Chapter 4

NOISE IMPACTS

NOISE IMPACTS

The purpose of this chapter is to examine the impacts of aircraft noise on existing and future land use and population within the study area. The effects of noise on people can include hearing loss, other ill health effects, and annoyance. While harm to physical health is generally not a problem in neighborhoods near airports, annoyance is a common problem. Annoyance can be caused by sleep disruption, interruption of conversations, interference with radio and television listening, and disturbance of quiet relaxation.

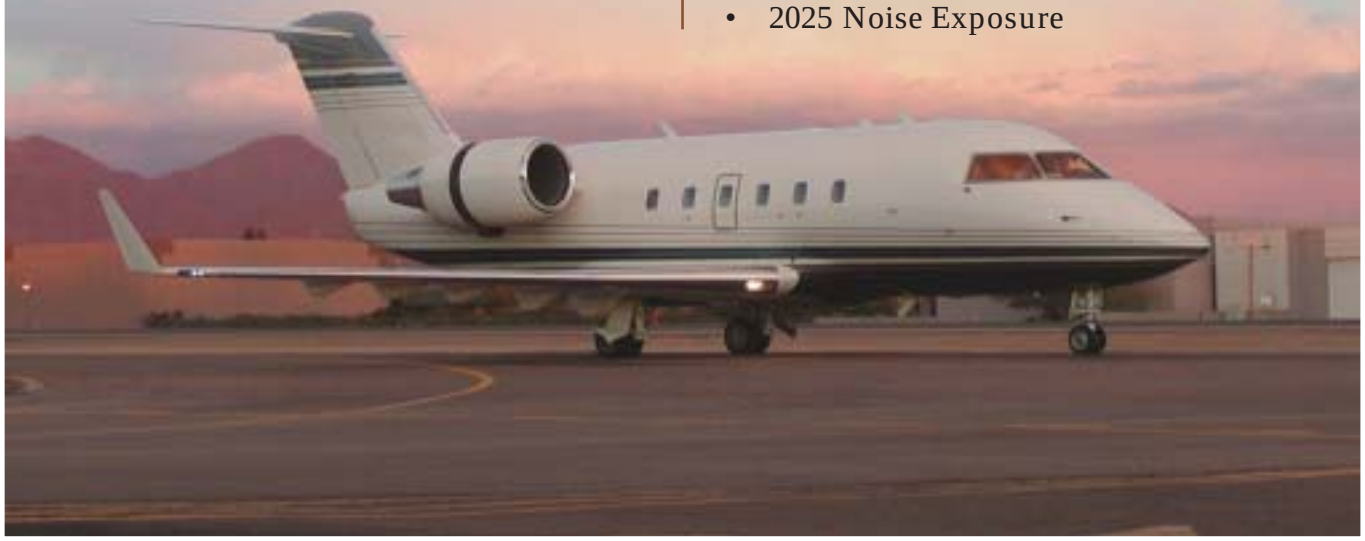
Individual responses to noise are highly variable, thus making it very difficult to predict how any person is likely to react to environmental noise. However, the response of a large group of people to environmental noise is much less variable and has been found to correlate well with cumulative noise metrics such as DNL. The development of aircraft noise impact analysis techniques has

been based on this relationship between average community response and cumulative noise exposure.

For more detailed information on the effects of noise exposure, refer to the ***Technical Information Paper (T.I.P.), Effects of Noise Exposure***.

The major sections in this chapter include the following:

- Land Use Compatibility
- Noise Complaints
- Current (2004) Noise Exposure
- Potential Growth Risk
- 2009 Noise Exposure
- 2025 Noise Exposure



LAND USE COMPATIBILITY

The degree of annoyance which people suffer from aircraft noise varies depending on their activities at any given time. People rarely are as disturbed by aircraft noise when they are shopping, working, or driving, as when they are at home. Transient hotel and motel residents seldom express as much concern with aircraft noise as do permanent residents of an area.

The concept of "land use compatibility" has arisen from this systematic variation in human tolerance to aircraft noise. Studies by governmental agencies and private researchers have defined the compatibility of different land uses with varying noise levels. (A review of these guidelines is presented in the ***T.I.P., Noise and Land Use Compatibility Guidelines***.) The Federal Aviation Administration (FAA) has established guidelines for defining land use compatibility for use in Part 150 studies.

PART 150 GUIDELINES

The FAA adopted land use compatibility guidelines when it promulgated Part 150 in the early 1980s. (The Interim Rule was adopted on January 19, 1981; the Final Rule, adopted on December 13, 1984, was published in the Federal Register on December 18, 1985, and became effective on January 18, 1985.) These guidelines were based on earlier studies and guidelines developed by federal agencies (Federal Interagency Committee of Urban Noise, 1980). These land use compatibility guidelines are only advisory; they are not regulations. Part 150 explicitly states that determinations of noise compatibility and regulation of land use are purely local responsibilities. (See Section A150.101 (a) and (d) and explanatory note in Table 1 of Part 150.) **Exhibit 4A** illustrates the FAA guidelines.

The FAA uses the Part 150 guidelines as the basis for defining areas within which noise compatibility projects may be eligible for federal funding through the noise set-aside funds of the Airport Improvement Program (AIP). In general, noise compatibility projects must be within the 65 DNL contour to be eligible for federal funding. According to the AIP Handbook, "Noise compatibility projects usually must be located in areas where noise measured in day-night average sound level (DNL) is 65 (dB) or greater." (See FAA Order 5100.38A, Chapter 7, paragraph 710.b.)

The FAA guidelines outlined in **Exhibit 4A** show that residential development, including standard construction (residential construction without special acoustical treatment), mobile homes and transient lodging, is incompatible with noise above 65 DNL. Homes of standard construction and transient lodgings may be considered compatible where local communities have determined these uses are permissible; however, sound insulation measures are recommended. Schools and other public use facilities are also generally incompatible with noise between 65 DNL and 75 DNL, but again, the guidelines note that where local communities determine that these uses are permissible, sound insulation measures should be used. Other land uses considered incompatible at levels exceeding 65 DNL include

03SP01-4A-2/19/04

LAND USE	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N[1]	N[1]	N[1]	N	N
PUBLIC USE						
Schools	Y	N[1]	N[1]	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	Y[4]
Parking	Y	Y	Y[2]	Y[3]	Y[4]	N
COMMERCIAL USE						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail-building materials, hardware and farm equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Retail trade-general	Y	Y	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock farming and breeding	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y[5]	Y[5]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with 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.

See other side for notes and key to table.

SCOTTSDALE AIRPORT

Exhibit 4A
LAND USE COMPATIBILITY GUIDELINES

KEY

Y (Yes)	Land Use and related structures 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, 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

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, respectively, 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 a NLR of 25.

7 Residential buildings require a NLR of 30.

8 Residential buildings not permitted.

Source: ***F.A.R. Part 150***, Appendix A, Table 1.

SCOTTSDALE AIRPORT

Exhibit 4A (Continued)
LAND USE COMPATIBILITY GUIDELINES

outdoor music shells and amphitheaters.

Land uses considered incompatible at levels above 75 DNL include hospitals, nursing homes, places of worship, auditoriums, concert halls, livestock breeding grounds, amusement parks, resorts, and camps. Many of these incompatible land uses are considered compatible in areas subject to noise between 65 DNL and 75 DNL if prescribed levels of noise reduction can be achieved through sound insulation. These include hospitals, nursing homes, places of worship, auditoriums, and concert halls.

Historic properties are identified in compliance with Part 150, Section 4(f) of the *Department of Transportation Act* (DOT Act), and the *National Historic Preservation Act of 1966*, as amended. In general, these properties are not any more sensitive to noise than are other properties of the same use; however, these federal regulations require that noise effects on these properties be considered when evaluating the effects of an action, such as a noise abatement or land use management procedure.

The strictest of these requirements is the DOT Act. Section 4(f) of the DOT Act provides that the U.S. Secretary of Transportation shall not approve any program (such as a Noise Compatibility Plan) or project which requires the use of any historic site of national, state, or local significance, unless there is no feasible and prudent alternative to the use of such land. The FAA is required to consider both the direct physical taking of eligible property (such as acquisition and demolition of historic structures) and the indirect use of or adverse impact to eligible property (such as the 65 DNL noise contour). When evaluating the effects of the noise abatement and land use management alternatives later in this report, it is necessary to also identify whether the proposed action conflicts with or is compatible with the normal activity of aesthetic value of any historical properties not already significantly affected by noise.

Land Use Guidelines at Scottsdale Airport

For purposes of the Part 150 Noise Compatibility Study for Scottsdale Airport, the FAA's land use compatibility guidelines will be used as the basis for making determinations about land use compatibility in the airport area.

While the FAA considers 65 DNL as the threshold of significant impact on noise-sensitive uses, the noise analysis for this study goes down to the 55 DNL level. This is partly in response to a federal report in environmental documents, which has recommended the need to examine potential noise impacts below 65 DNL where significant increases in noise may be expected (FICON, 1992, p. 3-5), and partly in response to local experience. Local noise complaint history indicates that residents within the 55 DNL noise contour are annoyed by existing aircraft noise levels (noise complaint characteristics will be reviewed in the next section).

For purposes of this Part 150 Study, noise between 55 and 65 DNL is considered to have a marginal effect on the following noise-sensitive land uses:

- Residential, including mobile home parks
- Schools
- Hospitals and nursing homes
- Churches, auditoriums, and concert halls
- Outdoor music shells and amphitheaters

While research has shown that significantly fewer people are affected as noise decreases below 65 DNL, aircraft noise continues to be a problem for at least some people at even extremely low DNL levels. This is indicated in the two graphs illustrated on **Exhibit 4B** relating to annoyance with DNL levels. (Also see the ***T.I.P., Noise and Land Use Compatibility Guidelines***.)

