



**FAA  
REPORT  
INTERNATIONAL  
AIRPORT  
F.A.R.  
PART 150  
NOISE COMPATIBILITY  
STUDY**



**SUMMARY REPORT**

# INTRODUCTION

The impact of aircraft noise on airport neighbors has been a major environmental issue in the United States for many years, particularly since the introduction of jets to the civilian aircraft fleet. At the same time, noise impacts from other sources also have increased commensurately with the growth of our urban areas. Adverse effects of noise from all sources must be dealt with positively. Recognizing these concerns, the City of Phoenix, along with the City of Tempe, initiated the Federal Aviation Regulation Part 150 Airport Noise Compatibility Study in January of 1987.

Noise compatibility planning is the key step in reducing and preventing conflicts which occur due to both increased aviation activity and urban growth. The F.A.R. Part 150 Airport Noise Compatibility Study has explored the full range of options available so that the City of Phoenix can determine how the airport can meet the increasing demands placed upon it while, at the same time, fulfilling the role of being a good neighbor to the developed areas nearby.

An even greater challenge has been where portions of the airport environs are undeveloped, such as is the case to the east and west of the airport, to ensure that vacant areas are developed for noise-compatible uses so that the airport can operate in the future without the constraints which inevitably occur when there are major land use conflicts.

The Part 150 Study has suggested several methods for reducing noise impacts. The noise abatement recommendations include the following:

- Rotational Runway Use (balanced flow).
- Noise Abatement Thrust Cutback after takeoff for airlines.
- National Business Aircraft Association departure procedures for general aviation business jets.
- Runway 26L Departure Turn to a 245 degree heading.
- One Mile DME Departure procedure for Runways 8R/L.
- Continue Existing Aircraft Run-up Policies.
- Encourage the Airlines Utilization of Stage III Aircraft - Particularly for nighttime departures.
- Adjustment of existing visual final approaches.

The Land Use Management Recommendations include the following:

- Noise Overlay Zoning
- Fair Disclosure Policy
- Comprehensive Planning
- Planning Commission Review Process
- Soundproofing

All of these recommendations are explained in more detail later in this summary report. The analysis that lead to these recommendations is contained in the Part 150 Study, which is on file with the Phoenix Aviation Department.

## PART 150 PROCESS

Part 150 of the Federal Aviation Regulations sets minimum planning standards for airport noise compatibility and establishes the approach to conducting studies authorized under Part 150.

The Airport Noise Compatibility Study has been a two-fold program directed, first, toward aircraft noise control and, second, toward land use compatibility. Four features make such a study under F.A.R. Part

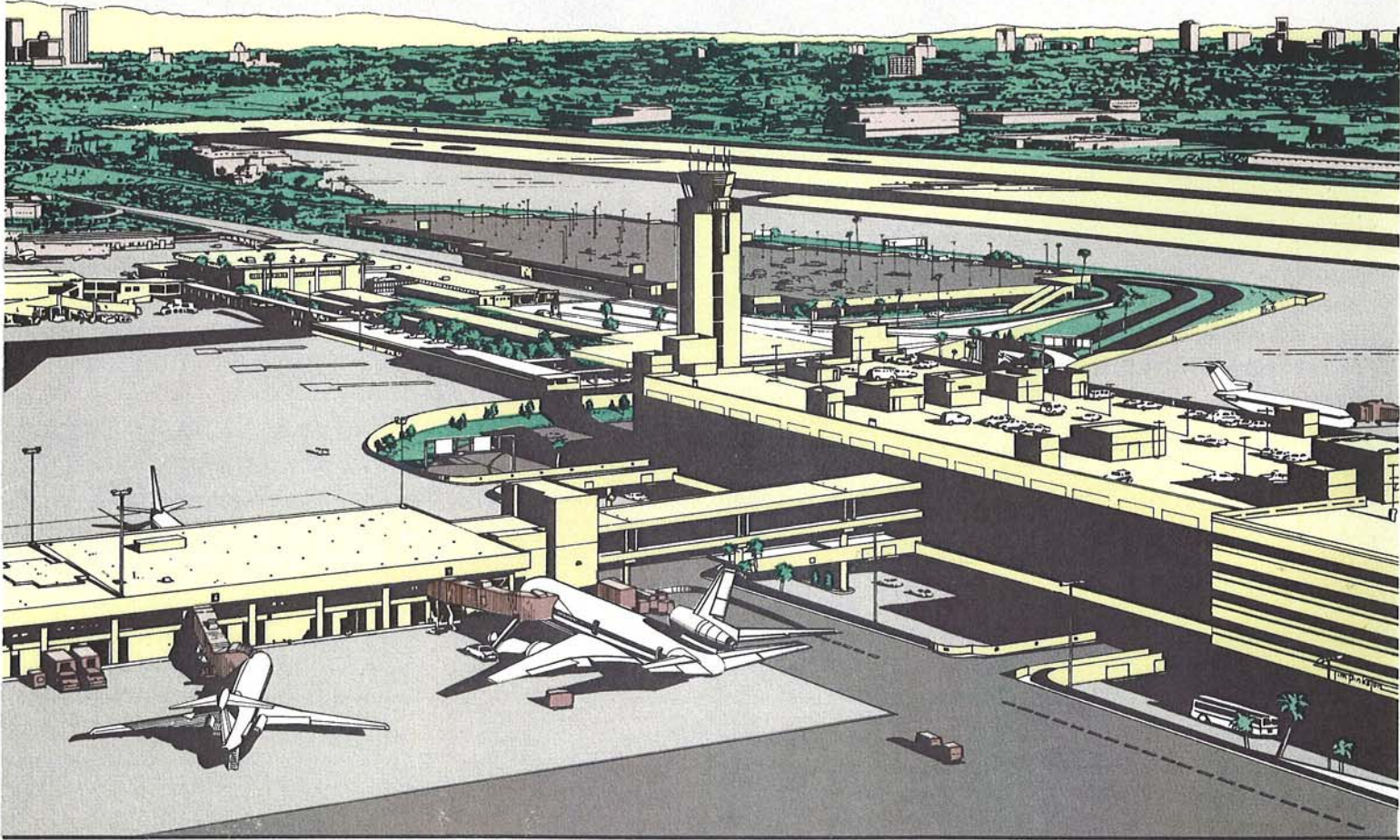
150 unique: it is the only comprehensive approach to preventing airport and community noise conflicts; implementation of the study recommendations is sought during the course of the study, rather than at the end; eligible items in the finally-approved plans may be funded from a special account in the Federal Airport Improvement Program; and a Noise Compatibility Study is the only airport study conducted primarily for the benefit of the airport neighbors.

