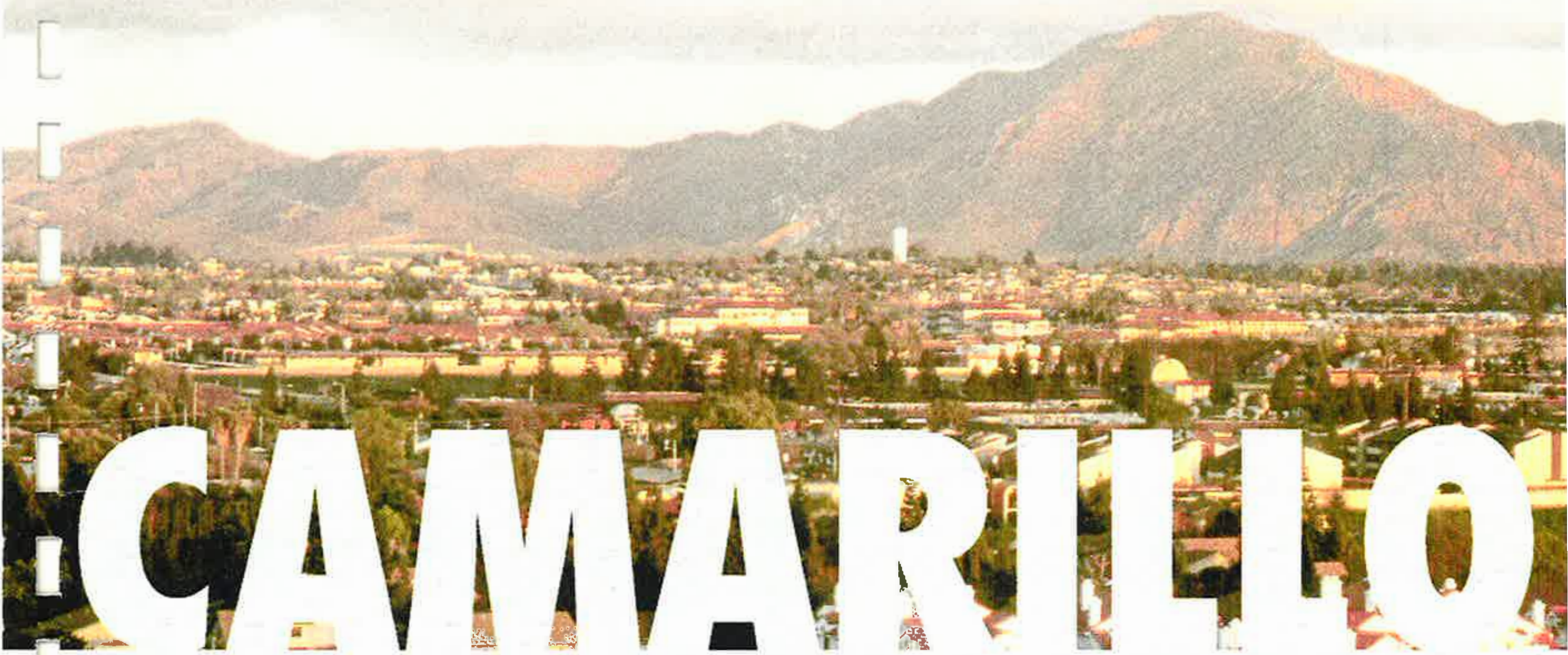

CAMARILLO AIRPORT

F.A.R. PART 150 NOISE COMPATIBILITY STUDY

Noise Exposure Maps

CAMARILLO AIRPORT

F.A.R. Part 150
Noise Compatibility Study

NOISE EXPOSURE MAPS

Prepared For

The County Of Ventura Department of Airports

By

Coffman Associates

May 1998

The preparation of this document was financed in part through a planning grant from the Federal Aviation Administration (FAA) as approved under the Airport and Airway Improvement Act of 1982, as amended. The contents of this report do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein, nor does it indicate that the proposed development is environmentally acceptable in accordance with applicable public laws.

CAMARILLO AIRPORT
Part 150 Noise Exposure Maps

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County of Ventura, California

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CAMARILLO AIRPORT

Part 150 Noise Exposure Maps

NOISE EXPOSURE MAPS

NOISE EXPOSURE MAPS

INTRODUCTION

Camarillo Airport is owned and operated by Ventura County, California.

The Noise Exposure Maps documentation for the airport presents current aircraft noise impacts and anticipated impacts in five years. The documentation contains sufficient information so that reviewers unfamiliar with local conditions and the local public unfamiliar with the technical aspects of aircraft noise can understand the findings.

The Noise Exposure Maps document includes the first three chapters of the complete F.A.R. Part 150 Noise Compatibility Study. Chapter One, Inventory, presents an overview of the airport, airspace, aviation facilities, existing land use, and local land use policies and regulations.

Chapter Two, Aviation Noise, presents existing and forecast aircraft noise exposure based on the assumption of no additional noise abatement efforts. This provides baseline data for evaluating potential noise abatement strategies in the second part of the study.

Chapter Three, Noise Impacts, analyzes the impact of the baseline aircraft noise defined in Chapter Two on noise-sensitive land uses and the resident population. It also includes an analysis of potential residential development trends in the study area.

The official Noise Exposure Maps are presented in this section following page vi. For the convenience of FAA reviewers, FAA's official Noise Exposure Map checklist is presented on pages ii through v.

F.A.R. PART 150
NOISE EXPOSURE MAP CHECKLIST

AIRPORT NAME: *Camarillo Airport, Camarillo, California*

REVIEWER: ______________________

	Yes/No/NA	Page No./ Other Reference
C. If the NEM and NCP are submitted together:		
1. Has the airport operator indicated whether the 5-year map is based on 5-year contours without the program vs. contours if the program is implemented?	N/A	
2. If the 5-year map is based on program implementation:		
a. are the specific program measures which are reflected on the map identified?	N/A	
b. does the documentation specifically describe how these measures affect land use compatibilities depicted on the map?	N/A	
3. If the 5-year NEM does not incorporate program implementation, has the airport operator included an additional NEM for FAA determination after the program is approved which shows program implementation conditions and which is intended to replace the 5-year NEM as the new official 5-year map?	N/A	
IV. **MAP SCALE, GRAPHICS, AND DATA REQUIREMENTS: [A150.101, A150.103, A150.105, 150.21(a)]**		
A. Are the maps sufficient scale to be clear and readable (they must not be less than 1" to 8,000'), and is the scale indicated on the maps?	Yes	See NEM Maps after p.vi
B. Is the quality of the graphics such that required information is clear and readable?	Yes	
C. Depiction of the airport and its environs.		
1. Is the following graphically depicted to scale on both the existing conditions and 5-year maps:		
a. airport boundaries?	Yes	
b. runway configurations with runway end numbers?	Yes	
2. Does the depiction of the off-airport data include:		
a. a land use base map depicting streets and other identifiable geographic features?	Yes	
b. the area within the 65 Ldn (or beyond, at local discretion)?	Yes	
c. clear delineation of geographic boundaries and the names of all jurisdictions with planning and land use control authority within the 65 Ldn (or beyond, at local discretion)?	Yes	
D. 1. Continuous contours for at least the 65, 70, and 75 Ldn?	Yes	
2. Based on current airport and operational data for the existing condition year NEM, and forecast data for the 5-year NEM?	Yes	Chapter Two, pp. 2-2 - 2-4
E. Flight tracks for the existing condition and 5-year forecast timeframes (these may be on supplemental graphics which must use the same land use base map as the existing condition and 5-year NEM), which are numbered to correspond to accompanying narrative?	Yes	Chapter Two, Exhibits 2D, 2E, and 2F after p. 2-8
F. Locations of any noise monitoring sites (these may be on supplemental graphics which must use the same land use base map as the official NEMs)	N/A	
G. Noncompatible land use identification:		
1. Are noncompatible land uses within at least the 65 Ldn depicted on the maps?	Yes	See NEM Maps after p. vi
2. Are noise sensitive public buildings identified?	Yes	
3. Are the noncompatible uses and noise sensitive public buildings readily identifiable and explained on the map legend?	Yes	