NOISE COMPLAINTS

Before assessing the exposure of local land use and population to existing aircraft noise levels, recent noise complaints and the methods for receiving complaints should be evaluated. By themselves, complaints cannot be taken as a complete assessment of a noise problem at an airport. Many unpredictable variables can influence whether a person chooses to file a noise complaint. Many people who are annoyed may find it inconvenient or intimidating to call and complain. Others who decide to complain may be unusually sensitive to noise or may be especially anxious about aircraft overflights. Unusual events, rather than a long-term situation, may also stimulate a complaint. Despite the limits of complaint information, it can aid in understanding the geographic pattern of concern about the noise created by the use of the airport.

Scottsdale Airport has a well-developed system for receiving and responding to noise complaints. Noise complaints can be submitted by calling the airport's 24-hour noise complaint hotline or via the airport's website. A monthly noise summary report is prepared and published on the airport's website. This report summarizes the noise complaints from the past month and provides the call location, complaint type (noise, low flight, safety), and aircraft type. The report also summarizes actions taken by staff to remedy the situation, which range from simply answering the complainant's questions, to convening a pilot briefing, to sending a letter to the pilot outlining the airport's noise abatement procedures.

Local complaints received by the airport are logged as either regional or local complaints. Regional complaints are logged into the system; however, a large amount of detail is not included for each complaint, as many times the aircraft causing the complaint did not originate from Scottsdale Airport.

Local complaints are tracked geographically with the use of a grid which contains one-mile by one-mile squares. The boundaries of the grid are Happy Valley Road to the north, Shea Boulevard to the south, 112th Street to the east, and 40th Street to the west. Noise complaints received from outside this boundary are tracked, but not mapped.

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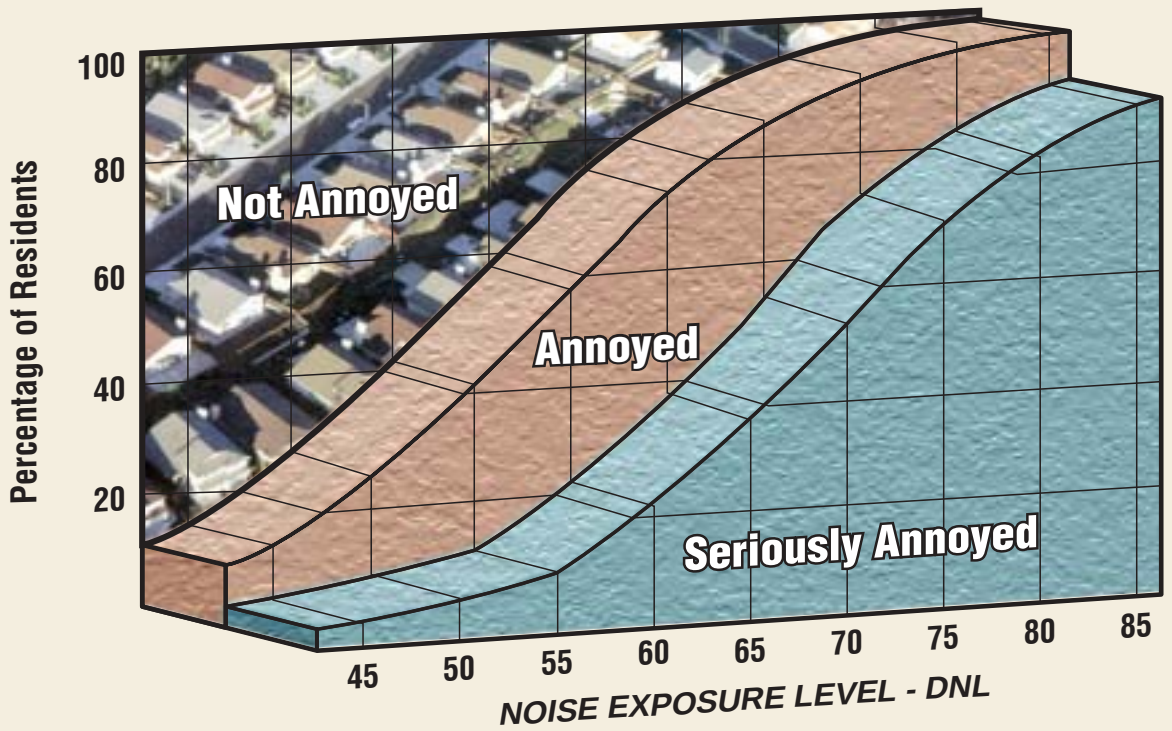
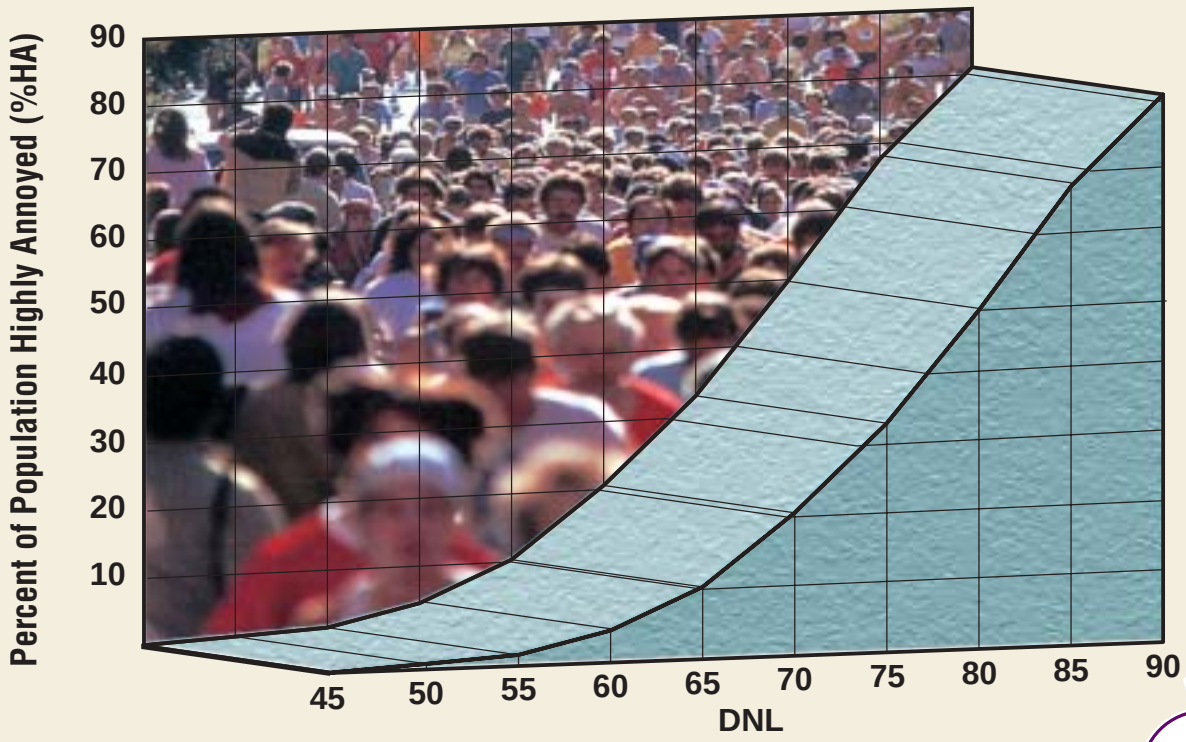


Source: Richards and Ollerhead 1973, p.31

UPDATED SCHULTZ CURVE



Equation for Curve: $\% HA = \frac{100}{1 + e\,(11.13 - .14\,Ldn)}$

Source: Finegold et al. 1992 and 1994.

Exhibit 4B
ANNOYANCE CAUSED BY AIRCRAFT
NOISE IN RESIDENTIAL AREAS

Mapping the general location of complaints allows airport staff to track emerging concerns in the community. **Exhibits 4C, 4D**, and **4E** provide a time-lapse view of the location of noise complaints over a period ranging from 1996 to 2003. **Exhibit 4C** contains the average number of noise complaints per grid square for a six-year period from 1996 through 2001. An aerial photograph taken in 1998 provides the backdrop for the exhibit. As depicted on the exhibit, the largest number of noise complaints was received from the area directly off the end of the runway, southwest of the airport. However, noise complaints were received from almost all the developed areas.

Exhibit 4D depicts the number of noise complaints received by area for the year 2002 only. An aerial photograph taken in 2003 provides a backdrop for the information. As depicted on the exhibit, the airport received a large number of noise complaints in 2002 from a developing area northeast of the airport, as well as areas immediately surrounding the airport. Noise complaints received for the mapping area in 2003 are depicted on **Exhibit 4E**. During this time span, additional noise complaints were received from the areas north of the 101 Loop, as well as the areas which immediately surround the airport.

As depicted on **Exhibit 4F**, operations have ranged from 185,000 in 1997, to 257,000 in 2000, to 194,500 in 2003. Therefore, based on this information, the spike in complaints does not appear to be tied to the number of operations. When comparing the aerial photograph used as a base for **Exhibits 4C, 4D,** and **4E,** it is evident that a number of residences have been constructed north of the airport. This increase in residences results in a larger population base, some of which may be annoyed by aircraft noise. Additionally, the implementation of the FAA's *Northwest 2000 Plan* heightened the public's awareness of aviation noise, which may have increased the number of noise complaints.

Tracking the trend of noise complaints geographically alone does not provide a proper presentation of the airport's impact on a community. This analysis needs to be paired with additional data such as total number of noise complaints, total number of individuals lodging noise complaints, and average number of complaints per person. This information, along with the approximate number of operations at the airport, is presented on **Exhibit 4F**. As depicted on the exhibit, the airport not only experienced a spike in total number of noise complaints in 2002 and 2003, but also in the average number of noise complaints per individual. The number of individuals which logged noise complaints has grown at a steady pace since 1997, reflecting development in the area; however, the number of complaints logged by each of those individuals, on average, has grown dramatically from 2.06 complaints per person in 1997, to 22.74 complaints per person in 2003. (The complaint information presented on the exhibit is the **total** number of complaints received by the airport. Total complaints include both regional and local complaints.)