## STUDY OBJECTIVES

Sky Harbor International Airport is the largest civil airport in Arizona and the regional focus of air transportation. At Sky Harbor there are over 400 scheduled jet flights daily to all parts of the United States by 18 airlines, as well as charter flights to points throughout the world and an Air National Guard unit. To protect this resource, the Noise Compatibility Study was initiated with these objectives:

- Determine existing aircraft and background noise levels and identify the effects of such noise on vicinity land uses.

- Modify aircraft flight tracks, air traffic control procedures, and airport facilities in order to reduce noise and impacts on people.
- Limit land development, in those areas where significant aircraft noise cannot be eliminated, to uses which are compatible with noise exposure.
- Establish procedures for implementation of the plan and for continued monitoring and periodic review of the implemented program.



## STUDY APPROACH

To meet these objectives, a study approach was designed that would identify the current and anticipated noise exposure and related impacts, offer alternative methods for its abatement, and develop a realistic and implementable plan for decreasing and/or preventing noise-related conflict between the airport and its neighbors. The study included the following major steps:

- **Study Initiation** - Materials were prepared to introduce the project to the community and put administrative procedures in place.
- **Existing Conditions** - Relevant information and data for Sky Harbor International Airport and its surrounding areas were assembled and organized.
- **Forecasts** - Detailed estimates of future air traffic activity by quantity and type were developed. (The forecasts of passenger movements and aircraft operations are indicated on the two accompanying graphs).
- **Aviation Noise** - The current and unabated future aircraft noise exposure levels within the airport environs were determined.
- **Community Noise** - The levels of noise associated with nonaviation sources within the study area for current and future conditions were determined.
- **Noise Impacts** - The number and intensity of impacts of aviation noise on the present and future resident population and land uses within the airport environs were evaluated. This analysis completed the compilation of data necessary for the preparation of official F.A.R. Part 150 Noise Exposure Map Documents.
- **Noise Alternatives** - Methodologies for the reduction of noise on land uses via the implementation of improved flight tracks and air traffic control procedures were evaluated.
- **Land Use Alternatives** - Current and potential methods for the management of land use development within those areas where noise will remain a long-term concern were investigated and mitigation techniques for any uses which remain impacts were prepared.
- **Noise Compatibility Program** - A recommended plan for noise compatibility at Sky Harbor International Airport which incorporates the most effective and implementable techniques of noise abatement

and land use management has been prepared. The result of this phase of the project is documentation in support of the formal submission of the Noise Compatibility Program under F.A.R. Part 150.