F.A.R. PART 150
NOISE EXPOSURE MAP CHECKLIST

AIRPORT NAME: *Camarillo Airport*
Camarillo, California

REVIEWER: ____________

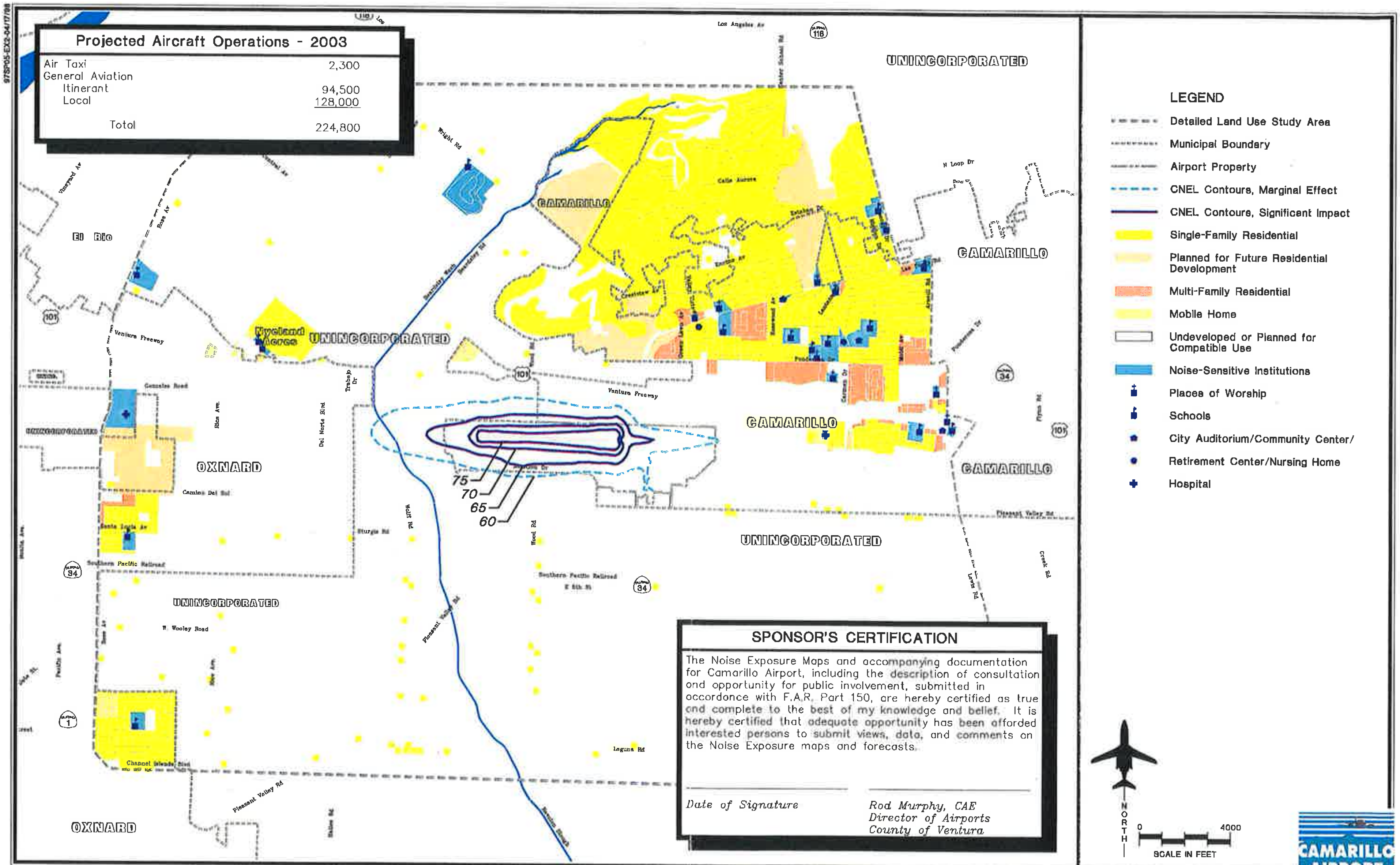
	Yes/No/NA	Page No./ Other Reference
3. Does the narrative include information on self generated or ambient noise where compatible/noncompatible land use identification consider non-airport/aircraft sources?	No	
4. Where normally noncompatible land uses are not depicted as such on the NEMs, does the narrative satisfactorily explain why, with reference to the specific geographic areas?	N/A	
5. Does the narrative describe how forecasts will affect land use compatibility?	Yes	Chapter Three, pp. 3-5 - 3-6
VI. **MAP CERTIFICATIONS: [150.21(b), 150.21(e)]** A. Has the operator certified in writing that interested persons have been afforded adequate opportunity to submit views, data, and comments concerning the correctness and adequacy of the draft maps and forecasts?	Yes	Certification statements on NEM Maps and p. vi
B. Has the operator certified in writing that each map and description of consultation and opportunity for public comment are true and complete?	Yes	Certification statements on NEM Maps and p. vi

SPONSOR'S CERTIFICATION

The Noise Exposure Maps and accompanying documentation for Camarillo Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with F.A.R Part 150, are hereby certified as true and complete to the best of my knowledge and belief. It is hereby certified that adequate opportunity has been afforded interested persons to submit views, data, and comments on the Noise Exposure maps and forecasts. It is further certified that the 1998 Noise Exposure Map and supporting data are fair and reasonable representations of existing conditions at the airport.

Date of Signature

Rod Murphy, CAE
Director of Airports
County of Ventura



Projected Aircraft Operations - 2003

Air Taxi	2,300
General Aviation	
Itinerant	94,500
Local	128,000
Total	224,800

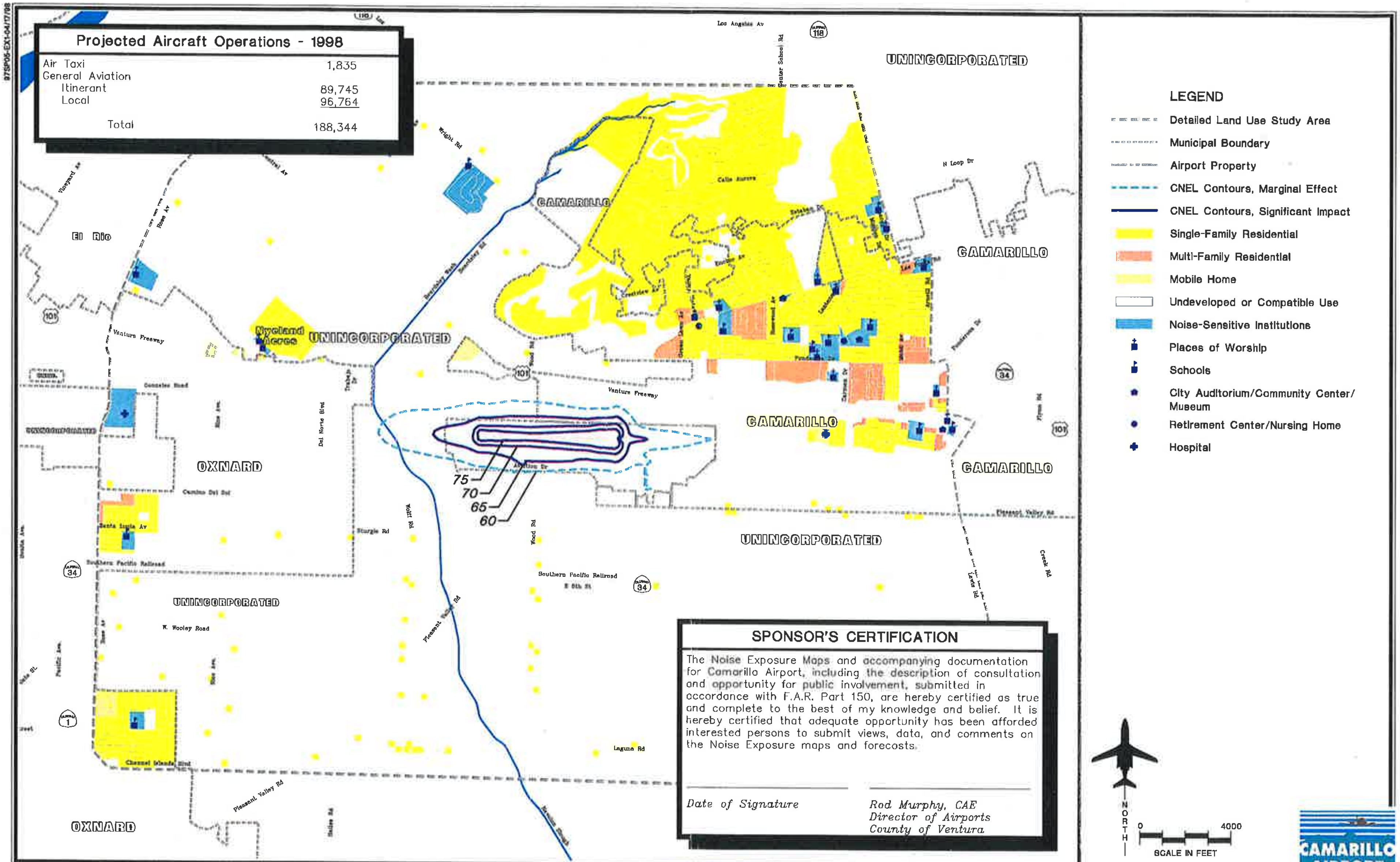
SPONSOR'S CERTIFICATION

The Noise Exposure Maps and accompanying documentation for Camarillo Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with F.A.R. Part 150, are hereby certified as true and complete to the best of my knowledge and belief. It is hereby certified that adequate opportunity has been afforded interested persons to submit views, data, and comments on the Noise Exposure maps and forecasts.

Date of Signature

Rod Murphy, CAE
Director of Airports
County of Ventura

Exhibit 2
2003 NOISE EXPOSURE MAP



Projected Aircraft Operations - 1998

Air Taxi	1,835
General Aviation	
Itinerant	89,745
Local	96,764
Total	188,344

SPONSOR'S CERTIFICATION

The Noise Exposure Maps and accompanying documentation for Camarillo Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with F.A.R. Part 150, are hereby certified as true and complete to the best of my knowledge and belief. It is hereby certified that adequate opportunity has been afforded interested persons to submit views, data, and comments on the Noise Exposure maps and forecosts.