CURRENT NOISE EXPOSURE

This section describes the exposure of existing land uses and population as they relate to the 2004 noise contours. For the purposes of this study, noise in excess of 55 DNL will be discussed for the purposes of evaluating future land use planning alternatives. It must be noted that only noise-sensitive land uses within the 65 DNL contour are eligible for federal funding assistance.

LAND USES EXPOSED TO 2004 NOISE

The location of existing noise-sensitive land uses in relation to the 2004 noise contours at Scottsdale Airport is shown on **Exhibit 4G**. Noise-sensitive land uses shown on the exhibit are based on Part 150 land use compatibility guidelines and include uses considered incompatible with noise above 65 DNL and marginally incompatible with noise between 55 and 60 DNL.

Contour Descriptions

The shape and extent of the contours reflect the underlying flight track assumptions. The contours to the north bend slightly to the west, reflecting the IFR turn to the BANYO intersection. (The location of the BANYO intersection is described on page 1-18.) The predominant use of Runway 3 for departures is evident, as the contours are long and slender to the north and bowed and pointed to the south.

The outermost contour on **Exhibit 4G** represents the 55 DNL contour. To the north, the contour extends approximately 8,000 feet over a multi-family development located near the intersection of Bell and Hayden Roads, as well as two medical facilities. To the south, the contour extends approximately 5,500 feet from airport property, over a mix of single-family residential development, and two medical facilities. Slight bulges in the contour to the east and west are a result of helicopters arriving to and departing from the airport. To the east and west, the contours extend approximately 2,000 feet from the airport.

The 60 DNL contour is smaller in shape than the 55 DNL contour and more precisely reflects the runway use at the airport. The long slender shape of the contour to the north is a result of departures, and the pointed and bowed shape of the contour to the south is a result of both approaches and departure run-up spools. To the north, the contour extends approximately 4,500 feet over compatible land uses. The contour extends approximately 1,500 feet to the south, encompassing a small number of single-family homes, a school, a medical facility, and a place of worship.

The 65 DNL contour extends approximately 1,800 feet to the north, over compatible land uses. To the south, the contour remains on airport property. For the most part, the contour remains on airport property to the east. To the west, the contour extends approximately 500 feet over primarily compatible land uses; however, a portion of property associated with the school south of the airport is contained within the 65 DNL contour in this area.

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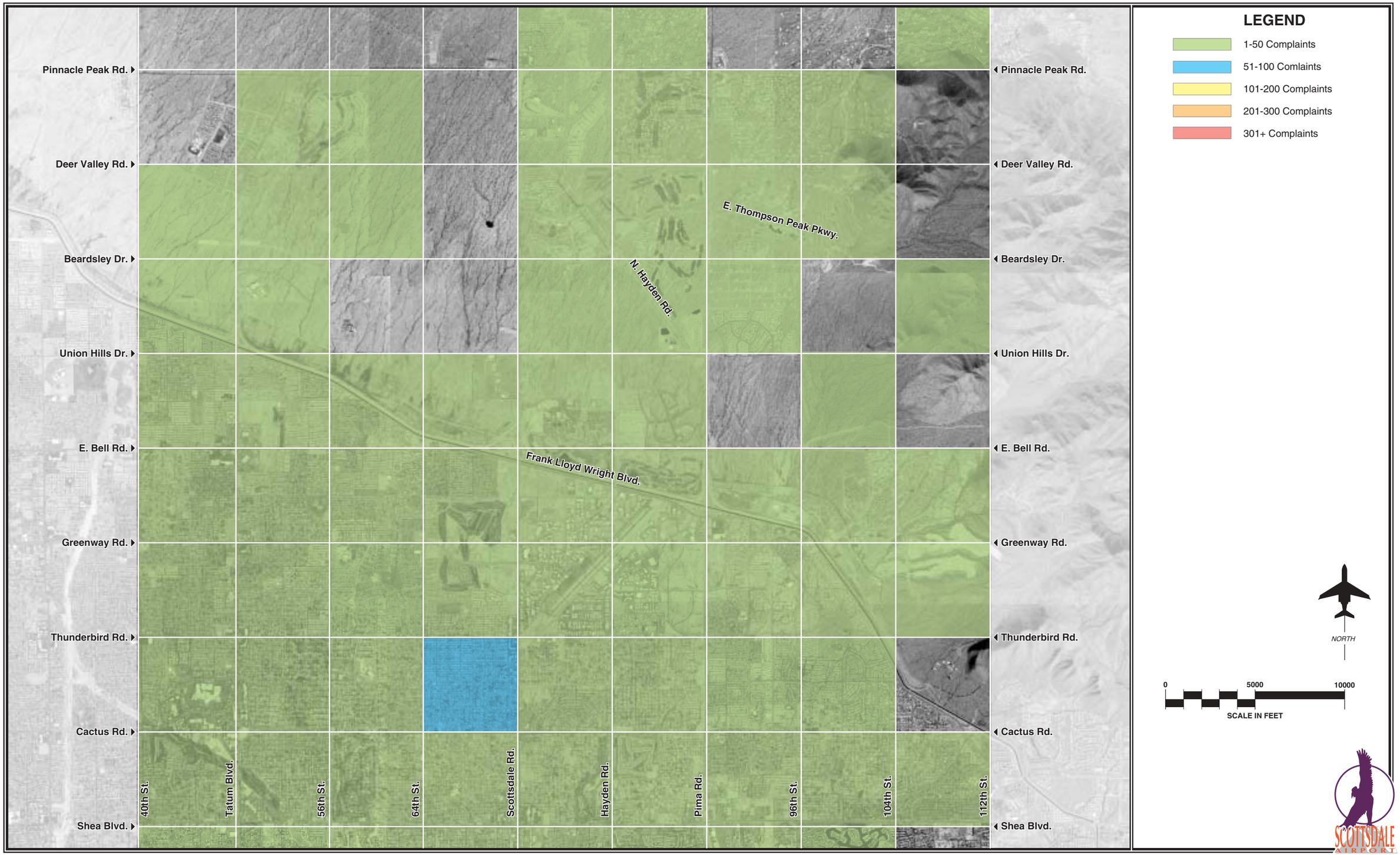

Exhibit 4C
TOTAL AVERAGE GENERALIZED NUMBER OF NOISE COMPLAINTS BY LOCATION, 1996-2001

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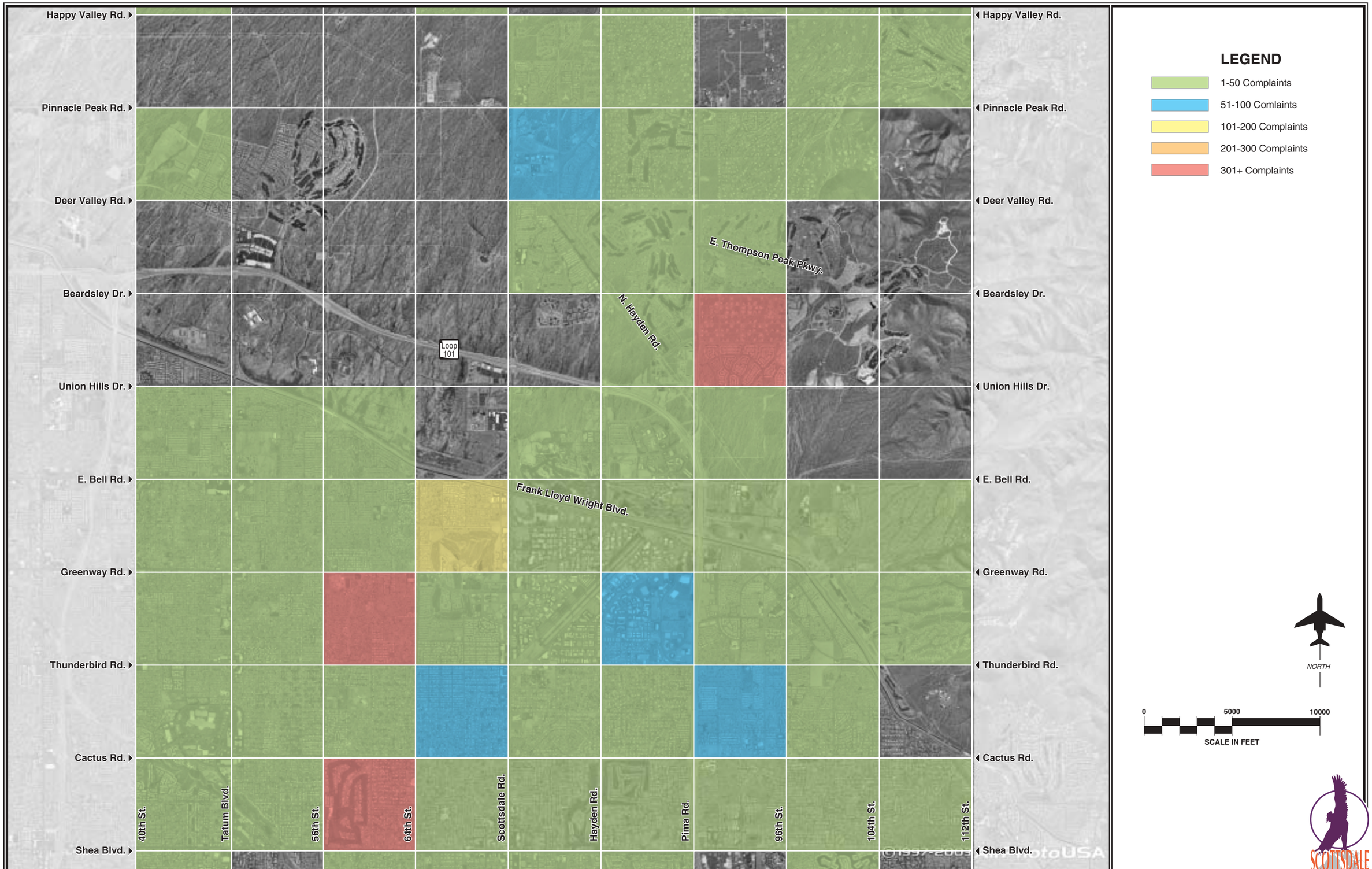