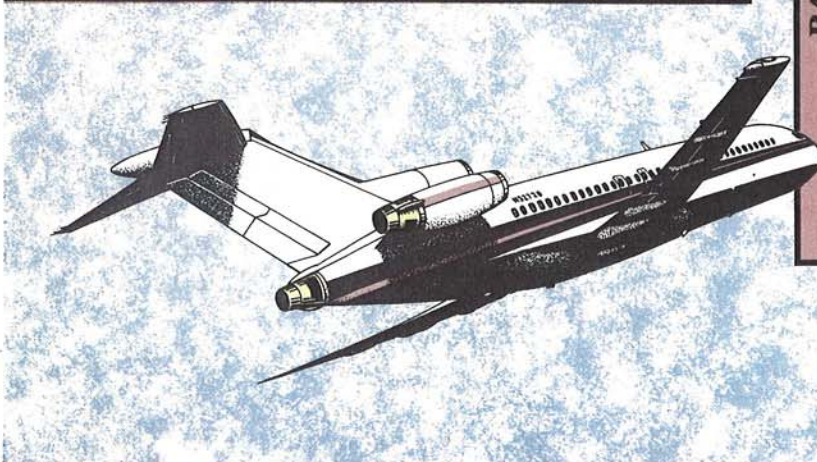
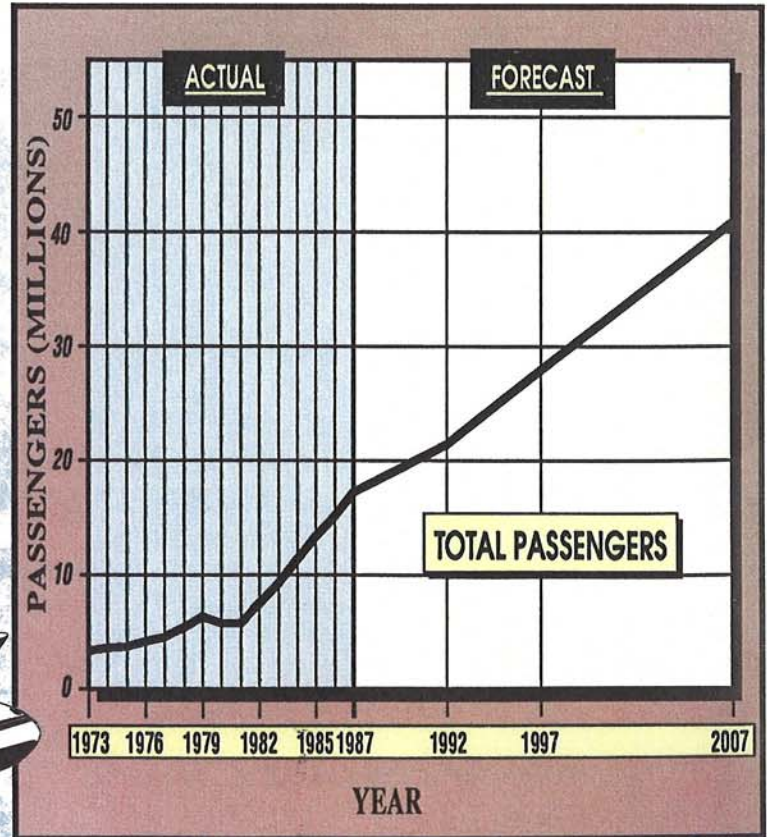
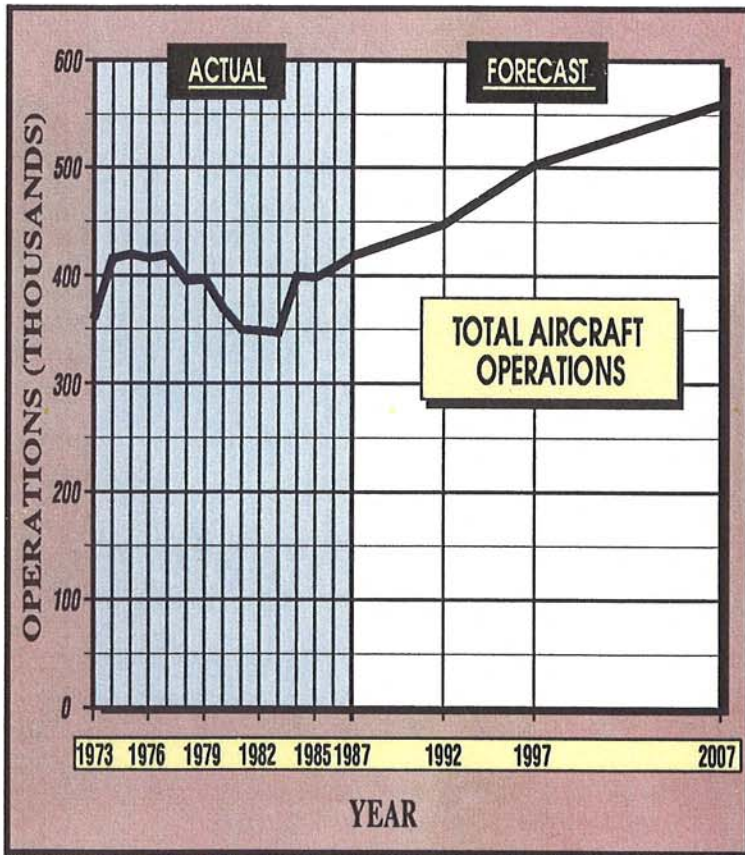
The study approach has included the direct involvement of the public and consultation with public agencies and aviation users throughout the planning process. This was accomplished through the participation of a Planning Advisory Committee (PAC) to review the work of the Consultant.

The PAC included 35 members representing the following groups:

- Homeowners Associations
- Airlines

- Airline Pilots Association
- Planning Agencies
- Federal Aviation Administration
- City of Phoenix
- City of Tempe
- City of Mesa
- City of Scottsdale
- Maricopa Association of Governments
- Arizona State University
- National Guard
- Citizens

PAC meetings were held throughout the study in order for committee members to review and comment on the study findings. In addition, Public Information Workshops were also held. These workshops allowed the general public to review the study progress and recommendations as well as provide individual input.



## EXISTING AND FUTURE IMPACTS

In order to assess the level of population impacts related to the present and future operation of the airport, noise exposure contours were developed. The contours are based on existing and forecast aircraft activity with no "new" noise abatement procedures in place. These contours, as well as the existing and future population impacts, were compiled into the Noise Exposure Map Document. The existing noise exposure contours are shown on the centerfold of this document.

The Day-Night Average Sound Level (Ldn) was used to assess aircraft noise exposure at Phoenix Sky Harbor International Airport. Ldn is consistent with existing measurement technologies and is the metric currently preferred by the Federal Aviation Administration (FAA), Environmental Protection Agency (EPA) and Department of Housing and Urban Development (HUD) as an appropriate measure of cumula-

tive noise exposure. All federally-funded Part 150 noise compatibility studies use Ldn (or a derivative methodology) as the sole or primary measure of noise exposure.

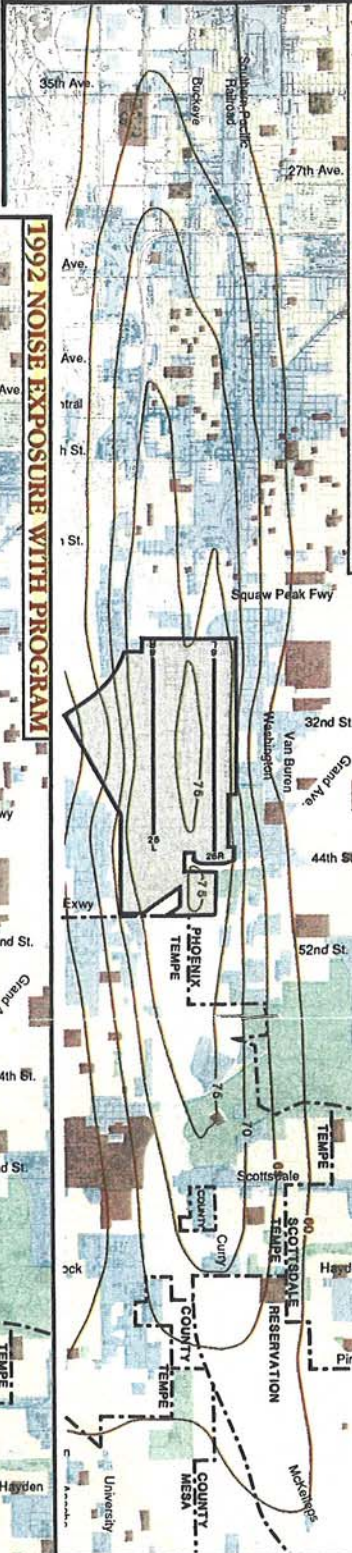
Ldn is defined as the average A-weighted sound level during a 24-hour period with a 10 decibel penalty applied to noise events occurring at night (10:00 p.m. to 7:00 a.m.). The 65, 70, and 75 Ldn noise contours have been established as being above the federally-defined significant level of impact on residential population. These Ldn levels and the population impacts associated with them have been used as a basis of evaluation for the Part 150 Study. Table A outlines the existing and future "unabated" population impacts. Table B indicates the reduced population impacts resulting from implementation of the recommended plan.