Date of Signature

Rod Murphy, CAE
Director of Airports
County of Ventura

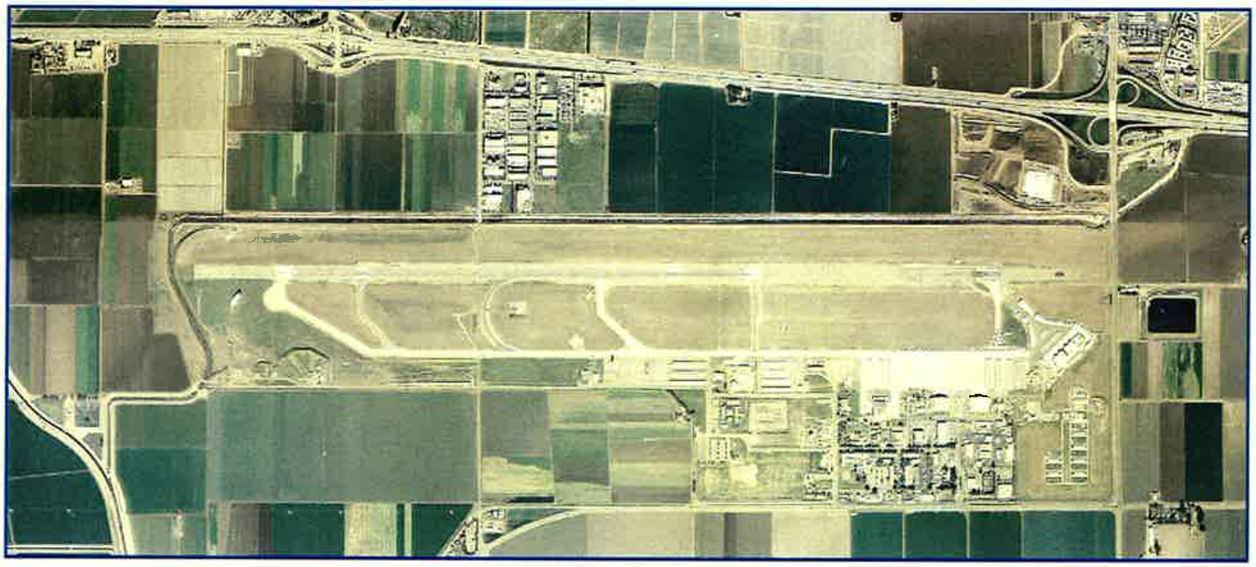
Exhibit 1
1998 NOISE EXPOSURE MAP

CAMARILLO AIRPORT
Part 150 Noise Exposure Maps

Chapter One
INVENTORY

Chapter One

INVENTORY



This chapter presents an overview of Camarillo Airport and its relationship to the surrounding communities. The background information in this chapter, which will be used in later stages of the noise compatibility planning process, is as follows:

- A description of the setting, local climate, and historical perspective of the airport.
- A description of airspace and air traffic control.
- A description of key airport facilities and navigational aids.
- A description of existing land uses in the study area.
- A discussion of the local land use planning and regulatory framework within the study area.

This noise compatibility study involves the preparation of two official documents: the Noise Exposure Maps (NEM) and the Noise Compatibility Program (NCP). The NEM document is a baseline analysis showing existing and potential future noise conditions at the airport. The NCP document presents a plan for effectively dealing with adverse noise impacts based on a three-part perspective. First, it addresses steps to reduce or shift the noise by changing air traffic control or aircraft operating procedures. Second, it provides land use planning recommendations to promote noise-compatible land uses in undeveloped areas exposed to aircraft noise. Third, it addresses special noise mitigation techniques to reduce the impact of significant noise on sensitive land uses in the area.

compatibility study with federal funding assistance. Part 150 provides for the development of two final documents: noise exposure maps and a noise compatibility program.

Noise Exposure Maps. The noise exposure maps document (NEM) shows existing and future noise conditions at the airport. It can be thought of as a baseline analysis defining the scope of the noise situation at the airport. It includes maps of noise exposure for the current year and a five-year forecast. The noise contours are shown on a land use map to reveal areas of noncompatible land use. The document includes detailed supporting information explaining the methods used to develop the maps.

Part 150 requires the use of standard methodologies and metrics for analyzing and describing noise. It also establishes guidelines for the identification of land uses which are incompatible with noise of different levels. Airport proprietors are required to update noise exposure maps when changes in the operation of the airport would create any new, substantial noncompatible use. This is defined as an increase in noise the yearly day-night average sound level (DNL) of 1.5 decibels over noncompatible land uses. (In California, the community noise equivalent level -- CNEL – is used in place of DNL.)

A limited degree of legal protection can be afforded to the airport proprietor through preparation and submission of noise exposure maps. Section 107(a) of the ASNA Act provides that:

> *No person who acquires property or an interest therein . . . in an area surrounding an airport with respect to which a noise exposure map has been submitted . . . shall be entitled to recover damages with respect to the noise attributable to such airport if such person had actual or constructive knowledge of the existence of such noise exposure map unless . . . such person can show --*
>
> *(i) A significant change in the type or frequency of aircraft operations at the airport; or*
>
> *(ii) A significant change in the airport layout; or*
>
> *(iii) A significant change in the flight patterns; or*
>
> *(iv) A significant increase in night-time operations occurred after the date of acquisition of such property . . .*

The ASNA Act provides that "constructive knowledge" shall be attributed to any person if a copy of the noise exposure map was provided to him at the time of property acquisition, or if notice of the existence of the noise exposure map was published three times in a newspaper of general circulation in the area. In addition, Part 150 defines "significant increase" as an increase of 1.5 DNL (or, in California, 1.5 CNEL). For purposes of this provision, FAA officials consider the term "area surrounding an airport" to mean an area within the 65 DNL (or CNEL) contour. (See F.A.R. Part 150, Section 150.21 (d), (f) and (g).)

F.A.R. Part 36 has three stages of certification. Stage 3 is the most rigorous and applies to aircraft certificated since November 5, 1975. Stage 2 applies to aircraft certificated between December 1, 1969 and November 5, 1975. Stage 1 includes all previously certificated aircraft.

F.A.R. Part 91, Subpart I, known as the "Fleet Noise Rule," mandated a compliance schedule under which Stage 1 aircraft were to be retired or refitted with hush kits or quieter engines by January 1, 1988. A very limited number of exemptions were granted by the U.S. Department of Transportation for foreign aircraft operating into specified international airports.

Pursuant to the Congressional mandate in the *Airport Noise and Capacity Act of 1990*, FAA established amendments to F.A.R. Part 91 by setting December 31, 1999 as the date for discontinuing use of all Stage 2 aircraft exceeding 75,000 pounds. FAA may grant an airline an extension of the deadline to December 31, 2003 if, by July 1, 1999, their fleets include no more than 15 percent Stage 2 aircraft. The Part 91 amendments also provide for two alternative phase-out schedules through the 1990s. The first is described in terms of the phase-out of Stage 2 aircraft, the second in terms of the phase-in of Stage 3 aircraft.

Under the first alternative, an airline must have eliminated or retrofitted 25 percent of its Stage 2 fleet by the end of 1994, 50 percent by the end of 1996, and 75 percent by the end of 1998. Under the second alternative, an airline must have a fleet of no less than 55 percent Stage 3 aircraft by the end of 1994, 65 percent by the end of 1996, and 75 percent by the end of 1998.

Neither F.A.R. Part 36 nor Part 91 apply to military aircraft. Nevertheless, many of the advances in quiet engine technology are being used by the military as they upgrade aircraft to improve performance and fuel efficiency.

F.A.R. Part 161 Regulation Of Airport Noise And Access Restrictions

F.A.R. Part 161 sets forth requirements for notice and approval of local restrictions on aircraft noise levels and airport access. Part 161 was written to implement provisions of the *Airport Noise and Capacity Act of 1990*. It applies to local airport noise and access restrictions on operations by Stage 2 or 3 aircraft. These include direct limits on maximum noise levels, nighttime curfews, and special fees intended to encourage changes in airport operations to lessen noise.

In order to implement noise or access restrictions on Stage 2 aircraft, the airport operator must provide public notice of the proposal and provide at least a 45-day comment period. This includes notification of FAA and publication of the proposed restriction in the *Federal Register*. An analysis must be prepared describing the proposal, alternatives to the proposal, and the costs and benefits of each.

general plans and zoning ordinances. The State has also established airport noise standards and noise insulation standards.

General Plan

The State of California performs many functions affecting local governments. Most important to the Part 150 process is the requirement for each local jurisdiction to develop a "long range General Plan for the development of the city or county" which "shall consist of a statement of development policies and shall include diagrams and text setting forth objectives, principles, standards, and plan proposals." Of the seven mandatory elements in the General Plan, two are especially important to the Part 150 study -- land use and noise.

The land use element of a general plan designates the proposed general distribution and intensity of uses of the land. This element serves as a framework for the plan and is intended to correlate all land use issues into a set of development policies. The land use element must include standards of population density and building intensity.

The noise element identifies and evaluates the noise situation in the community. The projected noise levels are calculated and mapped for airports and other major noise sources. Projected noise levels are used as a guide for establishing a pattern of land uses in the land use element that minimizes the exposure of residents to excessive noise.

Airport Noise Standards

The California Aeronautics Program's noise rules and regulations provide noise standards governing the operation of aircraft at all airports operating under a valid permit. (See Title 21, Subchapter 6, Sections 5000, *et seq.*) The regulations are designed to cause the airport proprietor, aircraft operator, local governments, and the State to work together to diminish noise. If an airport has a "noise problem", defined as incompatible land uses within the 65 CNEL contour, the airport proprietor must develop a noise program to reduce the noise impact. The F.A.R. Part 150 Noise Compatibility Program satisfies this requirement. Airports with noise problems are also required to conduct regular noise monitoring.