Exhibit 4D
GENERALIZED NUMBER OF NOISE
COMPLAINTS BY LOCATION, 2002

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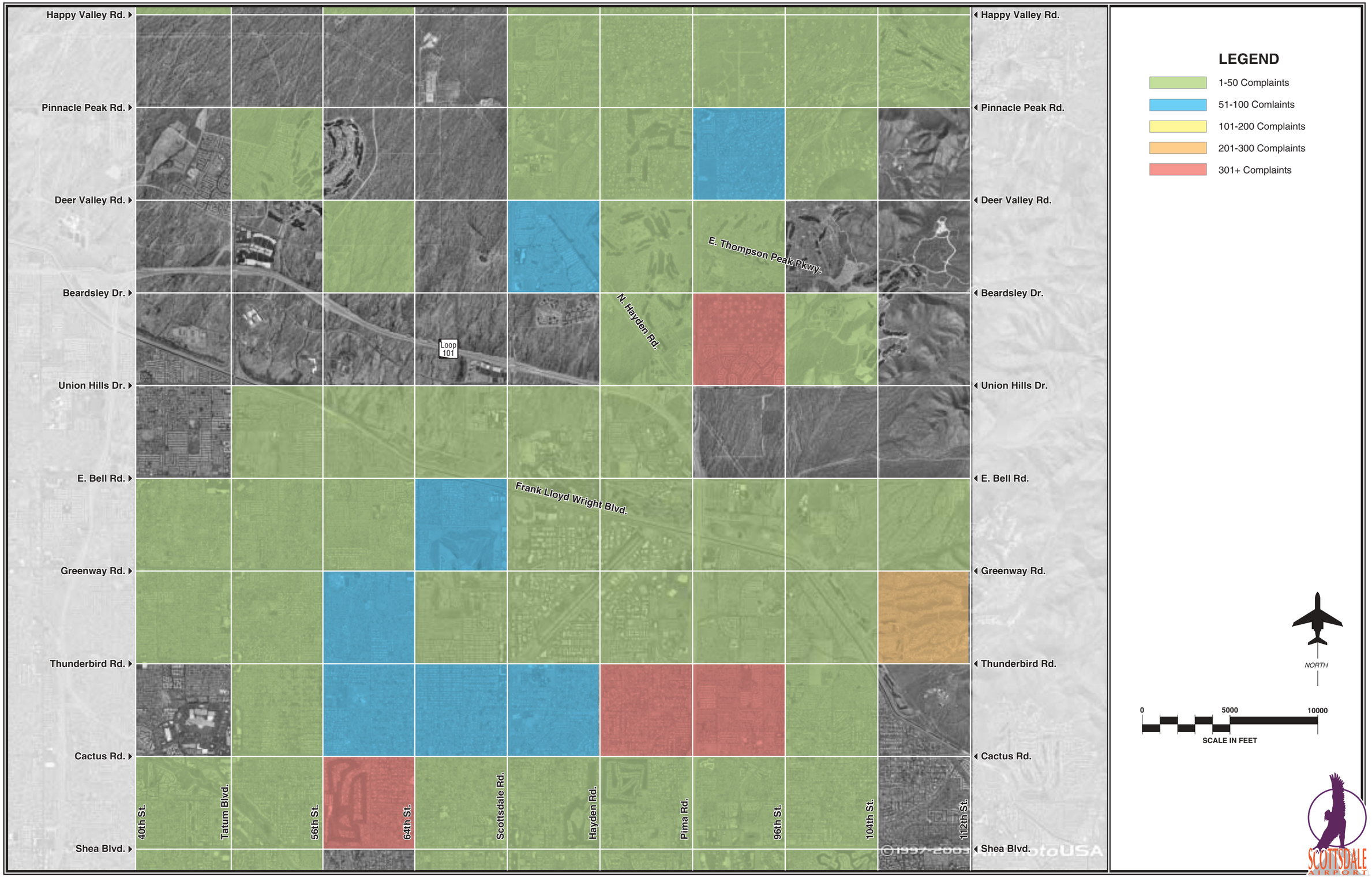

Exhibit 4E
GENERALIZED NUMBER OF NOISE
COMPLAINTS BY LOCATION, 2003

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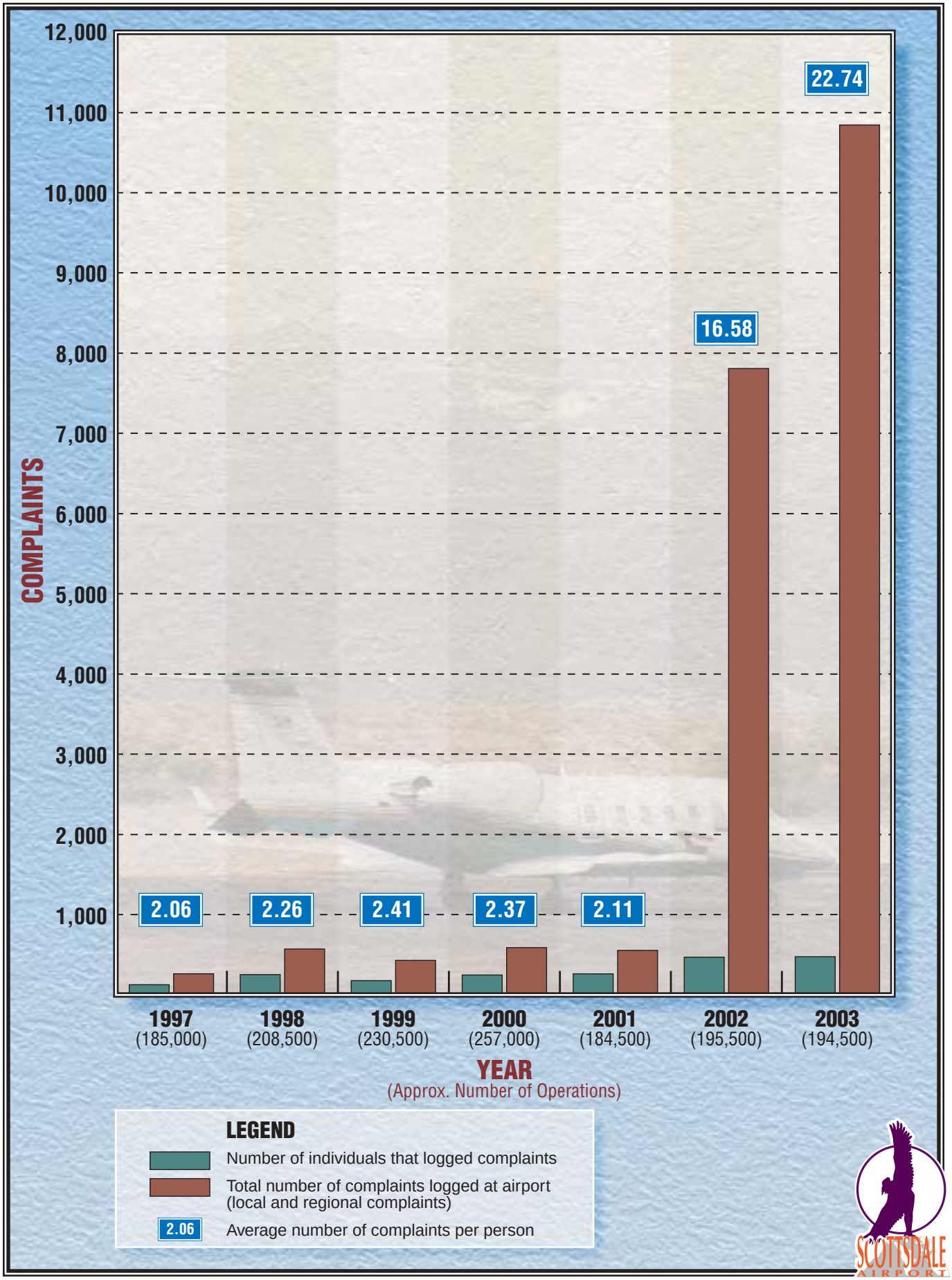

