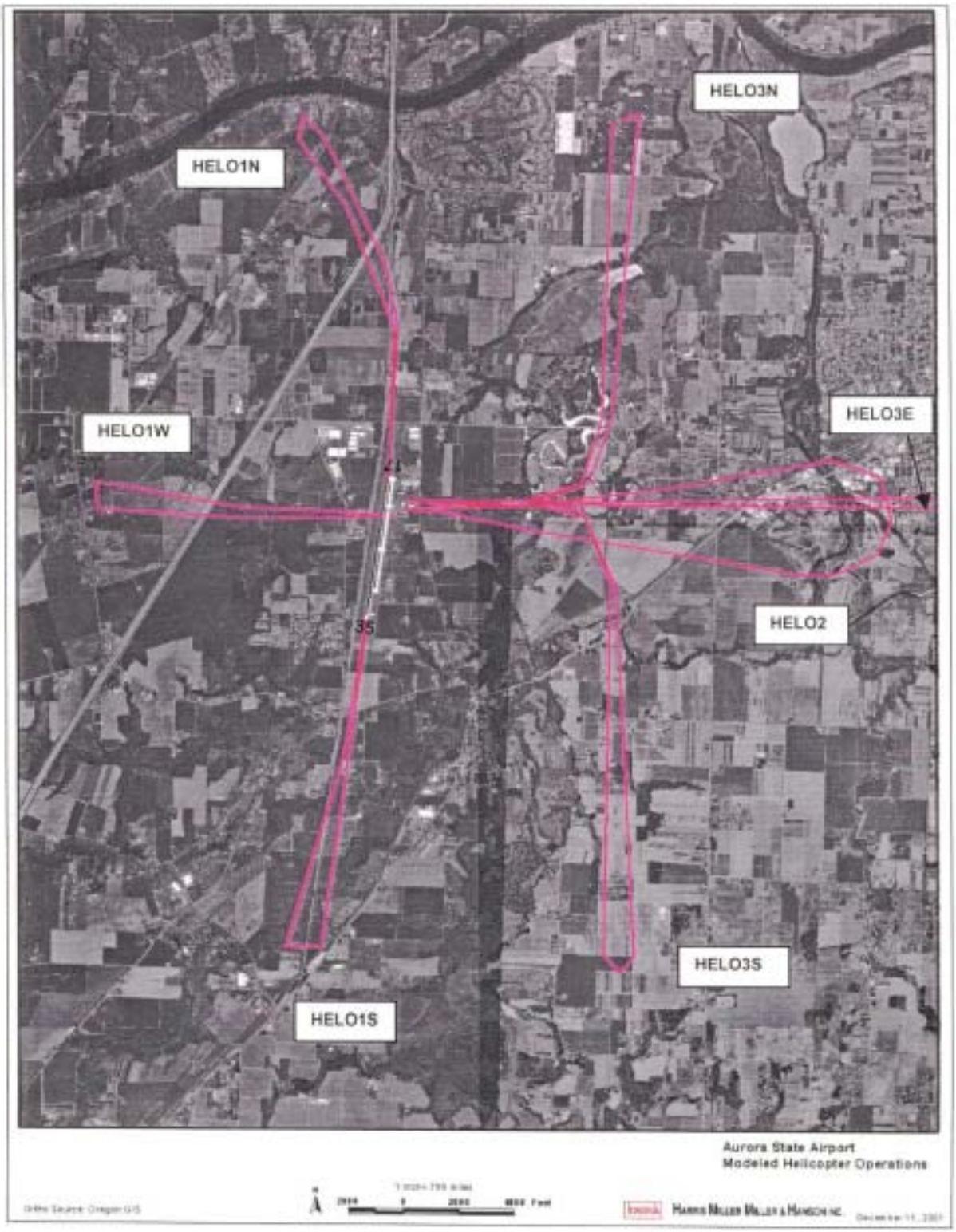


Table 5: Abated Flight Track Utilization Rates - Fixed-Wing

Aircraft Categories and Operations	Runway 17		Runway 35	
	Track	Use (%)	Track	Use (%)
Non-Jet Departures	17D1	25%	35D1	85%
	17D2	25%	35D2	15%
	17D3	50%		
Non-Jet Arrivals	17A1	40%	35A5	20%
	17A3	40%	35A6	40%
	17A4	20%	35A7	40%
Non-Jet Touch-and-Gos	17TGO1	50%	35TGO3	100%
	17TGO2	50%		
Jet Departures	17D1	100%	35D4	85%
			35D6	15%
Jet Arrivals	17A3	10%	35A5	90%
	17A4	90%	35A7	10%

Table 6: Abated Flight Track Utilization Rates - Helicopters

Aircraft Categories and Operations	Track	Use (%)
Helicopter Operations (Transient)	HELO1N	33%
	HELO1W	34%
	HELO1S	33%
Helicopter Operations (Maintenance)	HELO2	100%
Helicopter Operations (Based)	HELO3N	33%
	HELO3E	34%
	HELO3S	33%

NOISE EXPOSURE CONTOURS

This section presents two aircraft noise exposure contour sets with noise mitigation: (1) Year 2007 - Forecast Case, Figure 6; and (2) Year 2017 - Forecast Case, Figure 7. Also included in this section are estimates of housing units within DNL contour intervals with and without noise abatement. HMMH estimated the housing unit counts depicted in Table 7 using the aerial photo provided by ODA.

Table 7: Estimated Housing Units within the Aircraft DNL Contour Intervals
Source: ODA Aerial Photo, 19 October 1998

Year/Case	55-60 dB DNL	60-65 dB DNL	65-70 dB DNL	70-75 dB DNL	Total (within 55 dB DNL)
2007/Base	150	141	25*	0	316
2007/Abated	122	49	19*	0	190
2017/Base	195	146	37*	0	378
2017/Abated	149	57	25*	0	231

** Note: Incompatible land use according to FAA Guidelines (See Table 1)*

Incompatible Land Uses