**Table A**

<b>Existing and Future Population Impacts (Unabated)</b>							
<u>EXISTING</u>	<u>WEST</u>	<u>EAST</u>	<u>TOTAL</u>	<u>1992</u>	<u>WEST</u>	<u>EAST</u>	<u>TOTAL</u>
65-70 Ldn	8,566	6,550	15,116	65-70 Ldn	10,819	6,083	16,902
70-75 Ldn	9,415	2,230	11,645	70-75 Ldn	13,367	3,150	16,517
75+ Ldn	<u>4,232</u>	<u>0</u>	<u>4,232</u>	75+ Ldn	<u>1,668</u>	<u>0</u>	<u>1,668</u>
Total	22,213	8,780	30,993	Total	25,854	9,233	35,087
<u>1997</u>	<u>WEST</u>	<u>EAST</u>	<u>TOTAL</u>	<u>2007</u>	<u>WEST</u>	<u>EAST</u>	<u>TOTAL</u>
65-70 Ldn	10,346	7,335	17,681	65-70 Ldn	11,648	9,600	21,248
70-75 Ldn	14,106	2,724	16,830	70-75 Ldn	10,857	880	11,737
75+ Ldn	<u>1,511</u>	<u>0</u>	<u>1,511</u>	75+ Ldn	<u>40</u>	<u>0</u>	<u>40</u>
Total	25,963	10,059	36,022	Total	22,545	10,480	33,025

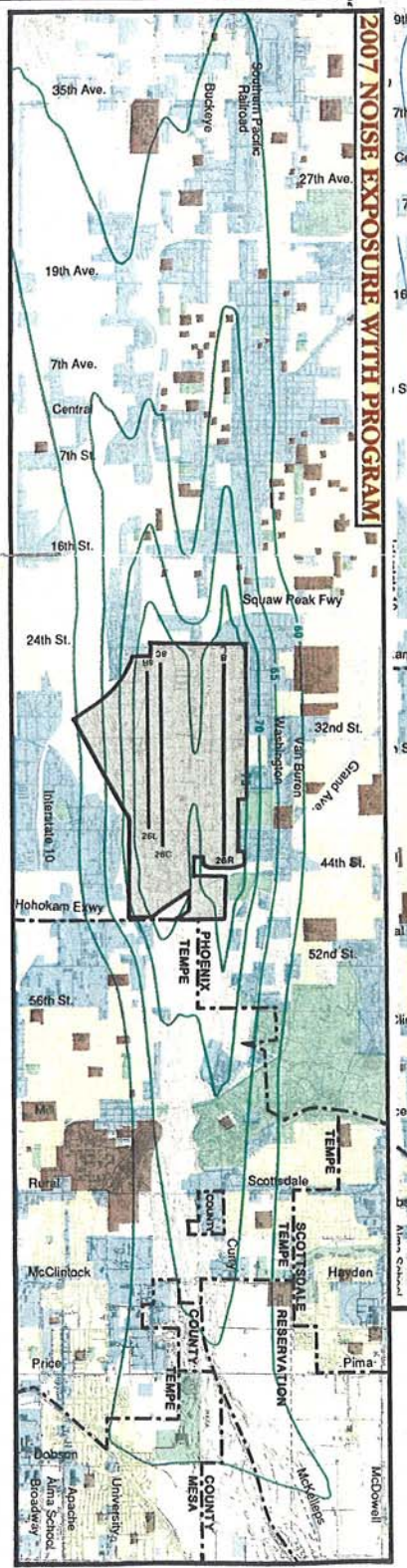
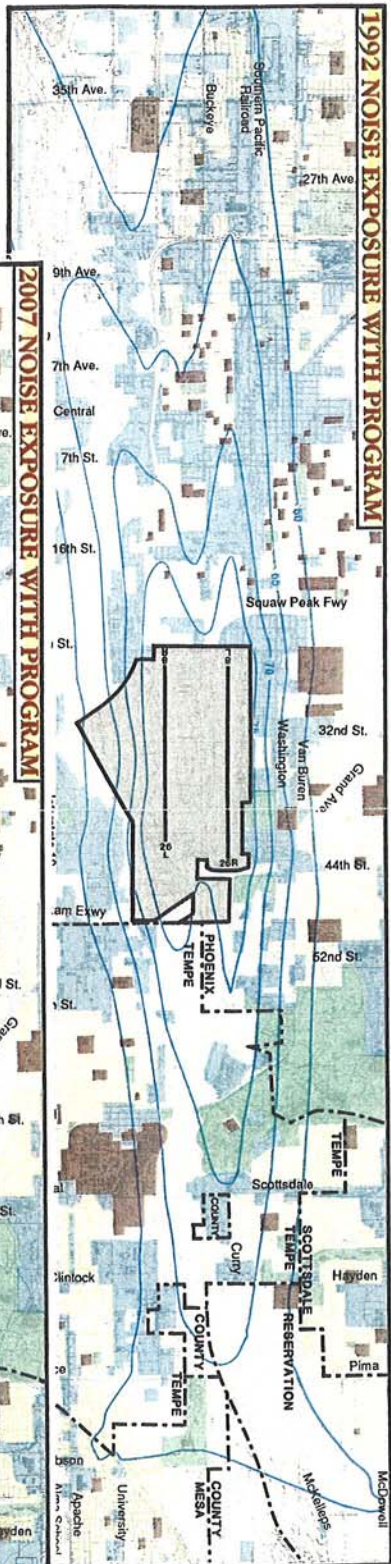