Exhibit 4F
NUMBER OF NOISE COMPLAINTS COMPARED TO
NUMBER OF INDIVIDUALS LODGING COMPLAINTS

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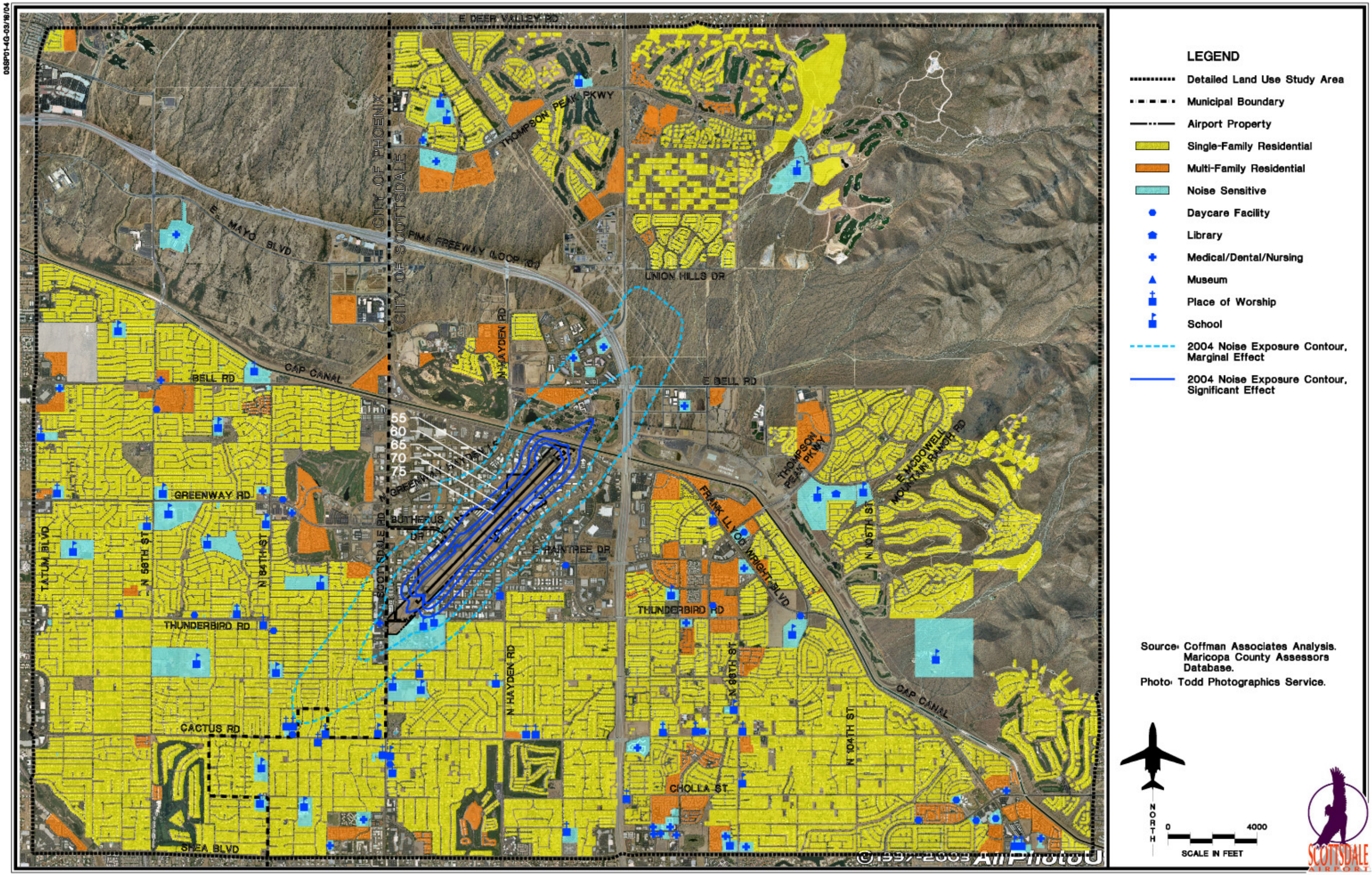

Exhibit 4G
2004 NOISE EXPOSURE CONTOURS WITH LAND USE

The 70 and 75 DNL noise contours remain close to the runway. These contours are mostly on airport property or within the commercial and industrial areas adjacent to the airport.

2004 Land Use Impacts

The number of dwelling units within each noise contour range is determined by computer-generated counts based on an underlying housing database. (Dwelling units, for the purposes of this study, include single-family homes and apartment and condominium units.) This database was developed with the use of geographical information system (GIS) data provided by the Maricopa County Assessor, aerial photography taken in April 2003, and field surveys conducted in October 2003. The location and number of noise-sensitive institutions was derived from the GIS data and notations made during the October 2003 field survey.

The 2004 land use impacts are summarized in **Table 4A** and described below.

A total of 1,123 dwelling units are exposed to noise levels of 55 DNL or higher. The majority of these dwelling units are located within the 55 to 60 DNL contour, which has a total of 1,093 dwelling units, including 567 in Scottsdale and 526 in Phoenix. Within the 60 to 65 DNL contour, there are 31 dwelling units, 3 in Scottsdale, and 27 in Phoenix. No dwelling units are found within the 65 DNL contour. The majority of the dwelling units affected by noise are found north and south of the airport. To the east and west, no dwelling units are contained within the noise contours.

Five noise-sensitive institutions are contained within the 55 DNL noise contour. Of these, two medical offices are contained within the 55 to 60 DNL contour. The noise-sensitive institutions within the 60 to 65 DNL contour include a medical office, Thunderbird Academy, and a place of worship associated with the Seventh Day Adventists.

POPULATION EXPOSED TO 2004 NOISE

In assessing community noise impacts, the number of people exposed and the level of noise to which they are exposed must be considered. While lower noise levels cover a larger area and usually affect more people, they are less annoying than higher noise levels. To assess the intensity of the impact, it is helpful to have a way of jointly considering both population and noise levels. The level-weighted population (LWP) methodology provides such an approach.

The LWP methodology assumes that increasing proportions of people are likely to be annoyed as noise increases. A detailed description of this methodology is provided in the ***T.I.P., Measuring the Impact of Noise on People***. In the 55 to 60 DNL range, 10.7 percent are likely to be annoyed by noise. In the 60 to 65 DNL range, 20.5 percent; in the 65 to 70 DNL range, 37.6 percent; in the 70 to 75 DNL range, 64.4 percent; and above 75 DNL, 100.0 percent of the population are likely to be annoyed by noise.

TABLE 4A
Noise-Sensitive Land Uses Exposed to 2004 Aircraft Noise
Scottsdale Airport

	Noise Contour (DNL)					
LAND USE	**55-60**	**60-65**	**65-70**	**70-75**	**75+**	**Total**
Existing Dwelling Units						
Scottsdale	567	3	0	0	0	570
Phoenix	526	27	0	0	0	553
Total	**1,093**	**30**	**0**	**0**	**0**	**1,123**
Noise-Sensitive Institutions						
Places of Worship	0	1	0	0	0	1
Medical Facilities	2	1	0	0	0	3
Schools	0	1	0	0	0	1
Other (Library, Museum, Etc.)	0	0	0	0	0	0
Total Noise-Sensitive Institutions	**2**	**3**	**0**	**0**	**0**	**5**
Historic Resources	0	0	0	0	0	0

Table 4B outlines the population, expressed in both absolute numbers and level-weighted population (LWP), exposed to various levels of existing noise. The population is calculated by counting the number of dwelling units within a given contour range and multiplying that number by the average household size. According to the 2000 U.S. Census, the average household size within the study area is 2.22 persons for the City of Scottsdale and 2.79 persons for the City of Phoenix.

As presented in **Table 4B**, the majority of the affected population, totaling 2,726 individuals, reside within the 55 to 60 DNL noise contour. Approximately 82 individuals reside within the 60 to 65 DNL contour. No residents are exposed to noise levels in excess of 65 DNL. The LWP of residents within the 55 to 60 DNL contour is 292 individuals and the LWP decreases to 17 residents within the 60 to 65 DNL contour.

TABLE 4B
Population Exposed to 2004 Aircraft Noise
Scottsdale Airport

	Noise Contour (DNL)					Total Above 55 DNL		Total Above 65 DNL	
	55-60	**60-65**	**65-70**	**70-75**	**75+**	**Residents**	**LWP**	**Residents**	**LWP**
Existing Population	2,726	82	0	0	0	2,808	308	0	0

Notes: LWP = Level-weighted population: an estimate of the number of people actually annoyed by aircraft noise. It is derived by multiplying the population in each DNL contour range by the appropriate LWP response factor. The factors used are as follows: 0.107 for 55-60 DNL, 0.205 for 60-65 DNL, 0.376 for 65-70 DNL, 0.644 for 70-75 DNL, and 1.000 for 75+ DNL.
Source: Coffman Associates analysis.

POTENTIAL GROWTH RISK

Before evaluating the impact of future aircraft noise, the likelihood of future noise-sensitive development in the area must be understood. Development trends in the vicinity of the airport are critical to noise compatibility planning. Future residential growth can constrain the operation of the airport if it occurs beneath aircraft flight tracks and within areas subject to high noise levels. The following paragraphs describe population growth and potential dwelling unit development within the study area, in order to determine the potential growth risk. The focus of discussion includes future population changes, residential development projects, and other noise-sensitive development.

As discussed in Chapter Two, the population of the study area is expected to grow at a steady pace. To accommodate the projected population growth, it is anticipated that additional residential development will be needed. New and in-fill residential development within the study area is expected to satisfy some of this anticipated growth. **Exhibit 4H** depicts the areas which are planned or zoned to accommodate the future residential growth of the area, as outlined within the general plans and zoning ordinances for the cities of Scottsdale and Phoenix. Areas which are hatched on the exhibit depict locations which are planned for compatible land uses within the general plans (i.e., commercial land uses), but *zoned for non-compatible land uses* (i.e., residential).

RESIDENTIAL AND NOISE-SENSITIVE LAND USE GROWTH RISK

The growth risk analysis focuses on undeveloped land which is planned or zoned for future residential or noise-sensitive use. Additional development may also occur through in-filling or redevelopment of developed areas.

As illustrated on **Exhibit 4H**, there are a number of areas within the study area which may experience either in-fill or new development. The areas which are most likely to experience the greatest amount of potential new non-compatible development (i.e., residential development) are found to the north of Scottsdale Airport. Development to the south, east, and west would primarily take the form of in-fill development.

Land use density figures used to calculate the growth risk were obtained from the general plans and zoning ordinances for the cities of Scottsdale and Phoenix. Areas planned for single-family residential or zoned for rural or low-density residential were assigned a "worst case" density of four dwelling units per acre; areas planned for multi-family residential or zoned for medium density residential were assigned a "worst case" density of 12 dwelling units per acre; and areas planned for multi-family development and zoned for high-density residential were assigned a "worst case" density of 25 dwelling units per acre.

2009 NOISE EXPOSURE

This section describes the exposure of existing and potential land uses and population to aircraft noise in 2009.

LAND USES EXPOSED TO 2009 NOISE

The forecasted 2009 noise contours are presented in **Exhibit 4J,** along with existing and potential future noise-sensitive land uses within the study area. The flight track assumptions for the 2009 contours were changed to reflect the introduction of an RNAV departure which will direct departing Instrument Flight Rule (IFR) traffic to follow a corridor along Cactus Road. It is assumed that 50 percent of IFR traffic departing to the southwest will utilize this departure procedure by 2009.