According to the statute, incompatible land uses include single and multi-family dwellings, trailer parks, and schools of standard construction. Land uses deemed compatible with airport noise include agriculture, airport property, industrial, commercial, zoned open space, and property subject to a navigation easement for noise. (See Section 5014.) Proprietors of airports with incompatible land uses within the 65 CNEL contour are able to operate the airport only if they are issued a variance by the California Aeronautics Program. (See Section 5075.)

metropolitan area (FAA 1995). Reliever airports play a key role in the nation's aviation system by providing an alternative to general aviation users in major metropolitan areas. The 290 reliever airports across the country have an average of 207 based aircraft and collectively account for 29 percent of the nation's fleet.

LOCALE

The City of Camarillo is located in southern California approximately 40 miles northwest of the City of Los Angeles. Camarillo Airport is located in Ventura County within the corporate limits of the City of Camarillo, three miles southwest of the city's central business district (CBD). The airport is situated less than one mile south of Ventura Freeway (Highway 101) and seven miles east of the Pacific Ocean coastline.

Primary airport access is gained from Pleasant Valley Road which is located immediately south of the airport. The airport is bordered to the east by Los Posas Road which links the airport to the Ventura Freeway and the City of Camarillo to the north as well as NAWS Point Mugu and the Pacific Coast Highway (State Highway 1) to the south. **Exhibit 1A** depicts the location of Camarillo Airport in its regional setting.

CLIMATE

Weather plays an important role in the operational capabilities of an airport. Temperature is an important factor in determining runway length required for aircraft operations. The percentage of time that visibility is impaired due to cloud coverage is a major factor in determining the use of instrument approach aids. Wind speed and direction determine runway selection and operational flow.

Annual precipitation in the Camarillo area averages 13.3 inches per year, approximately 87 percent of which falls from November through March. Average annual temperature is 65.8 degrees Fahrenheit. During summer months, the average temperature is 66.7 degrees, with an average daily maximum temperature of 73.3 degrees. During winter months, the average temperature is 54.7 degrees, with an average daily minimum temperature of 43 degrees. Prevailing winds are from the southwest with a mean hourly speed of nine miles per hour at noon.

AIRPORT HISTORY

The first landing strip at Camarillo Airport was constructed in the spring of 1942 by the Public Roads Administration. In the fall of 1942, the facility was enlarged and upgraded for use by the Army Air Force and the Marine Corps. In 1947, the landing strip was returned to Ventura County and was used jointly by the Army, California National Guard, and the Navy. The government regained control in May 1951 and used the airfield as Oxnard Air Force Base. In 1969, the Air Base was declared surplus property by the Federal Government and was

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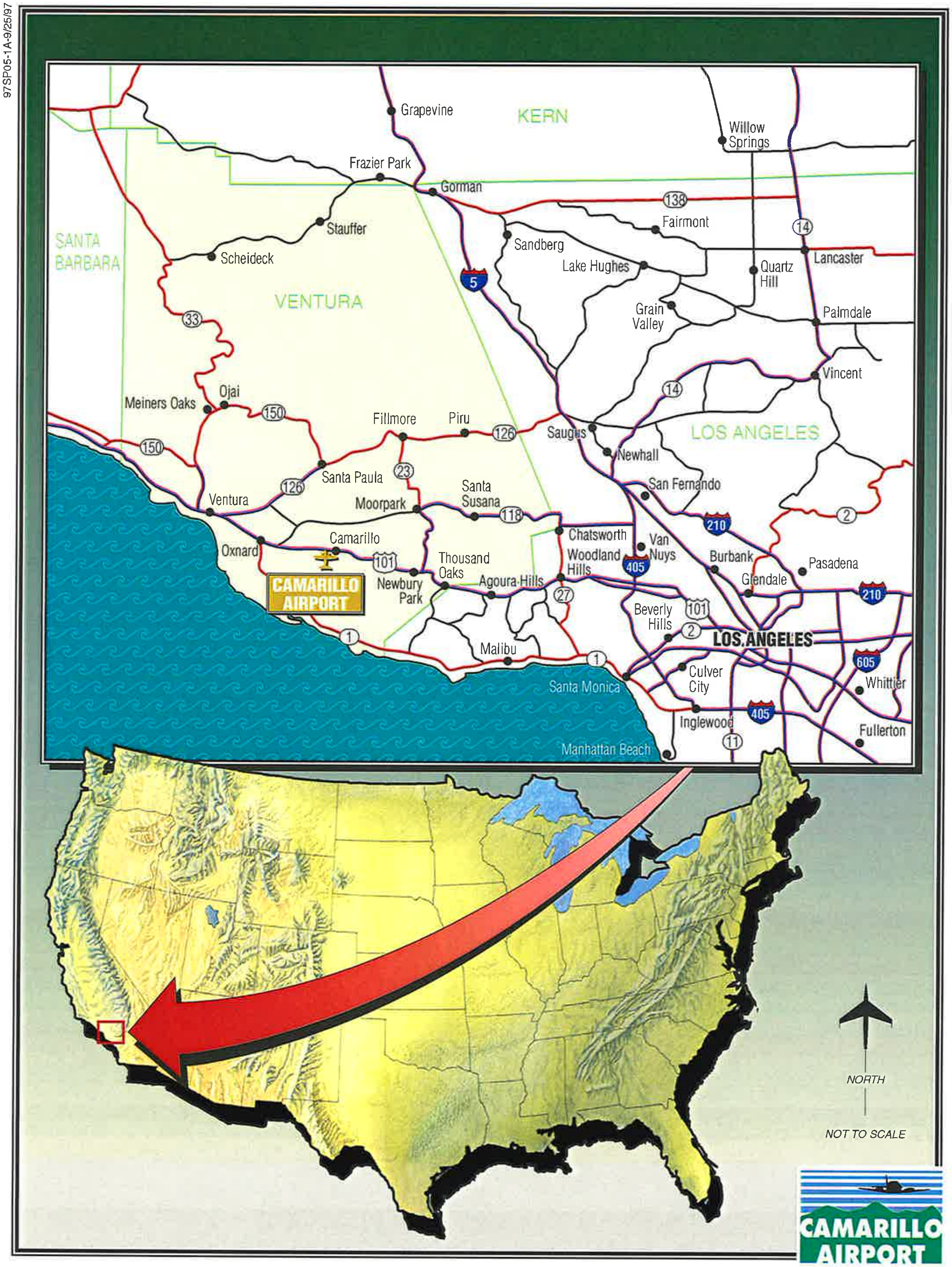


CAMARILLO AIRPORT

Exhibit 1A
LOCATION MAP

TABLE 1A
Historic And Forecast Operations
Camarillo Airport

		General Aviation			
Year	**Air Taxi**	**Local**	**Itinerant**	**Military**	**Total**
1990	5,799	115,285	91,346	1,243	213,673
1991	3,469	132,132	78,402	913	214,916
1992	1,744	99,382	83,295	1,060	185,481
1993	1,721	98,857	77,474	973	179,025
1994	2,025	103,567	84,487	771	190,850
1995	1,366	90,737	74,179	834	167,116
1996	2,031	86,885	83,860	129	172,905
1997*	1,835	86,758	89,708	43	178,344
FORECAST					
Short Term	2,300	118,000	92,000	2,500	214,800
Intermediate Term	2,600	134,000	106,000	2,500	245,100
Long Range	3,300	168,000	132,000	2,500	305,800

1997 operational data is for the twelve-month period from November 1996 through October 1997. Data does not include ultralight operations.

Sources: FAA Air Traffic Control Tower Monthly Activity Reports. Forecasts from Coffman Associates, 1996, p. 2-14.

AIRPORT FACILITIES

Airfield facilities influence the utilization of airspace and are important to the noise compatibility planning process. These facilities include the runway and taxiway systems and aircraft and terminal activity areas. **Exhibit 1B** depicts an overview of the airfield facilities. As mentioned in the previous section, the airport master plan study was recently competed. The main focus of an airport master plan is to provide an Airport Layout Plan (ALP) which includes a graphical representation of existing and planned airport facilities. Because planned facilities will be considered in this study, **Exhibit 1C, Airport Layout Plan**, has been included for reference.

RUNWAYS

Camarillo Airport is served by Runway 8-26 which is 6,010 feet long by 150 feet wide and aligned in an east-west direction. The runway surface is asphalt and is in good condition. The current *Airport/Facility Directory* listing for Camarillo Airport indicates runway load bearing strength for Runway 8-26 as 48,000 pounds for single wheel loading, 65,000 pounds for dual wheel loading, and 110,000 pounds for dual tandem wheel loading (National Ocean Service 1997a, p. 46).