Based on the FAA Guidelines in Table 1, the 19 and 25 estimated housing units within the abated 65-dB DNL contour constitute incompatible land use. These housing units consist of residences other than mobile homes and transient lodgings, and a mobile home park. These housing units are located to the west and southwest of ASA along the Wilsonville-Hubbard Highway and to the south of the airport. However, the change in preferential runway use from Runway 17 to Runway 35 has significantly decreased the incompatible land use by 6 and 12 estimated housing units for Years 2007 and 2017, respectively.

Aurora

The city of Aurora is primarily affected when ASA is operating in a south flow (landing and departing Runway 17). Arrivals from the south and east enter the traffic pattern on a flight track that is just east or northeast of the city. Departures off Runway 17 that turn left upon reaching 1,000 feet above ground level (AGL) also skirt the western and southwestern environs of Aurora. With the left traffic pattern, local flights in the pattern will fly anywhere from the northern edge to the southern edge of the city limits depending on other aircraft traffic or individual pilot technique. These aircraft are primarily the single-piston and turbo-prop aircraft. Making Runway 35 the preferential runway significantly reduces the noise exposure to the city and south of the city by reducing the number of departures and traffic patterns over the city and reduces the number of exposed housing units primarily in the 55-60 dB DNL contour interval. As Table 8 shows, the mitigation effort reduces the aircraft DNL at two Aurora residential areas by 3.9 dB and 6.0 dB. The FAA considers a change of 5 dB or more within the 45-60 dB DNL exposure interval as a slight-to-moderate degree of impact (Table 9).