Contour Descriptions

For the most part, the 2009 noise contours depicted on **Exhibit 4J** are similar in shape to their 2004 counterparts. The contours are slightly larger in size, primarily due to the forecasted increase in operations at the airport. The 2009 noise contours represent the estimated nose condition based on the forecasts of future operations, without any changes in operational procedures. This analysis provides a baseline which can be used to judge the effectiveness of noise abatement procedures that will be analyzed in future chapters.

The 55 to 60 DNL contour, at its longest point, extends approximately 8,100 feet from airport property to the north and 6,300 feet to the south. In all other directions, the contour mirrors that described for the 2004 55 DNL noise contour. To the south, the contour extends over residential land uses, as well as two places of worship, and one daycare facility. To the north, the contour extends over undeveloped areas, a multi-family residential development, and two medical facilities.

The 60 to 65 DNL contour, at its longest point, extends approximately 5,500 feet from airport property to the north and 2,000 feet to the south. To the east and west, the contour is very similar to that described for the 2004 noise condition. To the south, the contour extends over single-family residential land uses, as well as a medical facility, one school, and a place of worship. To the north, the contour extends over compatible land uses, as well as a small portion of a multi-family development.

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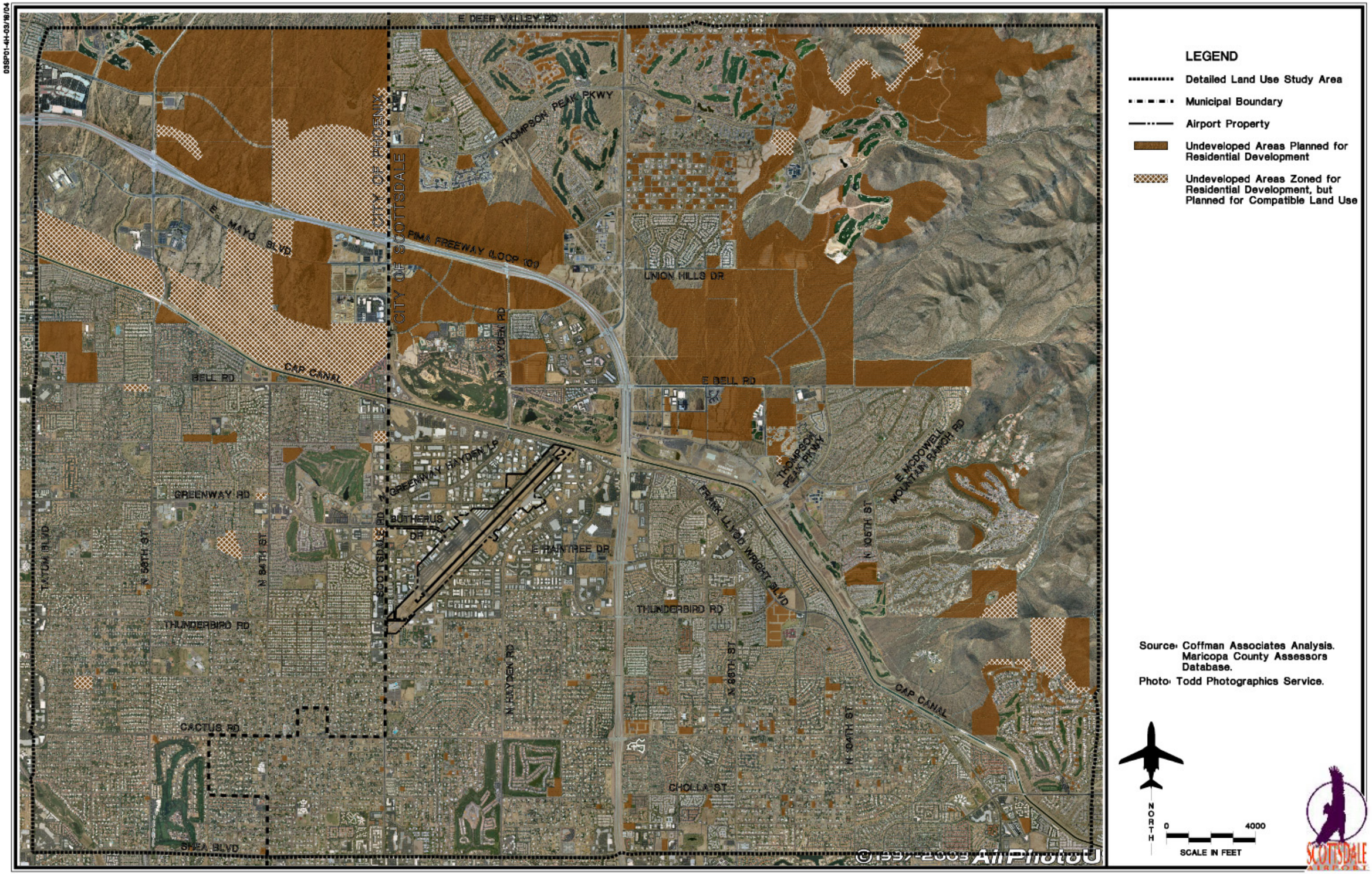

Exhibit 4H
GROWTH RISK AREAS

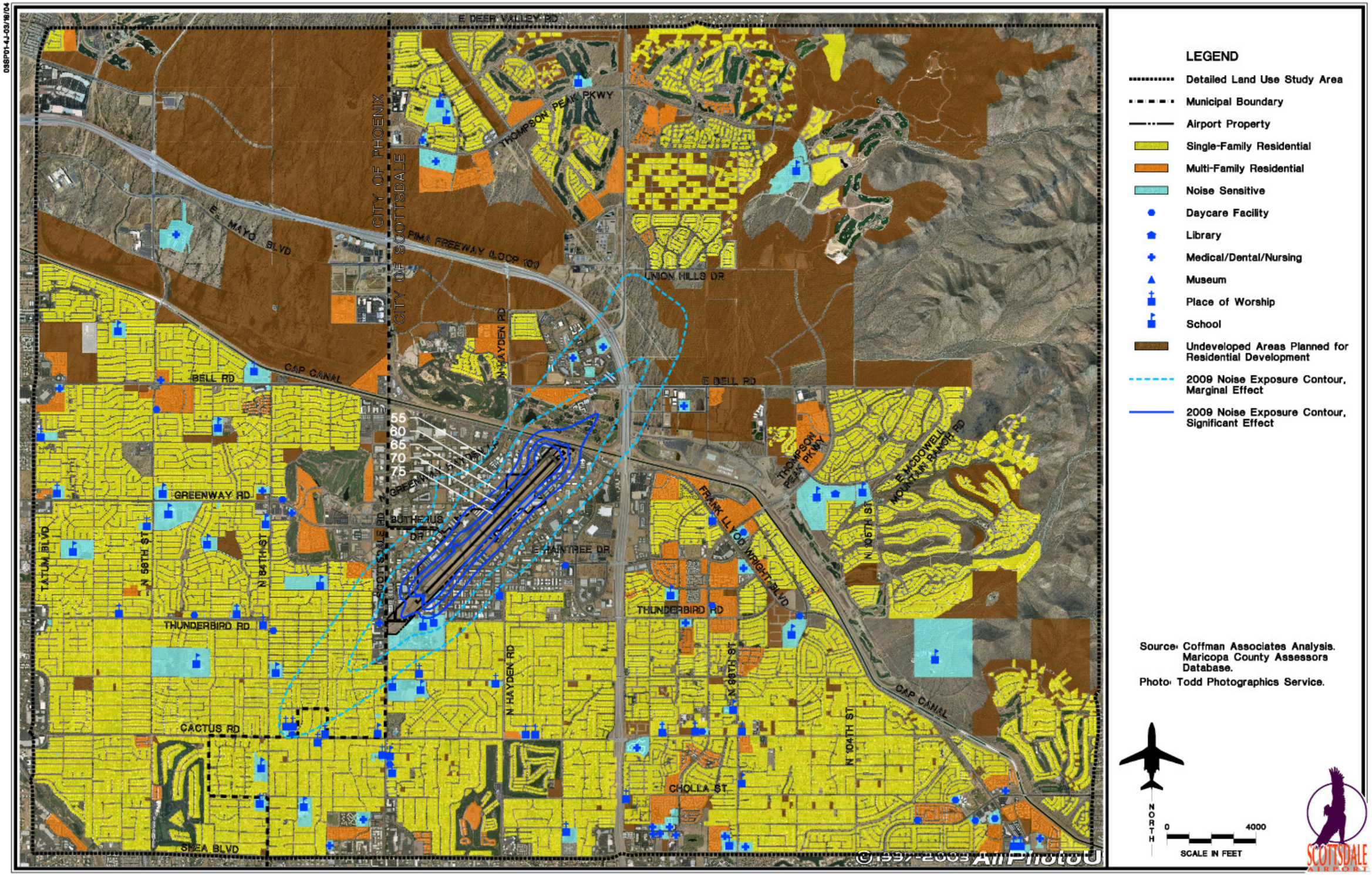

Exhibit 4J
2009 NOISE EXPOSURE CONTOURS WITH LAND USE

The 65 DNL contour is slightly larger than the 2004 65 DNL contour. It primarily remains on airport property to the south and east, extends over adjoining compatible land uses to the west, and extends approximately 2,100 feet to the north over compatible land uses. To the southeast, the contour does extend over property owned by a school.

The 70 and 75 DNL contours remain on airport property, for the most part, to the north, south, and west, and extend off airport property to the east, over airport-adjacent commercial and industrial land uses.

2009 Land Use Impacts

Noise-sensitive land uses potentially affected by noise in 2009 are shown in **Table 4C**. Due to the increased size of the noise contours, the impacts are greater than that described for the 2004 noise condition.