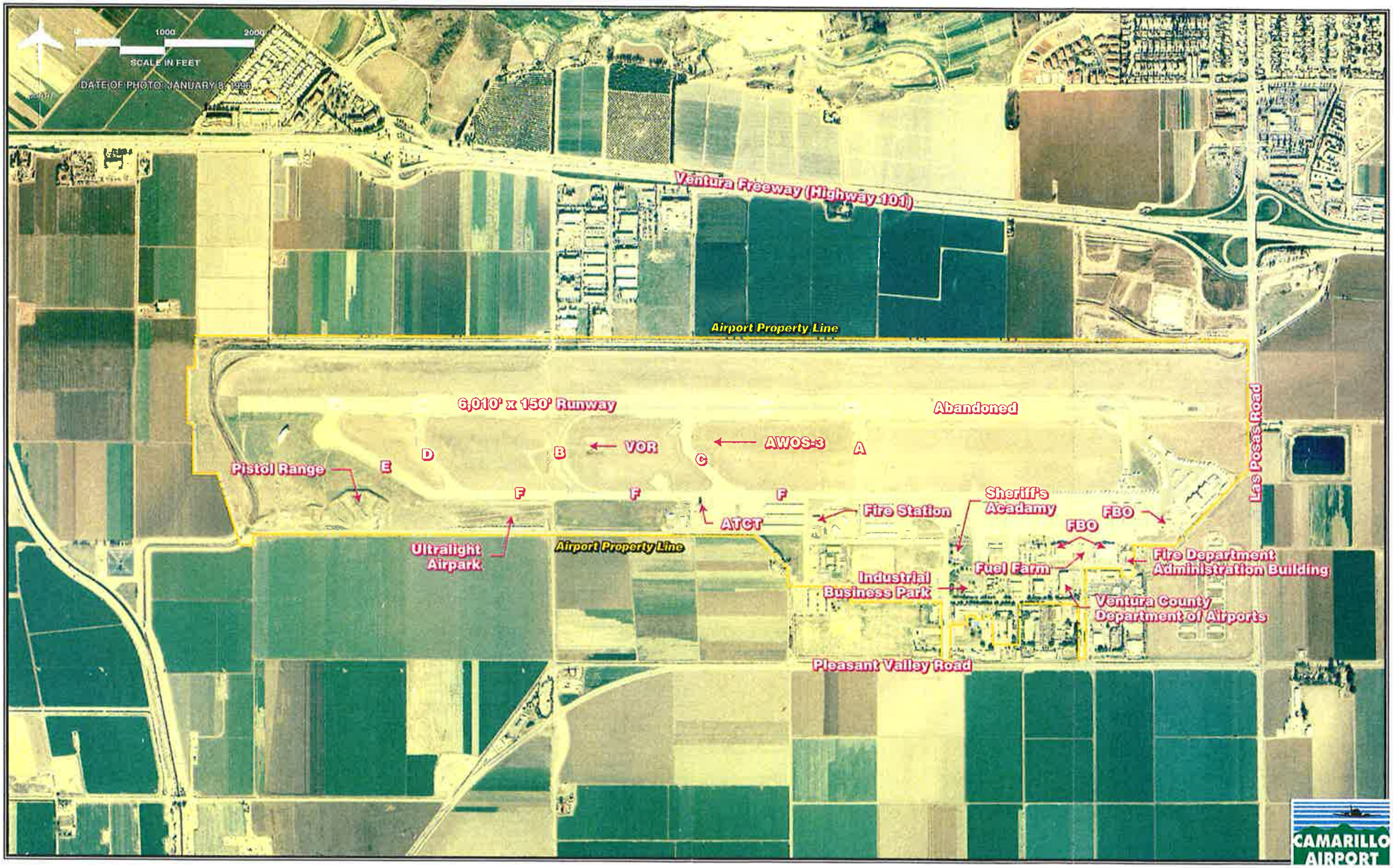
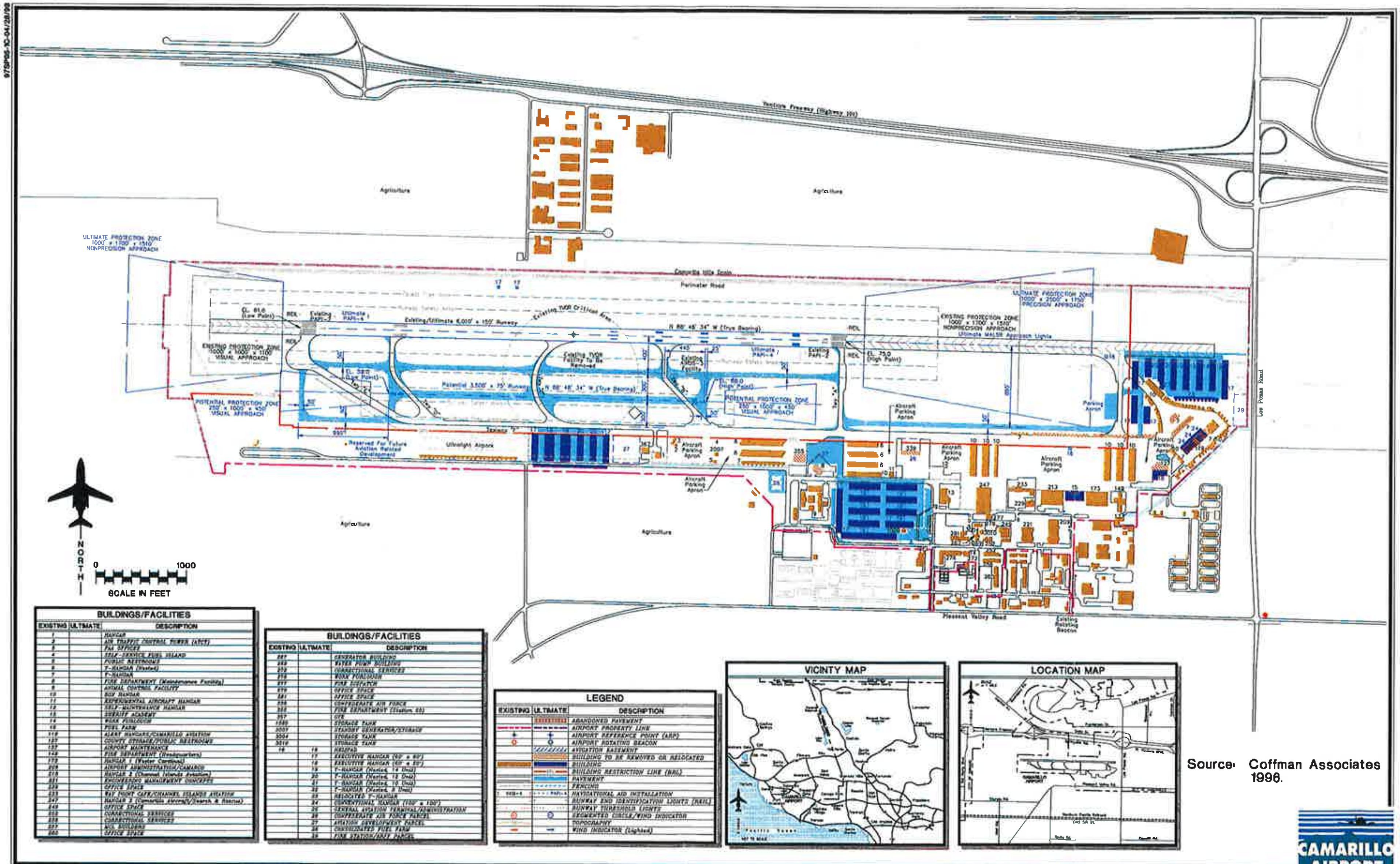


Exhibit 1B
AIRFIELD FACILITIES



Source: Coffman Associates 1996.

CAMARILLO AIRPORT

Exhibit 1C
AIRPORT LAYOUT PLAN

Exhibit 1C indicates future taxiway improvements. The most significant taxiway improvements include the construction of a parallel taxiway located 400 feet south of the Runway 8-26 threshold and a parallel taxiway north of the terminal area. Both these taxiways would provide for two-way circulation improving operational safety and efficiency. Other taxiway improvements indicated on the exhibit would be necessary only if the construction of the potential parallel runway is necessary.

FIXED BASE AND SPECIALTY OPERATORS

Terminal services are provided by several fixed base operators (FBOs) located in the terminal area at the airport. Channel Islands Aviation is a full service fixed base operator (FBO) located on the eastern portion of the airport. Services include a flight school, aircraft charter, aircraft rental, major aircraft maintenance, aircraft sales, line services, and fuel sales. The FBO operates two facilities on the airport. One accommodates aircraft maintenance and storage and includes office space. The other building consists of office and classroom space. The FBO owns 17 fixed wing aircraft and maintains 21 tie-down positions on the apron. Channel Islands Aviation provides both Jet A and 100 low lead (Avgas) fueling.

Western Cardinal, Inc. is another full service FBO on the airport. The FBO operates out of a conventional hangar and offers flight training, aircraft rental, aircraft sales (Piper Dealer), aircraft maintenance, and fuel sales. Western Cardinal, Inc. provides both Jet A and Avgas fueling services.

Sun Air Aviation is another FBO located in the northeastern corner of the airport. This FBO provides aircraft rental, charter services, pilot instruction, and aircraft maintenance. Sun Air owns and operates nine aircraft.

Other specialty operators at the airport include Avex and Camarillo Aircraft which provide aircraft sales and maintenance, respectively. The Confederate Air Force (CAF) operates out of a large conventional hangar east of Taxiway A. The CAF restores and maintains vintage military aircraft and participates in air shows across the country.

OTHER FACILITIES

An ultralight flight park is on the west side of the airport immediately south of parallel Taxiway F and is situated on a 1,200 feet long by 200 feet wide piece of property. The flight park is served by a gravel and oil runway of indeterminate length oriented in a east-west direction nearly parallel Runway 8-26.

Besides the aviation facilities, the Ventura County Department of Airports has developed an industrial/ business park on the non-aviation portions of the deactivated air base property. Some tenants lease buildings dating back to the air base, while others have developed new facilities on the property leased from the airport. The development of the industrial/ business

The Los Angeles ARTCC located in Los Angeles, California, controls IFR aircraft entering and leaving the southern California area. The area of jurisdiction for the Los Angeles center includes most of the State of California, and portions of Nevada, Arizona, and Utah.