Charbonneau

The community of Charbonneau is approximately 2 miles north of ASA directly under the arrival flight path for Runway 17. Most jet aircraft and some other aircraft, during periods of marginal weather, will fly published instrument approaches at altitudes of 800 – 1,400 feet above the Charbonneau community. Departures from Runway 35 are directed to turn left upon reaching 1,200 feet MSL to avoid flying over Charbonneau; however, these aircraft

Figure 6: Year 2007 Forecast DNL Noise Exposure Contours - Abated

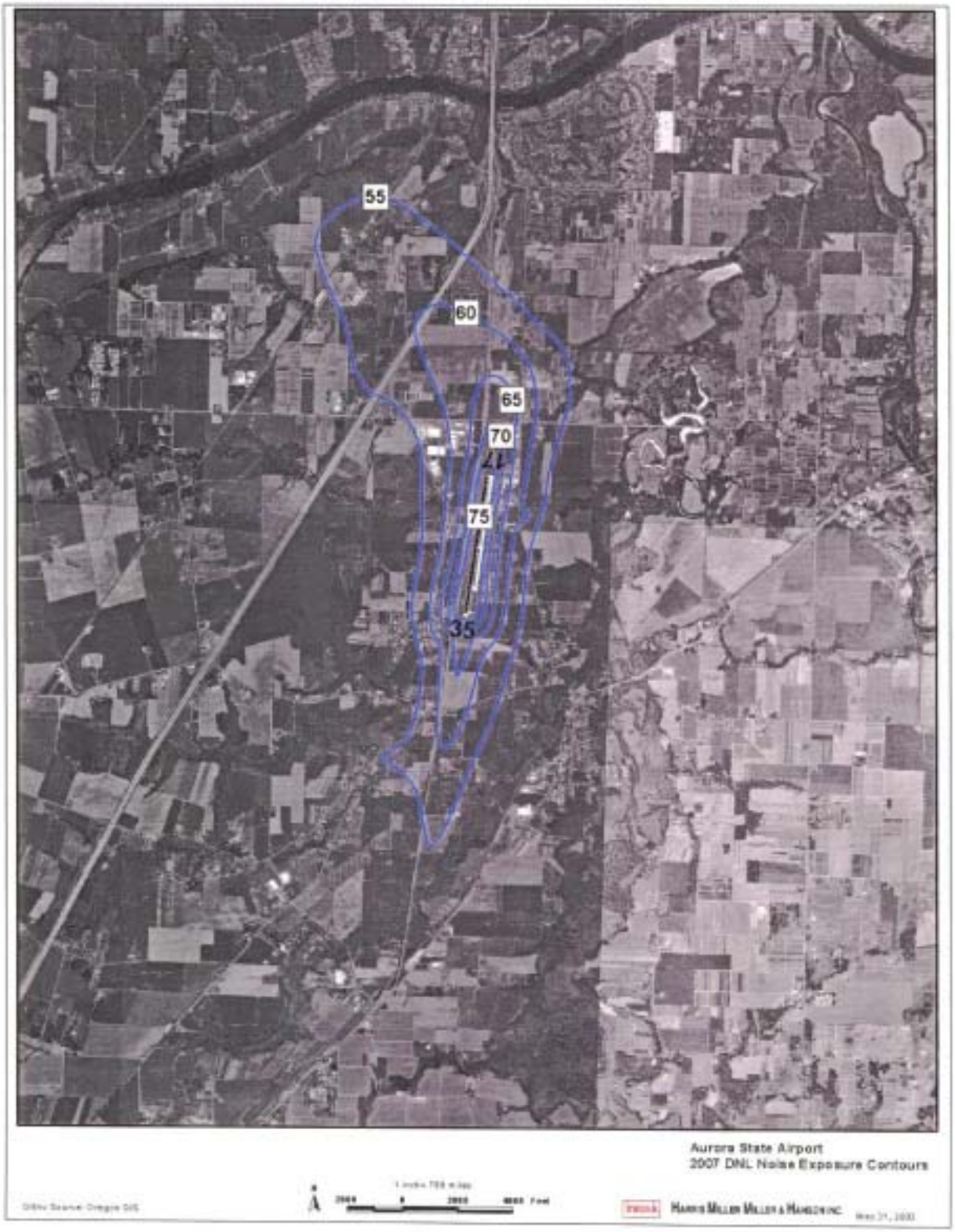
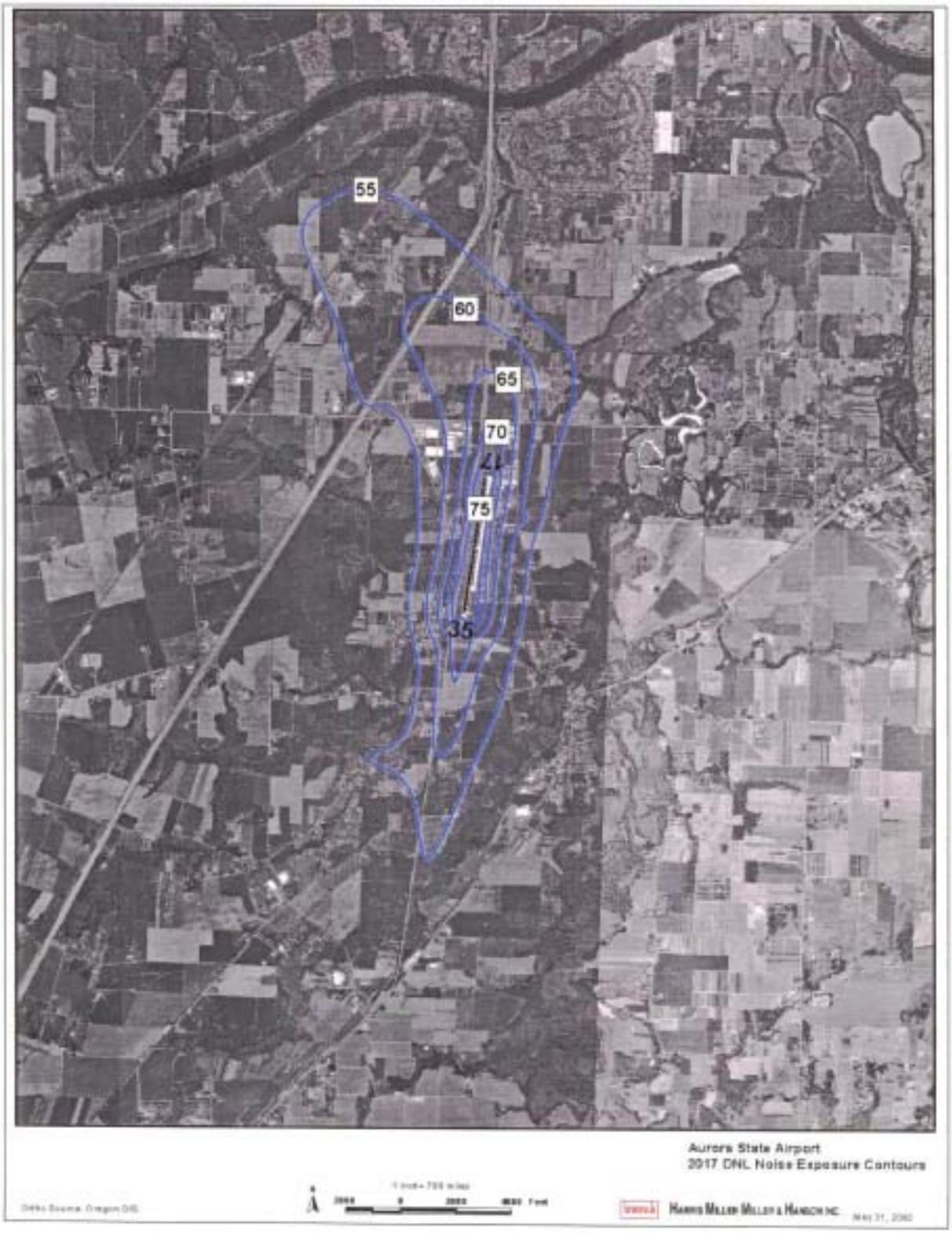