Exhibit 4J illustrates the location of noise impacts throughout the study area. Approximately 1,143 dwelling units are contained within the 55 to 60 DNL noise contour, and 117 dwelling units are within the 60 to 65 DNL noise contour. No dwelling units are exposed to noise over 65 DNL.

Eight noise-sensitive institutions are contained within the 55 DNL noise contour. These include all of those contained within the 2004 noise contours, as well as two additional places of worship and a daycare facility.

Based on the growth risk analysis, there is the potential for approximately 590 additional dwelling units within the 55 DNL noise contour, for a total of 1,850 potential units. The growth potential exists to the north of the airport, as this land is currently undeveloped. **Table 4C** presents a breakdown of the potential growth within each noise contour.

POPULATION EXPOSED TO 2009 NOISE

The future population impacts parallel the patterns observed for land use impacts. The total existing population exposed to noise above 55 DNL increases from 2,808 in 2004, to 3,212 in 2009, which corresponds to an increase in the LWP value from 309 to 372. **Table 4D** depicts the impact of 2009 noise on the existing local population.

The majority of the affected population, 2,921 people, continues to reside within the 55 to 60 DNL noise contour. Within the 60 to 65 DNL contour, 292 people reside, and there are no residents residing in the 65 DNL contour.

Table 4D also provides an estimate of the number of potential, additional residents which may be impacted by 2009 aircraft noise. Approximately 1,311 additional residents could be exposed to noise above 55 DNL, for a total of 4,523 existing and potential population impacts. All of the potential additional impacts would be realized within the 55 to 60 DNL contour.

TABLE 4C
Noise-Sensitive Land Uses Exposed to 2009 Aircraft Noise
Scottsdale Airport

	Noise Contour (DNL)					
LAND USE	**55-60**	**60-65**	**65-70**	**70-75**	**75+**	**Total**
Existing Dwelling Units						
Scottsdale	471	61	0	0	0	532
Phoenix	672	56	0	0	0	728
Total	**1,143**	**117**	**0**	**0**	**0**	**1,260**
Future Potential Dwelling Units	590	0	0	0	0	590
Total Dwelling Units	1,733	117	0	0	0	1,850
Noise Sensitive Institutions						
Places of Worship	2	1	0	0	0	3
Medical Facilities	2	1	0	0	0	3
Schools	1	1	0	0	0	2
Other (Library, Museum, Etc.)	0	0	0	0	0	0
Total Noise Sensitive Institutions	**5**	**3**	**0**	**0**	**0**	**8**
Historic Resources	0	0	0	0	0	0

TABLE 4D
Population Exposed to 2009 Aircraft Noise
Scottsdale Airport

	Noise Contour (DNL)					Total Above 55 DNL		Total Above 65 DNL	
	55-60	**60-65**	**65-70**	**70-75**	**75+**	**Residents**	**LWP**	**Residents**	**LWP**
Existing Population	2,921	292	0	0	0	3,213	372	0	0
Potential Population	1,311	0	0	0	0	1,311	140	0	0
Total Population	**4,232**	**292**	**0**	**0**	**0**	**4,524**	**512**	**0**	**0**

Notes: LWP = Level-weighted population: an estimate of the number of people actually annoyed by aircraft noise. It is derived by multiplying the population in each DNL contour range by the appropriate LWP response factor. The factors used are as follows: 0.107 for 55-60 DNL, 0.205 for 60-65 DNL, 0.376 for 65-70 DNL, 0.644 for 70-75 DNL, and 1.000 for 75+ DNL.
Source: Coffman Associates analysis.

2025 NOISE EXPOSURE

This section describes the exposure of existing and potential land uses and population to aircraft noise in 2025.

LAND USES EXPOSED TO 2025 NOISE

Exhibit 4K illustrates the forecast 2025 noise contours, together with both

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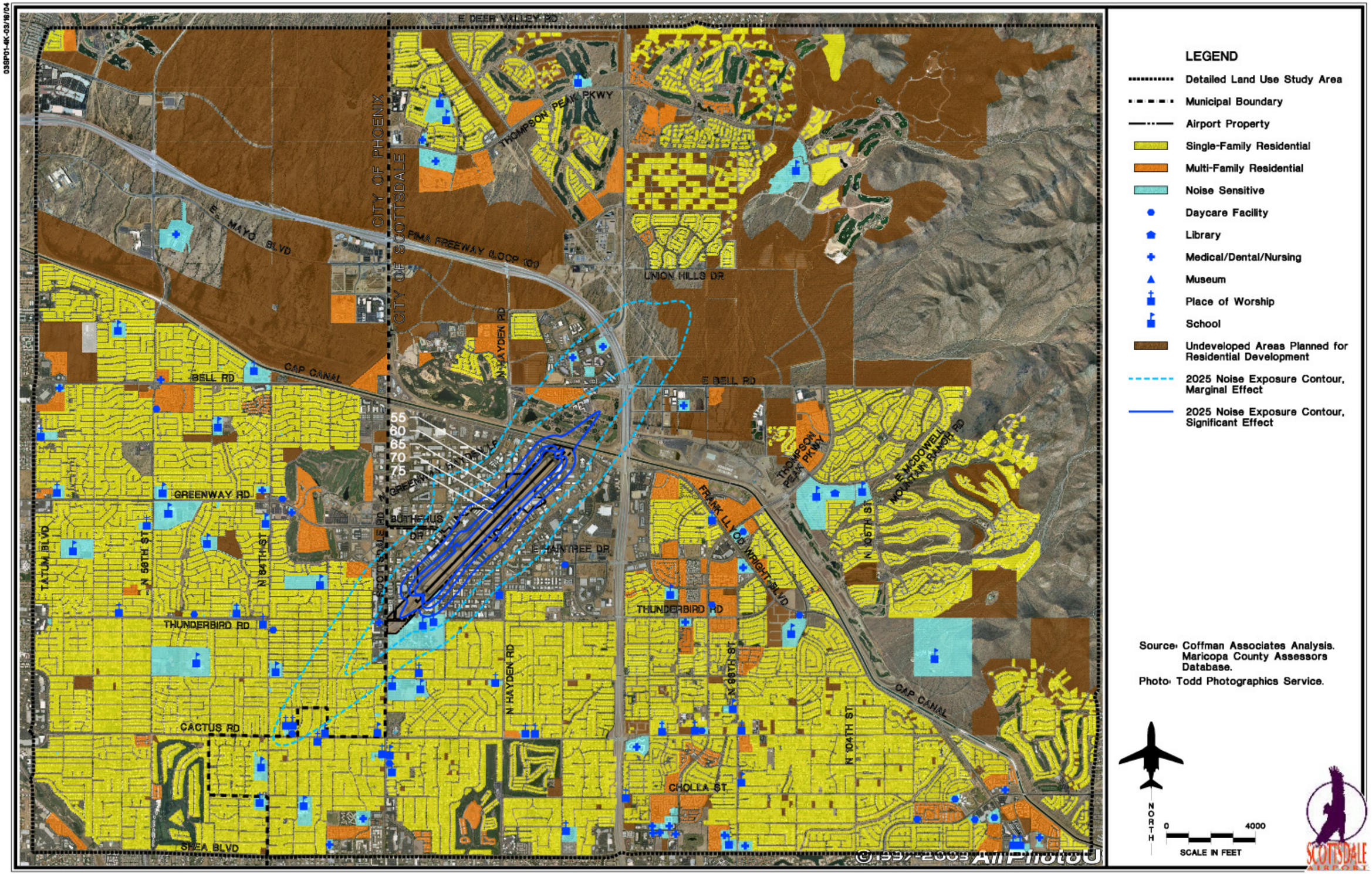

Exhibit 4K
2025 NOISE EXPOSURE CONTOURS WITH LAND USE

existing and potential future noise-sensitive land uses within the study area. As with the 2009 noise contours, the flight track assumptions for the 2025 contours were changed to reflect the introduction of an RNAV departure which will direct departing IFR traffic to follow a corridor along Cactus Road. It is assumed that 90 percent of IFR traffic departing to the southwest will utilize this departure procedure by 2025.

Contour Descriptions

The 2025 noise contours encompass approximately the same area as the 2009 contours and are larger than the 2004 contours due to the forecasted increase in airport operations. The contours are very similar in shape to their counterparts, with the exception of the northernmost portions of the 55 DNL contour. This contour does not have the bulge to the west as experienced under the 2004 and 2009 noise conditions, due to the phase-out of Stage 2 aircraft.

The 55 to 60 DNL contour extends approximately 8,500 feet to the north over undeveloped areas, a multi-family residential development, and two medical facilities. To the south, the contour extends approximately 7,000 feet over a school, two places of worship, and a daycare facility.

The 60 to 65 DNL contour is similar in shape to the 2004 and 2009 60 DNL noise contours, extending approximately 5,500 feet from the airport to the north over a small portion of a multi-family development. To the south, the contour extends approximately 2,500 feet over a medical facility, a school, and a place of worship. The contours mirror the previous years' contours to the east and west.

The 65 to 70 DNL contour mirrors the previous years' contours in shape and extends approximately 2,250 feet to the north, while remaining on airport property to the south.

The 70 and 75 DNL contours primarily remain on airport property to the north, south, and west, and extend over adjoining compatible land uses to the east.

Land Use Impacts

Noise-sensitive land uses potentially impacted by noise in 2025 are presented in **Table 4E**. The number of impacts increases slightly when compared to the 2009 impacts. The greatest number of impacts is realized south of the airport.

The total number of dwelling units affected by noise above 55 DNL in 2025 increases to 1,311 total units, all consisting of single-family homes and condominiums/apartments. The increase in impacts is a result of the larger contours and the concentration of aircraft activity as a result of implementation of the RNAV procedures. Approximately 58 dwelling units are exposed to noise between 60 and 65 DNL. There are no dwelling units exposed to noise above 65 DNL in 2025.