**1987 NOISE EXPOSURE WITHOUT PROGRAM**



**LEGEND**

- Municipal Boundaries
- Airport Boundary
- ▭ Residential
- ▭ Noise Sensitive Institutional
- ▭ Parks, Open Space, Recreational
- ▭ Commercial, Industrial, Services
- ▭ Undeveloped Rights-Of-Way
- ▭ Generalized Airport Property
- 55 Idm Noise Contour
- 65
- 70
- 75



**Table B**  
**EXISTING AND FUTURE POPULATION AND LAND USE PATTERNS**

	UNABATED NOISE	ABATED NOISE	1987	1992	1997	2007
Population Within						
65-70 Ldn	15,116	13,899	9,779	4,054	0	0
70-75 Ldn	11,645	513	35	0	0	0
75+ Ldn	4,232	0	0	0	0	0
Total	30,993	14,352	9,814	4,054	0	0
Land Use:						
Noise Sensitive						
Schools	13	24	14	5	4	9
Churches	37	6	5	0	4	4
Hospitals	2	1	0	0	0	0

\* Abatement includes effects of noise abatement measures and land use management measures. Residents of homes that are not managed in accordance with the standards set forth in the program are not included in the noise exposure for the purposes of this comparison.

---

---

## NOISE COMPATIBILITY PROGRAM

The Noise Compatibility Program constitutes the second of two parts required for an Airport Noise Compatibility Study under F.A.R. Part 150. The Noise Compatibility Program seeks an optimal accommodation of both airport operations and community activities within acceptable safety, economic, and environmental parameters. Such an effort involves both the reduction of existing land use conflicts, either by aircraft noise abatement or by changes to the land use itself, and the prevention of new incompatible land uses.

During the study, 32 various noise abatement alternatives were examined using the various techniques:

- Runway Use and Flight Route Changes

- Airport Restrictions and Regulations
- Modified Aircraft Operational Procedures
- Airport Facility Development/ Changes

In order to evaluate each noise abatement alternative, several criteria were utilized including noise reduction factors (number of people), operational factors (conflicts, capacity, safety), environmental factors (air or water quality), and cost factors (flight delays, capital improvements).

Nineteen land use management alternatives were also examined in the Part 150 study and included techniques such as compatible use zoning, noise overlay zoning, noise easements, noise insulation, fair disclosure, planning commission review, and acquisition programs.

## RECOMMENDED NOISE ABATEMENT PLAN

After considerable analysis, as well as review and input from the Planning Advisory Committee, the following measures have been recommended to reduce or shift noise so as to reduce impacts on airport neighbors.

The recommended noise abatement program is separated into two phases -- measures which are considered implementable by 1992 and those which may require a longer period to implement.

### Short-Term Program Measures

The first stage of the aviation noise abatement program consists of those measures which are believed to be achievable by 1992. These measures assume the airport in its present configuration of two parallel east to west runways. The recommended measures include the following:

- Continue a runway use program calling for the equalization of departure operations to the east and west for both the daytime and nighttime periods.
- Request airlines adopt the use of FAA Advisory Circular 91-53 or equivalent replacement noise abatement departure procedures by jet air carrier aircraft when departing from all runways. Request that low bypass ratio aircraft reduce power to 1.7 EPR or less during the thrust reduction mode and that high bypass ratio aircraft reduce power to normal climb thrust. Although AC 91-53 does not specify a 1.7 EPR cutback, most airlines have found this level to be acceptable for noise abatement under nearly every condition.
- Request the use of National Business Aircraft Association "close-in" or comparable departure procedures by general aviation business jet aircraft when departing from all runways.

- Implement a left turn by all jets and large propeller aircraft departing Runway 26L to a heading of 245 degrees upon crossing the middle marker for Runway 08R approaches. Maintain that heading until reaching 13 DME from the SRP VORTAC. To enhance traffic separation, assign Runway 26R/L departures based on SID procedure selected. Assign Runway 26L to aircraft using left-turning or straight-out SIDs. Assign Runway 26R to aircraft using right-turning SIDs.
- Implement a departure route procedure which overflies the Salt River to a position one mile west of the SRP VORTAC for use by all jets and large propeller aircraft departing Runways 08R/L (One DME departure.)
- Investigate the potential to standardize initial departure and final approach routes for helicopter traffic using Sky Harbor Airport.
- Continue existing runway policies which disallow engine runup operations between 11:00 p.m. and 5:00 a.m.
- Encourage the airlines to utilize Stage III aircraft for all operations but, more specifically, encourage the use of Stage III aircraft for nighttime departures.
- Adjustment of visual final approaches to reduce noise impacts of arriving aircraft.

### Long-Term Program Measures

The elements of the longer-term program (beyond 1992) are variable based upon the presence or absence of a third parallel runway located on the south side of the existing south parallel runway. The current Master Plan project anticipates the need for development of this facility prior to the year 1997. Until the runway is commissioned, the short term program may continue in place, but when the new runway comes on line, two additional noise abatement measures are recommended.

- Implement turns by all jets and large propeller aircraft departing "new" Runway 26L to a heading of 245 degrees upon crossing the middle marker (assuming such is in place) for Runway 08R approaches. If no middle marker is constructed, the turn location should be defined relative to the SRP VORTAC. Maintain that heading until reaching 13 DME from the SRP VORTAC.

- Implement a departure route procedure which overflights the Salt River to a position one mile west of the SRP VORTAC for use by all jets and large propeller aircraft departing Runway 08R (Extended One DME departure.)