Figure 7: Year 2017 Forecast DNL Noise Exposure Contours - Abated



departures may still be audible in the westernmost parts of the community. The jets and twin-piston aircraft on approach to Runway 17 at ASA are the primary contributors to aircraft noise in this area. Changing the preferential runway to Runway 35 reduces the arrivals to Runway 17. In addition, having aircraft depart Runway 35 turn right or left after reaching 900 feet MSL, reduces the potential for aircraft noise exposure on the Charbonneau community. As Table 8 shows, the mitigation effort reduces the aircraft DNL at a Charbonneau residential area by 3.4 dB.

Deer Creek

The community of Deer Creek is just west of the south end of Runway 35. For Runway 17 operations, all departing aircraft are audible in Deer Creek. Those aircraft making a left turn after departure are less audible. For Runway 35 operations, the start-of-takeoff will be detected as well as noise from aircraft in the left traffic pattern. The primary contributors to aircraft noise in Deer Creek are jets and twin-piston aircraft departing Runway 17. With the abated case, the number of housing units affected is significantly reduced as the takeoff noise is predominantly start-of-takeoff noise versus noise associated with aircraft departing Runway17. Even with more aircraft in this vicinity due to the Runway 35 left traffic pattern, Table 8 shows the mitigation effort reduces the aircraft DNL at a Deer Creek residential area by 1.4 to 1.5 dB.

Table 8: Comparison of Base Case and Abated Case Aircraft DNL at Selected Sites
Source: INM 6.0c, HMMH

Year	Site	Base Case	Abated Case	
		DNL (dB)	DNL (dB)	Delta (dB)
2007	Charbonneau	49.7	46.3	-3.4
	North Aurora	55.5	51.6	-3.9
	Central Aurora	53.8	47.8	-6.0
	Deer Creek	57.6	56.2	-1.4
2017	Charbonneau	50.1	46.7	-3.4
	North Aurora	55.9	52.0	-3.9
	Central Aurora	54.2	48.2	-6.0
	Deer Creek	58.1	56.6	-1.5

Table 9: Basis for Noise Impact Criteria

DNL Exposure Interval of Alternative or Proposed Action	Minimum Change in DNL	Degree of Impact	Source
Less than 45 dB	N/A	Minimal	ATNS (FAA, 1990)
45 dB to less than 60 dB	5 dB	Slight-to-Moderate	ATNS (FAA, 1990)
60 dB to less than 65 dB	3 dB		FICON, 1992; FAA Order 1050.1D, Change 4, 1999
Greater than or equal to 65 dB	1.5 dB	Significant	FAA Order 1050.1D, Change 4, 1999; 14 CFR Part 150, Section 150.21(2)(d); FICON, 1992
Note: *ATNS = Air Traffic Noise Screening Procedure (FAA Notice 7210.360)*			

CONCLUSIONS

This study recommends adopting the noise abatement procedures and implementation program as outlined in the Recommended Noise Mitigation Package, which includes changing Runway 35 to the preferential runway. The recommended noise abatement procedures will provide a substantial reduction in aircraft noise exposure within the local environs of ASA as shown in Figures 6 and 7. These procedures will reduce the number of aircraft flying over the towns of Aurora and Charbonneau. The Recommended Noise Mitigation Package will benefit the ASA environs into the future by keeping the aircraft noise exposure to a minimum at locations of existing homes and where future homes are expected to be built as identified in the County's Master Plan (according to the DECIBEL Committee).

The recommended noise abatement procedures will ***reduce*** aircraft noise exposure by: ***4 to 6 dB*** in Aurora, which according to FAA guidelines in Table 9 is a slight-to-moderate change in the degree of impact, and ***3.4 dB*** in Charbonneau and ***1.5 dB*** in Deer Creek.