The number of noise-sensitive institutions will remain at eight, the same number as 2009. No noise-sensitive development is exposed to noise over 65 DNL noise contour.

Based on the growth risk analysis, there is the potential for approximately 477 additional residential dwelling units within the 55 DNL noise contour, as presented in **Table 4E**. All of the potential units are found within the 55 to 60 DNL noise contour. There are no growth risk areas impacted by noise in excess of 60 DNL.

TABLE 4E
Noise-Sensitive Land Uses Exposed to 2025 Aircraft Noise
Scottsdale Airport

	Noise Contour (DNL)					
LAND USE	**55-60**	**60-65**	**65-70**	**70-75**	**75+**	**Total**
DWELLING UNITS						
Existing Dwelling Units						
Scottsdale	624	0	0	0	0	624
Phoenix	629	58	0	0	0	687
Total	1,253	58	0	0	0	1,311
Future Potential Dwelling Units	477	0	0	0	0	477
Total Dwelling Units	**1,728**	**60**	**0**	**0**	**0**	**1,788**
NOISE-SENSITIVE INSTITUTIONS						
Places of Worship	2	1	0	0	0	3
Medical Facilities	2	1	0	0	0	3
Schools	1	1	0	0	0	2
Other (Library, Museum, Etc.)	0	0	0	0	0	0
Total Noise-Sensitive Institutions	**5**	**3**	**0**	**0**	**0**	**8**
HISTORIC RESOURCES	*0*	*0*	*0*	*0*	*0*	*0*

POPULATION EXPOSED TO 2025 NOISE

The total existing population exposed to noise above 55 DNL decreases from 3,197 in 2009, to 2,945 in 2025, which corresponds to a decrease in LWP from 369 to 328. **Table 4F** presents the impact of 2025 noise on the existing local population.

The majority of the affected population resides within the 55 to 60 DNL contour, with a total impact of 2,813 residents. Within the 60 to 65 DNL noise contour reside132 individuals. No individuals are impacted by noise greater than 65 DNL.

Approximately 1,059 additional residents could potentially be exposed to

noise greater than 55 DNL in 2025. The potential population is found within the 55 to 60 DNL contour. There are no growth risk areas impacted by noise above 60 DNL.

TABLE 4F
Population Exposed to 2025 Aircraft Noise
Scottsdale Airport

	Noise Contour (DNL)					Total Above 55 DNL		Total Above 65 DNL	
	55-60	**60-65**	**65-70**	**70-75**	**75+**	**Residents**	**LWP**	**Residents**	**LWP**
Existing Population	3,140	162	0	0	0	3,302	369	0	0
Potential Population	1,060	0	0	0	0	1,060	113	0	0
Total Population	**4,200**	**162**	**0**	**0**	**0**	**4,362**	**482**	**0**	**0**

Notes: LWP = Level-weighted population: an estimate of the number of people actually annoyed by aircraft noise. It is derived by multiplying the population in each DNL contour range by the appropriate LWP response factor. The factors used are as follows: 0.107 for 55-60 DNL, 0.205 for 60-65 DNL, 0.376 for 65-70 DNL, 0.644 for 70-75 DNL, and 1.000 for 75+ DNL.
Source: Coffman Associates analysis.

SUMMARY

This chapter has analyzed the impacts of aircraft noise on existing and future land use and population in the vicinity of Scottsdale Airport. **Table 4G** summarizes the land use and population impacts.

Exhibit 4L depicts the 2004, 2009, and 2025, 55, 60, and 65 DNL noise contours for comparative purposes. The 2009 and 2025 contours are larger than the existing 2004 noise condition due to the forecasted increase in operations.

Given current zoning, planned land uses, and approved development plans within the study area, there is a potential for future residential development within the 55 to 60 DNL contours in 2009 and 2025.

TABLE 4G
Land Uses and Population Impact Summary
Scottsdale Airport

	2004	2009	2025
Land Use			
DWELLING UNITS			
Existing Dwelling units	1,123	1,260	1,311
Future Potential Dwelling Units	NA	590	477
Total Dwelling Units	**1,123**	**1,850**	**1,788**
NOISE-SENSITIVE INSTITUTIONS			
Places of Worship	1	3	3
Medical Facilities	3	3	3
Schools	1	2	2
Other (Libraries, Museums, etc.)	0	0	0
Total Noise-Sensitive Institutions	**5**	**8**	**8**
HISTORIC RESOURCES			
Total Historic Resources	**0**	**0**	**0**
Population			
Total Existing Population above 55 DNL	2,808	3,213	3,302
Total Existing LWP above 55 DNL	308	372	369
Total Potential Population above 55 DNL	NA	4,524	4,362
Total Potential LWP above 55 DNL	NA	512	482
Total Existing Population above 65 DNL	0	0	0
Total Existing LWP above 65 DNL	0	0	0
Total Potential Population above 65 DNL	NA	0	0
Total Potential LWP above 65 DNL	NA	0	0

Notes: LWP = Level-weighted population: an estimate of the number of people actually annoyed by aircraft noise. It is derived by multiplying the population in each DNL contour range by the appropriate LWP response factor. The factors used are as follows: 0.205 for 60-65 DNL, 0.376 for 65-70 DNL, 0.644 for 70-75 DNL, and 1.000 for 75+ DNL.
Source: Coffman Associates analysis.

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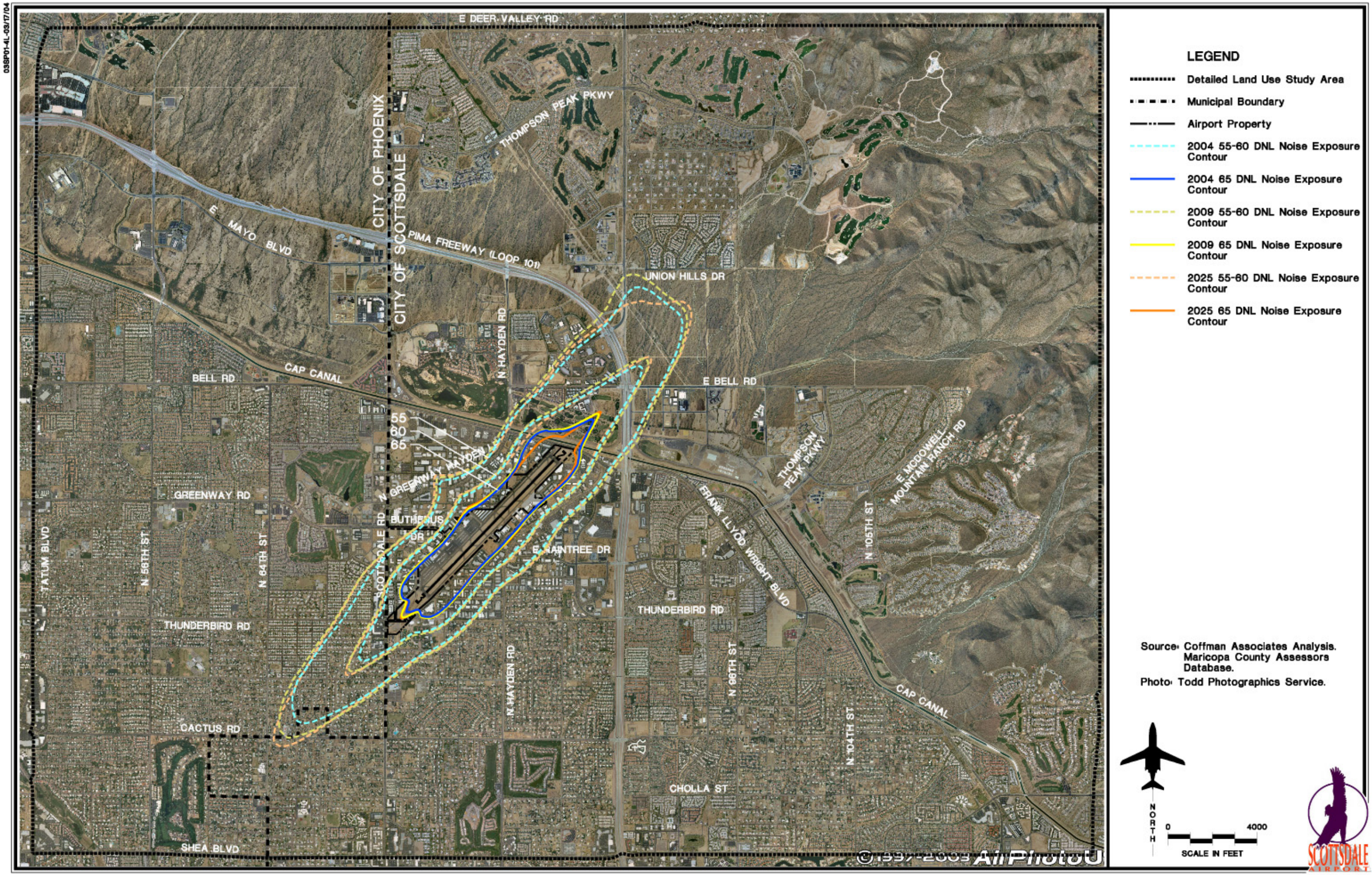

LEGEND

- Detailed Land Use Study Area
- Municipal Boundary
- Airport Property
- 2004 55-60 DNL Noise Exposure Contour
- 2004 65 DNL Noise Exposure Contour
- 2009 55-60 DNL Noise Exposure Contour
- 2009 65 DNL Noise Exposure Contour
- 2025 55-60 DNL Noise Exposure Contour
- 2025 65 DNL Noise Exposure Contour

Source: Coffman Associates Analysis. Maricopa County Assessors Database.

Photo: Todd Photographics Service.

NORTH

0 4000

SCALE IN FEET

SCOTTSDALE AIRPORT

Exhibit 4L
NOISE EXPOSURE CONTOUR COMPARISON