## RECOMMENDED LAND USE MANAGEMENT PLAN

With the implementation of the noise abatement recommendations outlined above, the area exposed to noise above 65 Ldn will be significantly reduced in both the current and future time frames, although in neither case will it be eliminated. A similar reduction of areas above 70 and 75 Ldn will occur in the near and long terms. The population exposed to noise in excess of 65 Ldn will be reduced significantly in each time frame, while the exposure of noncompatible uses to noise above 75 Ldn will be almost eliminated within five years and noise above 70 Ldn within ten years. The effectiveness of the noise abatement recommendations in reducing noise impacts in the airport vicinity can be enhanced by adopting the land use management measures described below.

### Noise Overlay Zoning

Noise overlay zoning is intended to establish special standards within a noise-impacted area to help mitigate the problems caused by noise. These standards supplement the standards of the underlying zoning classifications.

It is recommended that both Phoenix and Tempe adopt noise overlay zoning. The outer boundaries of the overlay zones should be based on the abated noise contours for the 1992 noise abatement plan. This is based on the assumption and belief that the recommended noise abatement plan will receive FAA approval and attain fully successful implementation. It is also proposed that noise easements be secured from all new noise-sensitive development inside the noise overlay zones prior to the issuance of occupancy permits.

It should be emphasized that the noise overlay zone provisions should apply only to new construction, but not improvements to or expansion of pre-existing uses. It is proposed that the builder or developer be required to demonstrate compliance with noise attenuation performance standards.

### Fair Disclosure Policy

Fair disclosure policies may be implemented in one or both of two ways: a legally binding requirement for licensed real estate agents to inform prospective buyers of residential property that the property is exposed to significant levels of aircraft noise; and an informal program of the airport to call attention to aircraft noise exposure on local neighborhoods and the significance of such exposure. Presently, the State of Arizona controls all legislation regulating the conduct and requirements of real estate agents dealing in intrastate transactions. It is

believed that formal fair disclosure requirements could only be implemented by Phoenix and Tempe if the State passed new enabling legislation to that effect.

### Comprehensive Planning

It is proposed that Phoenix and Tempe adopt the final Part 150 Study as the airport compatibility element of their general plans. They should amend their current general plan documents as necessary so as to give the airport compatibility element full force and effect. The City of Scottsdale, Maricopa County, the Indian Community and the City of Mesa may also elect to adopt the Part 150 Plan to serve as a guide in future development decisions.

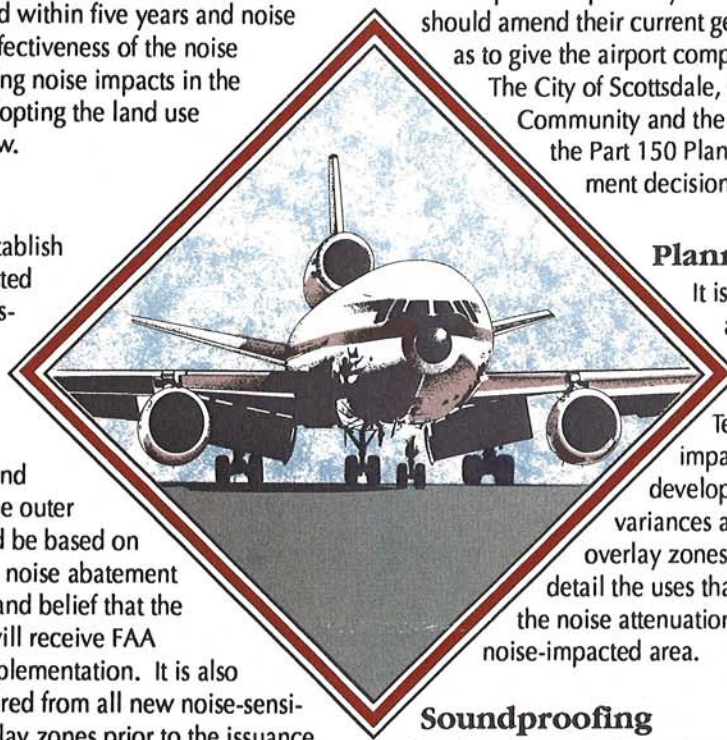
### Planning Commission

It is recommended that guidelines be adopted for planning commissions, boards of zoning adjustment and planning departments in Phoenix and Tempe requiring them to consider the impact of airport noise on community development proposals and applications for variances and special use. The proposed noise overlay zones in Phoenix and Tempe will spell out in detail the uses that are acceptable or unacceptable, and the noise attenuation measures that are required, in the noise-impacted area.

### Soundproofing

Soundproofing may be applied to all types of residences, nursing homes, hospitals, schools, churches, and any other use of which it can be clearly demonstrated that aircraft noise substantially interferes with customary indoor activities. A condition of a soundproofing program should be that the owner grant the airport an aviation easement for noise and sign a nonsuit covenant. The proposed soundproofing program for the Sky Harbor vicinity is comprised of high-priority, near-term actions and lower-priority, longterm actions. Both sets of actions consist of soundproofing programs to be operated by the City of Phoenix and the City of Tempe, in their respective jurisdictions.

The near-term program which includes all homes remaining within the Ldn 70 contour and many in the higher reaches of the 65-70 Ldn range, is scheduled to be implemented by 1992. The long-term program, scheduled to be implemented after 1992 (but earlier if possible), includes eligible residences in the higher levels of the Ldn 65-70 range not covered by the near-term program.