Radar Air Traffic Control Facility (RATCF)

The ARTCC delegates certain airspace to local terminal facilities which are responsible for the orderly flow of air traffic arriving and departing the major terminals. The Los Angeles ARTCC has delegated airspace to Point Mugu radar air traffic control facility (RATCF). The RATCF is staffed and operated by the U.S. Navy and is under contract with the FAA for terminal control of civilian aircraft.

The RATCF uses direct radio communications and Automated Radar Terminal tracking system to control air traffic within its jurisdiction. Air traffic control services provided by Point Mugu RATCF include radar vectoring, sequencing and separation of IFR aircraft, and traffic advisories for all aircraft. The RATCF provides air traffic control services between 6:00 a.m. and 10:00 p.m. Between 10:00 p.m. and 6:00 a.m. air traffic control services is provided by the Los Angeles ARTCC.

Camarillo Airport Traffic Control Tower (ATCT)

The Camarillo Airport control tower operates daily from 7:00 a.m. to 9:00 p.m. local time, controlling aircraft movement within the Class D Airspace and on the runway and taxiway system. The IFR arrivals and departures from Camarillo Airport are coordinated with the Point Mugu radar air traffic control facility (RATCF).

AIRSPACE STRUCTURE

Since the inception of aviation, nations have set up procedures within their territorial boundaries to regulate the use of airspace. Until recently, the system used to regulate airspace in the United States was different from other countries. The FAA has taken the lead role in international efforts to standardize airspace nomenclature and flight rules. On September 16, 1993, all airspace within the United States was reclassified to provide consistency with international standards. However, the basic premise of the use of airspace in the United States remains the same, and airspace is still broadly classified as either "controlled" or "uncontrolled."

The difference between controlled versus uncontrolled airspace relates primarily to requirements for pilot qualifications, ground to air communications, navigation and air traffic services, and weather conditions.

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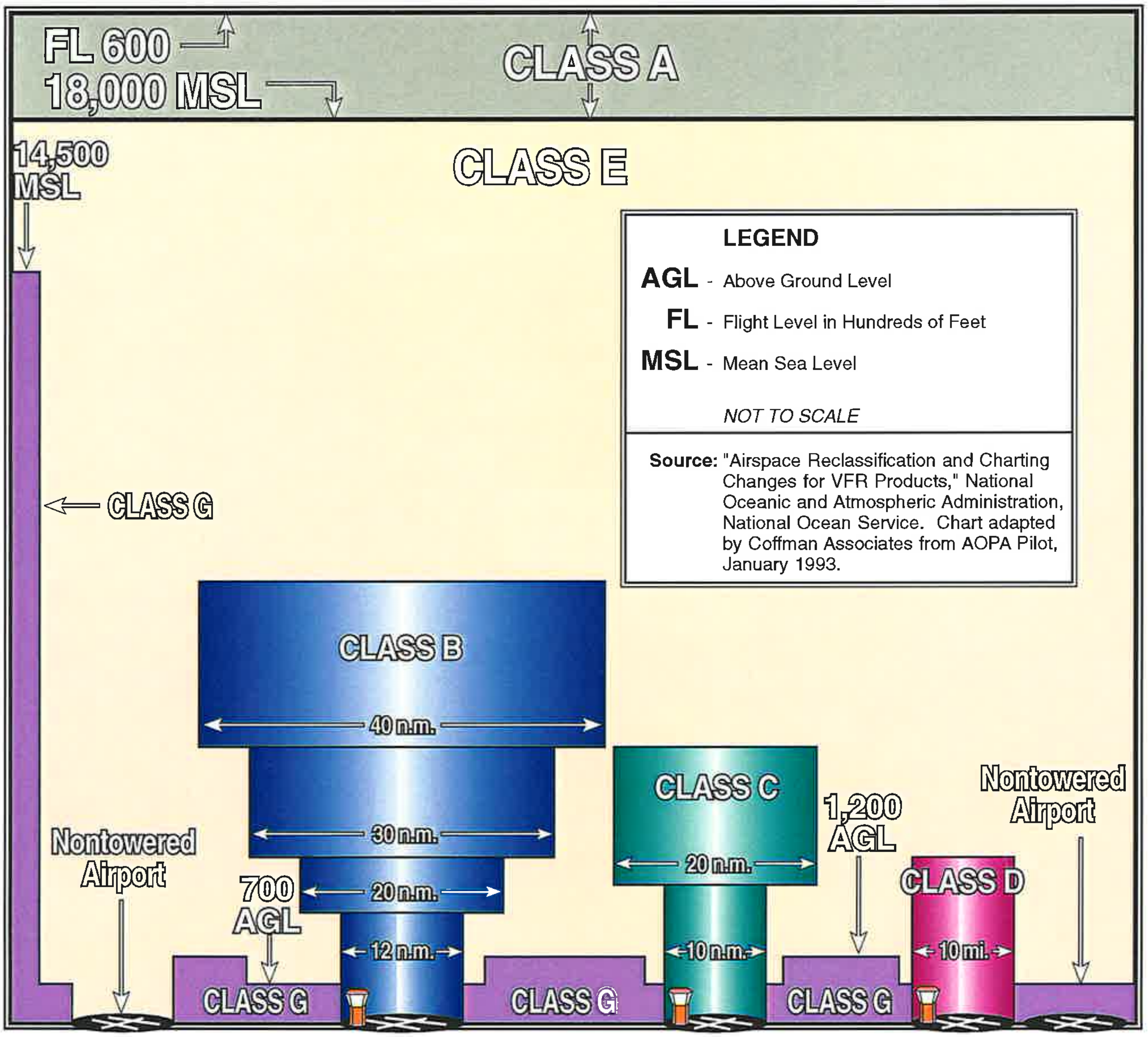


CLASSIFICATION	DEFINITION
CLASS A	Generally airspace above 18,000 feet MSL up to an including FL 600 .
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
CLASS D	Generally airspace from the surface to 2,500 feet AGL sourrounding towered airports.
CLASS E	Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
CLASS G	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.

CAMARILLO AIRPORT

Exhibit 1D
AIRSPACE CLASSIFICATION

97SP05-1E-9/29/97

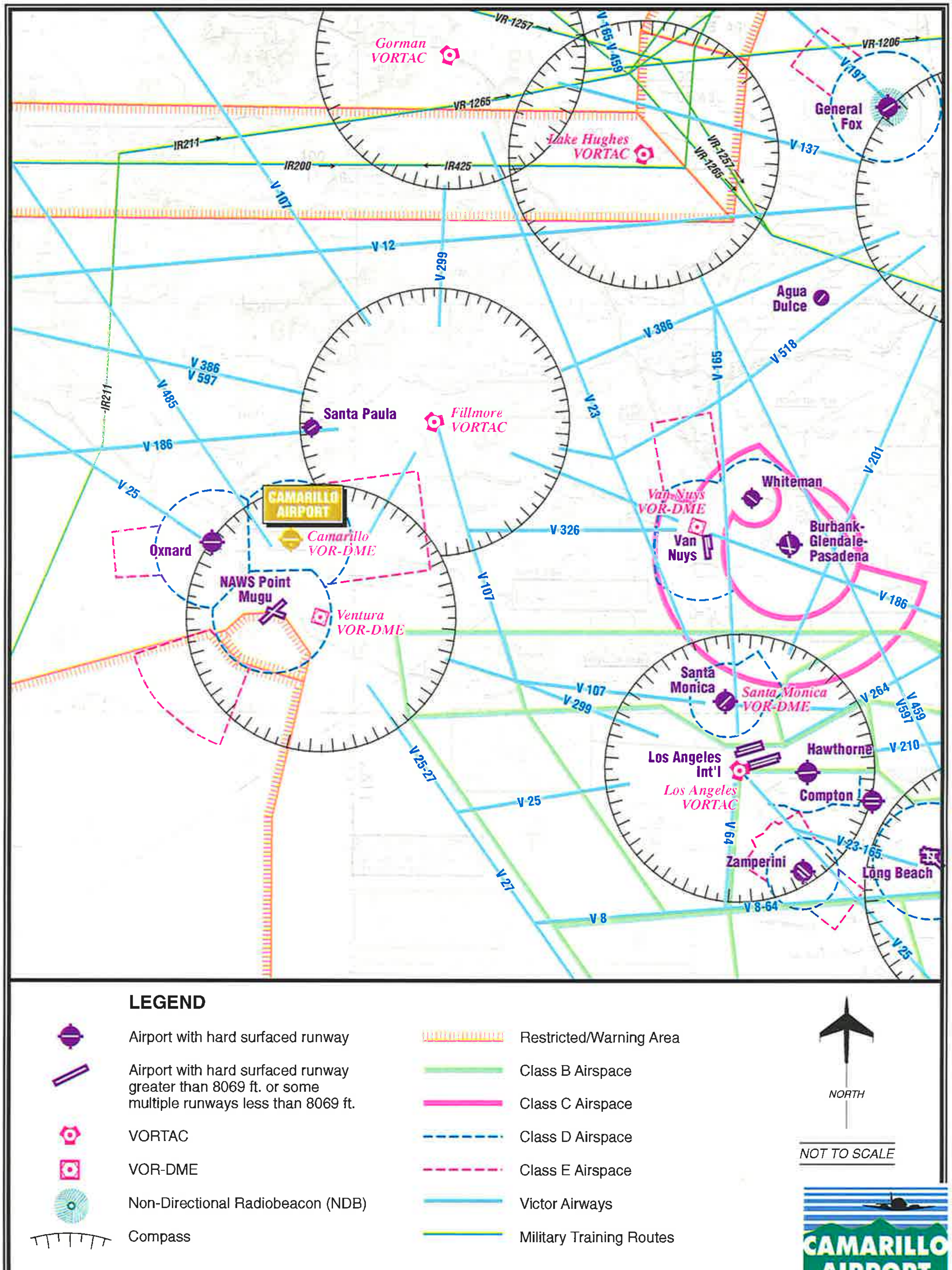


Exhibit 1E
REGIONAL AIRSPACE

Airport located approximately 40 nautical miles northwest of Camarillo Airport are surrounded with Class C airspace.

Class D Airspace

Class D airspace is normally a circular area with a radius of four to five miles around the primary airport and any extensions necessary to include instrument approach and departure paths. This controlled airspace typically extends upward from the surface to about 2,500 feet above the elevation of airports with operating control towers. Camarillo Airport, Oxnard Airport, and Naval Air Weapons Station (NAWS) Point Mugu are encompassed by Class D airspace.

As depicted on **Exhibit 1E**, Camarillo's Class D airspace is interrupted to the south and southeast by NAWS Point Mugu's Class D airspace, and to the west by Oxnard Airport's Class D airspace. The ceiling of Camarillo's and Oxnard's Class D airspace is 2,000 feet above mean sea level (MSL). NAWS Point Mugu's Class D airspace has a ceiling of 3,000 feet MSL.

Class E Airspace

The Class E category contains airspace formerly designated as control zones for non-towered airports and transition surfaces. The Class E airspace for a non-towered airport extends from the surface upward to overlying or adjacent controlled airspace. Otherwise, Class E airspace terminates at the base of Class A airspace. When Class E airspace is designated as a surface area, it is configured to contain all instrument approaches. When designated as an extension of Class B, Class C, or Class D airspace, the extension allows standard instrument approach procedures without communications requirements for VFR operations.

Class G Airspace

Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and 700 feet above the surface underneath many of the Class E transition surfaces in the study area. Also, the Camarillo and Oxnard Class D airspace reverts to Class G airspace when the airport traffic control towers at each airport are closed. Additional FAA rules regulate flight altitudes over congested residential areas, National Parks, and outdoor recreational areas. Therefore, practical access to uncontrolled airspace is very limited in the study area.

Special Use Airspace

Restricted and warning areas indicate the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Immediately adjacent and south of NAWS Point Mugu lies an area of restricted airspace (R-2519). This is shown in **Exhibit 1E**. This area is operated continuously and has an unlimited floor and ceiling. The accurate enroute air navigation. Various devices use ground-based transmission facilities and on-board receiving instruments. Enroute NAVAIDS often provide navigation to more than one airport as well as to aircraft traversing the area. Enroute NAVAIDS that operate in the study area are discussed below.

The VOR (Very High Frequency Omnidirectional Range) provides course guidance to aircraft by means of a VHF radio frequency. TACAN (Tactical Air Navigation), primarily a military-oriented facility, is often collocated with a VOR station. TACAN provides both course guidance and line-of-sight distance measurement from a UHF transmitter. A properly equipped aircraft translates the VORTAC signals into a visual display of both azimuth and distance. Distance measuring equipment (DME) is also sometimes collocated with VOR facilities. DME emits signals enabling pilots of properly equipped aircraft to determine their line-of-sight distance from the facility. One VORTAC facility, the Fillmore VORTAC, offers navigational assistance in the study area. Two combined VOR/DME units are in the study area: Camarillo and Ventura.

VORs define low-altitude (Victor) and high altitude airways (Jet Routes) through the area. Because of the area's congested airspace, most aircraft enter Southern California, especially the Los Angeles basin, via one of these numerous federal airways. Aircraft assigned to altitudes above 18,000 feet MSL use the Jet Route system. Other aircraft use low altitude airways, also known as Victor Airways. Radials off VORs define the centerline of these flight corridors.

Three Victor Airways are in the immediate vicinity of Camarillo Airport. V25 lies immediately above the airport and runs in a northwest-southeast direction between the Ventura VOR/DME and the San Marcus VORTAC. V27-485 originates less than one nautical miles west of the airport and runs in a northwesterly direction. V299 originates approximately five nautical miles east of the airport and runs in a northeasterly direction.

AREA AIRPORTS

Oxnard Airport is the only airport served by commercial (commuter) airlines in the immediate vicinity. Located five nautical miles west of Camarillo Airport, Oxnard Airport has over 200 based aircraft and experiences approximately 100,000 annual operations. To the southeast, however, the Los Angeles Basin is served by a number of commercial service airports as illustrated on **Exhibit 1E**. They include Los Angeles International, Burbank-Glendale-Pasadena, Long Beach, Ontario International, and John Wayne-Orange County, all of which are served by major airlines. Approximately 40 nautical miles to the northwest, Santa Barbara is the only other commercial service airport within relatively close proximity of Camarillo Airport.

Other than Oxnard Airport, one public use general aviation airport and one military airport are located near the Camarillo Airport study area. Santa

Flight Rules (IFR) and Visual Flight Rules (VFR). Instrument Flight Rules are those that govern the procedures for conducting instrument flight. Visual Flight Rules govern the procedures for conducting flight under visual conditions. Most air carrier, military, and general aviation jet operations are conducted under IFR regardless of the weather conditions.

Visual Flight Rule Procedures: Under VFR conditions, the pilot is responsible for collision avoidance and will typically contact the tower when approximately 10 miles from the airport for sequencing into the traffic pattern.

Generally, VFR general aviation traffic stays clear of the more congested airspace and follows recommended VFR flyways in the area. There are no VFR flyways located in the vicinity of the Camarillo Airport; however, many VFR flyways are located to the southeast which aid VFR pilots in traversing the greater Los Angeles area.

Instrument Flight Rule Procedures: The Point Mugu RATCF handles all IFR traffic to and from Camarillo Airport. IFR arrival traffic is transferred to the RATCF by the ARTCC as traffic enters RATCF airspace. Traffic is typically vectored to the Camarillo or Ventura VOR/DME and then to the airport via vectors or the published nonprecision approach procedure. IFR departures require clearance from the Point Mugu RATCF before takeoff unless RATCF is closed. When the RATCF is closed, aircraft receive IFR clearance once airborne from the Los Angeles ARTCC.

Local ATC Procedures: At present there is no formal runway use program at Camarillo Airport that dictates the use of one runway over the other. Arrivals and departures, however, are almost exclusively on Runway 26 due to the prevailing westerly winds.

Arrivals and departures occur occasionally on Runway 8. Operations on this runway usually occur in Santa Ana wind conditions (strong winds from the northeast) or if requested by the pilot.

Noise Abatement Procedures

At Camarillo Airport, the Airport Traffic Control Tower, Ventura County Department of Aviation, and airport users have developed and published noise abatement procedures concerning VFR operations. Instructions are outlined regarding departures, arrivals, and pattern procedures at the airport which are aimed at minimizing noise exposure over noise-sensitive areas without compromising safety. Pilots are requested to follow the published procedures unless it is considered unsafe, weather conditions do not allow, or otherwise are instructed to deviate by the Airport Traffic Control Tower. The procedures include:

- No aircraft departures between 0000-0500 without prior approval of the Airport Administrator.

- Aircraft are instructed to stay as high as practical over residential areas during overflight, approaches, and departures.

The Camarillo ATCT and ultralight aircraft operators have entered into an operational letter of agreement. As illustrated on **Exhibit 1B**, an ultralight airpark is located in the southwest corner of the airfield. The ultralight airpark has a paved runway nearly parallel to Runway 8-26. Because of its proximity to the airfield, the potential exists for airspace conflicts between the slower ultralight aircraft and higher performance aircraft utilizing the airport. The letter of agreement details departure and arrival procedures that ultralight aircraft are to follow, some of which are mandatory. Mandatory requirements include a traffic pattern south of the runway and the need for specific approval of requests for a pattern which is opposite of runway traffic.

Another letter of agreement is established between the Oxnard and Camarillo ATCT, NAWS Point Mugu RATCF, Aspen Helicopters, and Sinton Helicopters. It defines operational procedures for agriculture helicopters requesting special visual flight rules (SVFR) operations during IFR weather conditions. Helicopter pilots are to maintain contact with the appropriate ATC facility and maintain adequate separation as assigned by the controlling ATC facility. This letter of agreement also designates SVFR routes for arrivals and departures to and from Oxnard and Camarillo Airports. For Camarillo, two routes have been established: Aspen/Sinton Ag Routes Foxtrot and Tango. Route Foxtrot runs from the Camarillo Airport to Fifth Street, then west via Fifth Street to the shoreline at or below 500 feet. Route Tango runs from the western end of Runway 8-26, then northwest over the Saticoy Bridge at or below 500 feet.

Another letter of agreement has been established between the Camarillo ATCT and the Ventura County Sheriff's Department. It establishes procedures for VFR operations to and from Camarillo Airport and establishes arrival and departure routes. These defined procedures and routes are for the use of the Sheriff's Department helicopters or other helicopters authorized by the Sheriff's Department while operating in Camarillo Class D Airspace. The letter of agreement stipulates that arrivals and departures shall be in accordance with the established routes and altitudes and shall begin and terminate at the Hangar 3 ramp unless otherwise coordinated. **Exhibit 1F** depicts the location of the Hangar 3 ramp and the routes defined in the letter of agreement. The established routes are as follows:

- Central Departure, West/Northeast -- Cross Taxiway Echo and proceed westbound, remaining south of the runway centerline to Revolon Slough, then northbound to Highway 101, then on course. Traffic permitting, the tower will call an early northbound turn.