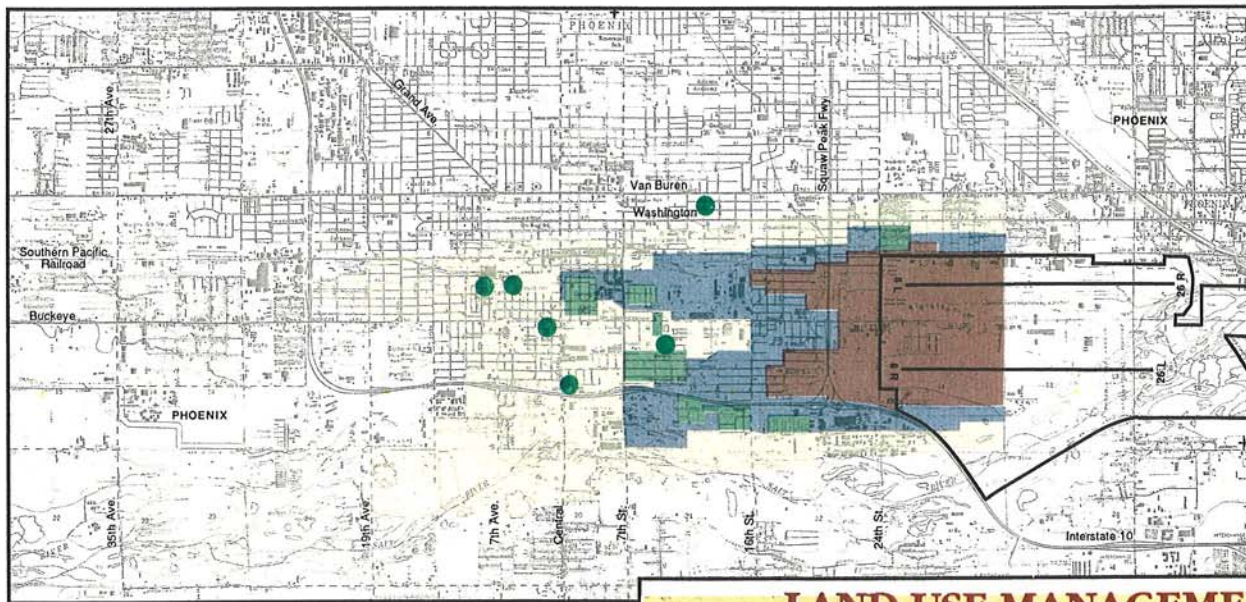
A portion of the recommended soundproofing program is combined with a redevelopment program. All of the areas recommended for soundproofing in Phoenix are composed of older, smaller homes, many of which are in varying degrees of structural deterioration. As such, it would be an inefficient investment of funds to install thousands of dollars worth of soundproofing in a home that was in a spiral of deterioration. Therefore, for all Phoenix areas, it is recommended that soundproofing of sub-standard dwellings be implemented only as part of a neighborhood rehabilitation program.

Traditionally, the soundproofing programs begin with small pilot projects in which the management system is established; consultants, suppliers and contractors are located; techniques are reviewed and tested; and results are monitored. When the program is capable of functioning smoothly, the soundproofing efforts are undertaken on a large scale. Since much of the Phoenix program will probably be coupled

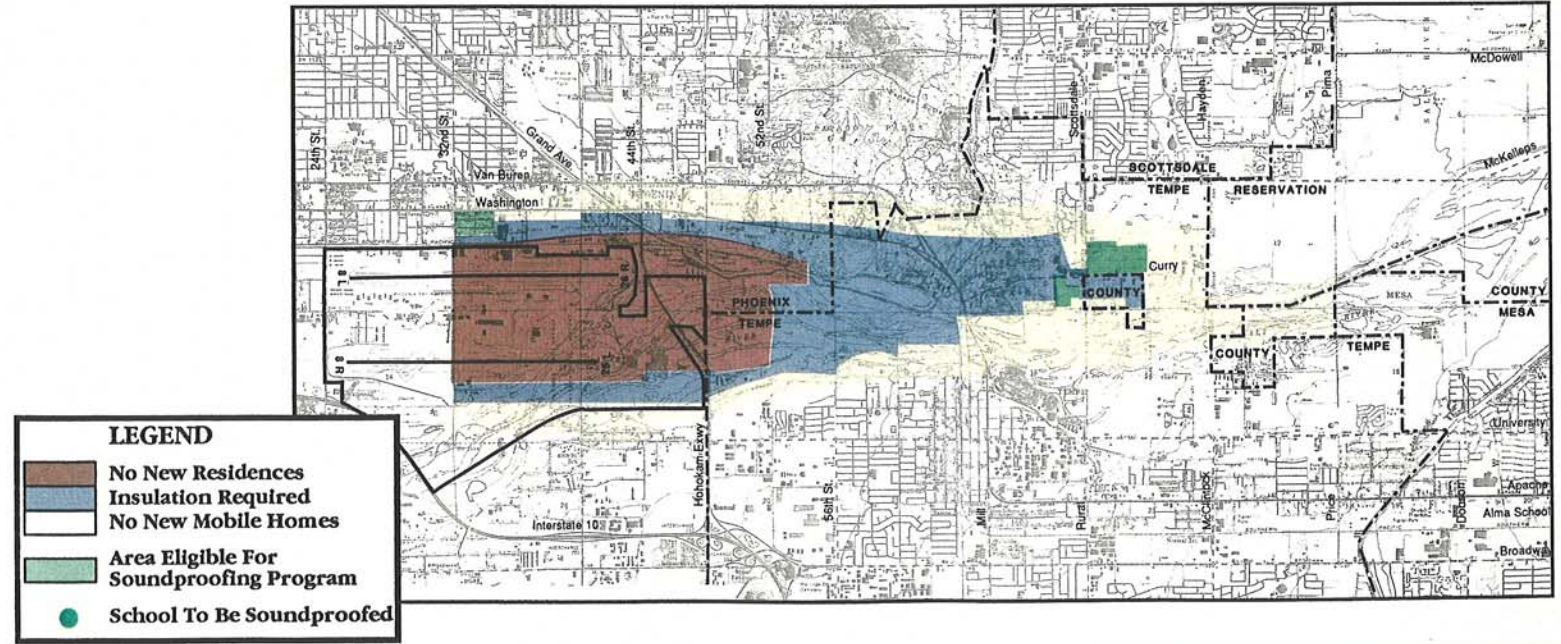
with neighborhood rehabilitation, it is especially important that pilot programs be established at first.

There are approximately 2,064 dwelling units in the recommended soundproofing program; 1,353 in Phoenix and 711 in Tempe. Of those in Phoenix, 743 are in the Ldn 70 contour (all in the near-term program) and 610 are in the Ldn 65-70 contour band (843 in the near-term program and 510 in the long-term program). Of those in Tempe, 144 are in the Ldn 70 contour and above, and 567 are in the Ldn 65-70 contour range. There are no units in either Tempe or Phoenix with in the 75 Ldn.

Included in the recommended soundproofing program are six Phoenix schools located in the 1992 abated Ldn 65-70 contour band. The areas recommended for inclusion in the noise overlay zone and soundproofing programs are indicated on the accompanying illustration.



**LAND USE MANAGEMENT PLAN**



**LEGEND**

- No New Residences
- Insulation Required
- No New Mobile Homes
- Area Eligible For Soundproofing Program
- School To Be Soundproofed

# PROGRAM RESULTS

The Noise Compatibility Program results are outlined in the accompanying program impacts Table C.

Table C

<b>Impacts of Noise Compatibility Program</b>					
<u>Type of Impact</u>	<u>Existing</u>	<u>Abated</u>			
	<u>Unabated</u>	<u>Existing</u>	<u>1992</u>	<u>1997</u>	<u>2007</u>
Square miles within					
65-70 Ldn	8.7	9.1	9.5	9.1	7.5
70-75 Ldn	7.5	6.5	5.0	3.8	3.3
75+ Ldn	5.9	4.7	4.2	4.1	3.5
Number of Noise Sensitive Uses Within 65 Ldn Contour:					
Schools	13	9	9	5	4
Churches	37	30	24	14	9
Hospitals	2	2	1	0	0

The total number of significantly noise-impacted residents can be expected to drop from 30,993 today to 4,054 by 2007 due to a combination of effects from quieter aircraft, noise abatement measures, and the soundproofing programs. This represents a 54% reduction in

impacts over the 5-year period, and an 87% reduction in impacts over the 20-year period, as illustrated in the accompanying population Table D. The future noise exposure contours are displayed in the centerfold of this brochure.

Table D

<b>Impacts of Noise Compatibility Program on Population</b>					
<u>Scenario</u>	<u>Community</u>	<u>65-70</u>	<u>70-75</u>	<u>75+</u>	<u>Total</u>
Existing Unabated	Phoenix	8,781	9,415	4,232	22,248
	Tempe	6,335	2,230	0	8,565
	Total	15,116	11,645	4,232	30,993
1992 W/Abatement*	Phoenix	11,274	373	0	11,647
	Tempe	2,565	140	0	2,705
	Total	13,839	513	0	14,352
1997 W/Abatement*	Phoenix	8,596	35	0	8,631
	Tempe	1,183	0	0	1,183
	Total	9,779	35	0	9,814
2007 W/Abatement	Phoenix	3,534	0	0	3,534
	Tempe	520	0	0	520
	Total	4,054	0	0	4,054

\* Abatement includes effects of noise abatement measures and land use management measures. Residents of homes that are soundproofed, or are found to be adequately soundproofed already, are considered to be no longer impacted for the purposes of this comparison.

## CONTINUING PROGRAM

The success of the Noise Compatibility Program requires not only an initial effort to implement the proposed noise abatement and land use management recommendations, but also a continuing effort to monitor the effectiveness of the program and to identify new or unanticipated problems and changing conditions. Several components of a Continuing Program are recommended at Sky Harbor International Airport. They are discussed below:

### Noise Monitoring and Contour Updating

It is recommended that a structured program of noise measurement be implemented to periodically measure average noise levels so as to determine the adequacy of noise modeling to reflect actual noise conditions. A program consisting of no less than ten consecutive days of continuous measurement at each location is recommended each calendar quarter. The cumulative average day Ldn noise levels should then be calculated for each consecutive four quarter period. These averages will allow the airport to remain current in its knowledge of existing noise levels throughout the area. These periods of noise monitoring should also be supplemented with flight tracking for the same period that the noise monitoring occurs.

The program outlined above, which utilizes quarterly monitoring and flight tracking, will statistically provide the needed measurement periods to determine overall effectiveness of the Part 150 Program recommendations. In addition, the noise monitoring and flight tracking will be able to assess the seasonal variations associated with air traffic activity.

In summary, the need for permanent noise monitoring and continuous flight tracking is not warranted for enforcement. However, regular monitoring and tracking efforts will provide an excellent check as to whether the Part 150 Program is producing the desired results.

### Complaint Response

The complaint response function of the airport staff refers to those activities which record and analyze noise complaints. They include compilation of a noise complaint file, initial response to those complaining, follow up actions and evaluation of individual complaints where possible, and recurrent reports.

### Plan Review and Evaluation

- a. Periodic review of the plan and any procedural changes suggested by the airport staff, the aviation industry, local planning agencies, or the general public, including preparation of technical descriptions of the proposal and its feasibility and cost. A noise abatement committee may be established, perhaps using members of the Planning Advisory Committee, to conduct this review with assistance from airport noise abatement staff.
- b. Review by the FAA to determine feasibility and impact of any proposed changes on the air traffic system.
- c. Review written response by affected operators, including the number of operations impacted and its anticipated costs or savings.
- d. Development of a supplemental technical report by noise abatement staff, or updating of the Plan document.
- e. Publication of an annual report on progress toward full implementation of the Noise Compatibility Program.

As a general rule of thumb, a Part 150 Update can be anticipated every 5 to 8 years. However, following the implementation of the short-term program (through 1992) the cities of Phoenix and Tempe agree to open discussions to consider additional or new noise abatement and land use measures which might be available and appropriate beyond 1992.

## CONCLUSION

The Phoenix Sky Harbor International Airport Part 150 Study recommendations have provided a realistic and implementable noise compatibility program which provides significant reductions in population impacts over the next five years (Part 150 time frame) as well as through the year 2007.

These recommendations, while effective in providing significant noise reduction, also provide for the continued growth of the aviation activity needed to support the future Phoenix Metropolitan Area.

For specific information on the details of the study, please contact:

The Phoenix Aviation Department  
(602) 273-3300