- City Departure, Northeast over the City of Camarillo -- Proceed eastbound, remaining south of the runway until instructed by the tower to cross the extended centerline to Camarillo.

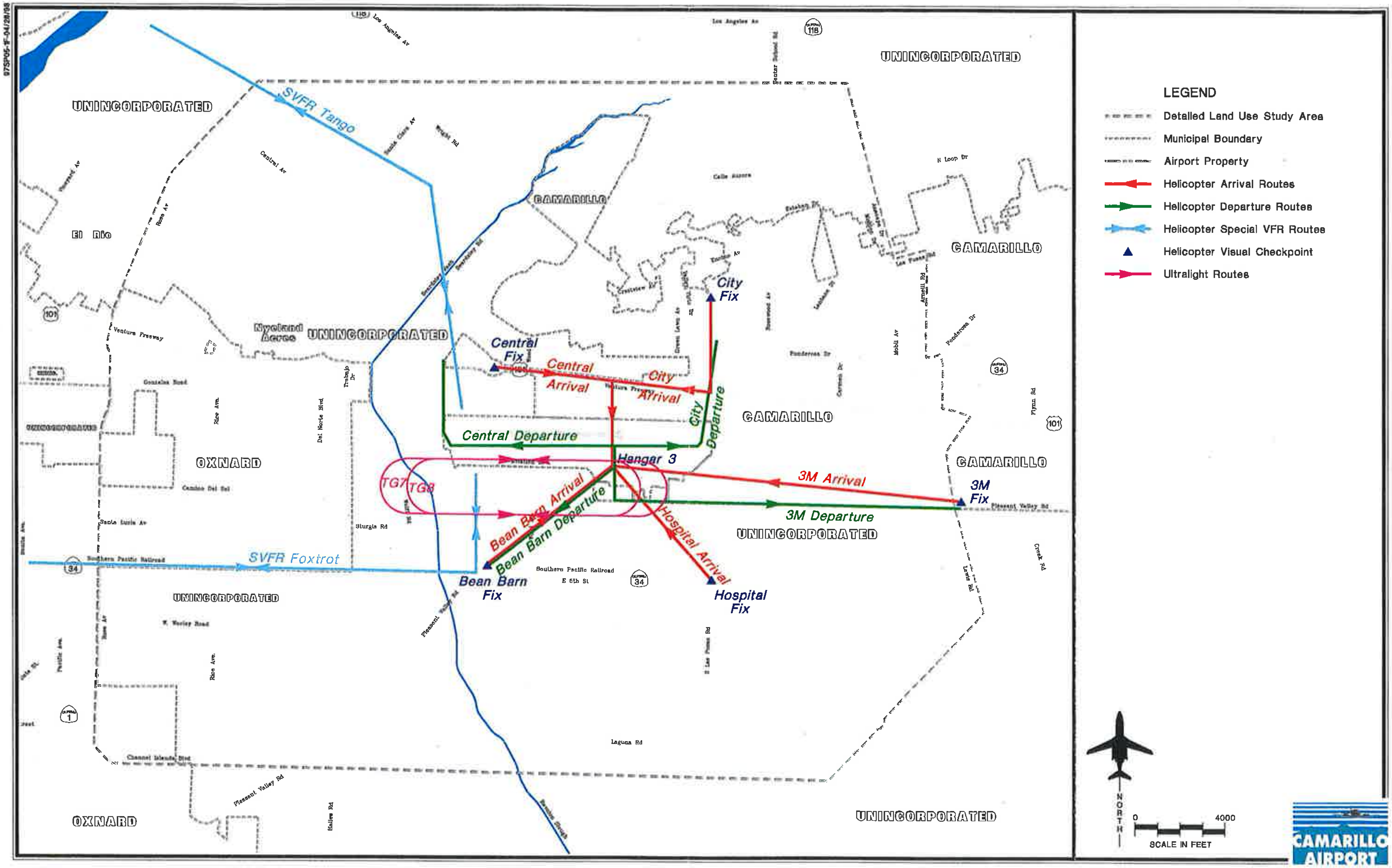


Exhibit 1F
HELICOPTER AND ULTRALIGHT ROUTES

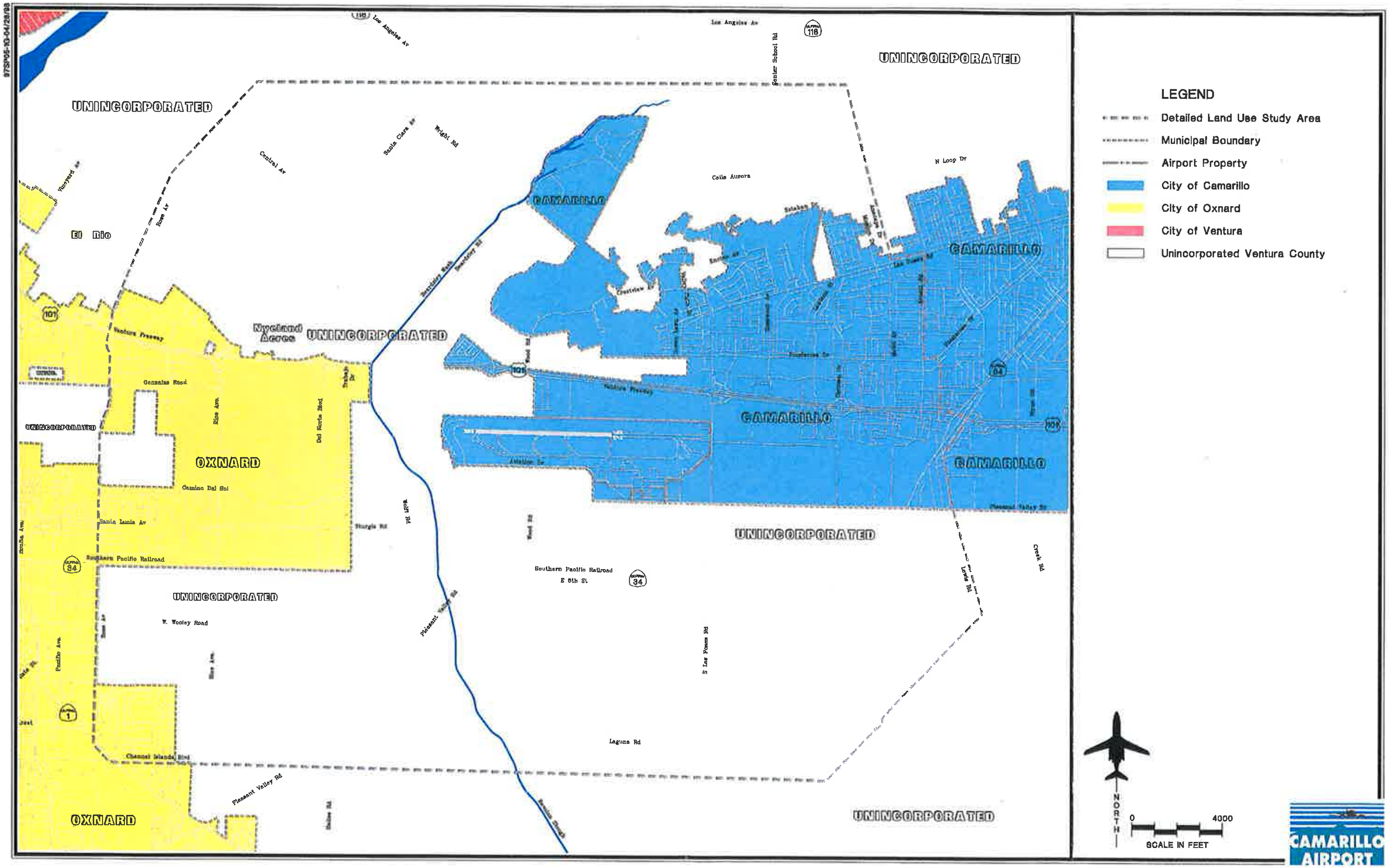


Exhibit 1G
STUDY AREA AND JURISDICTIONAL BOUNDARIES

detailed background data -- it is not a definition of the noise impact area. Areas adversely affected by aircraft noise will be defined in later analyses.

EXISTING LAND USE

Exhibit 1H shows existing land use in the study area. The land use classification system, shown in **Table 1C**, has been designed to fit the requirements of airport noise compatibility planning. Three categories of residential land use are identified -- single-family, multi-family, and mobile homes. Noise-sensitive institutions are also identified. The other land use categories are generally considered to be compatible with aircraft noise. They include commercial, industrial, transportation, and utilities; agriculture; parks and open space; and undeveloped land.

Most of the study area is in agricultural use. The northeast quadrant of the study area is developed land in the City of Camarillo and primarily includes residential areas. Commercial and industrial development is concentrated along the Ventura Freeway (U.S. 101). Some residential development is south of the Ventura Freeway east of the airport and directly along the extended runway centerline.

The City of Oxnard lies west of the airport. Most of the Oxnard part of the study area is a large industrial/ business area which is only partially developed. Some residential development is on the west edge of the study area.

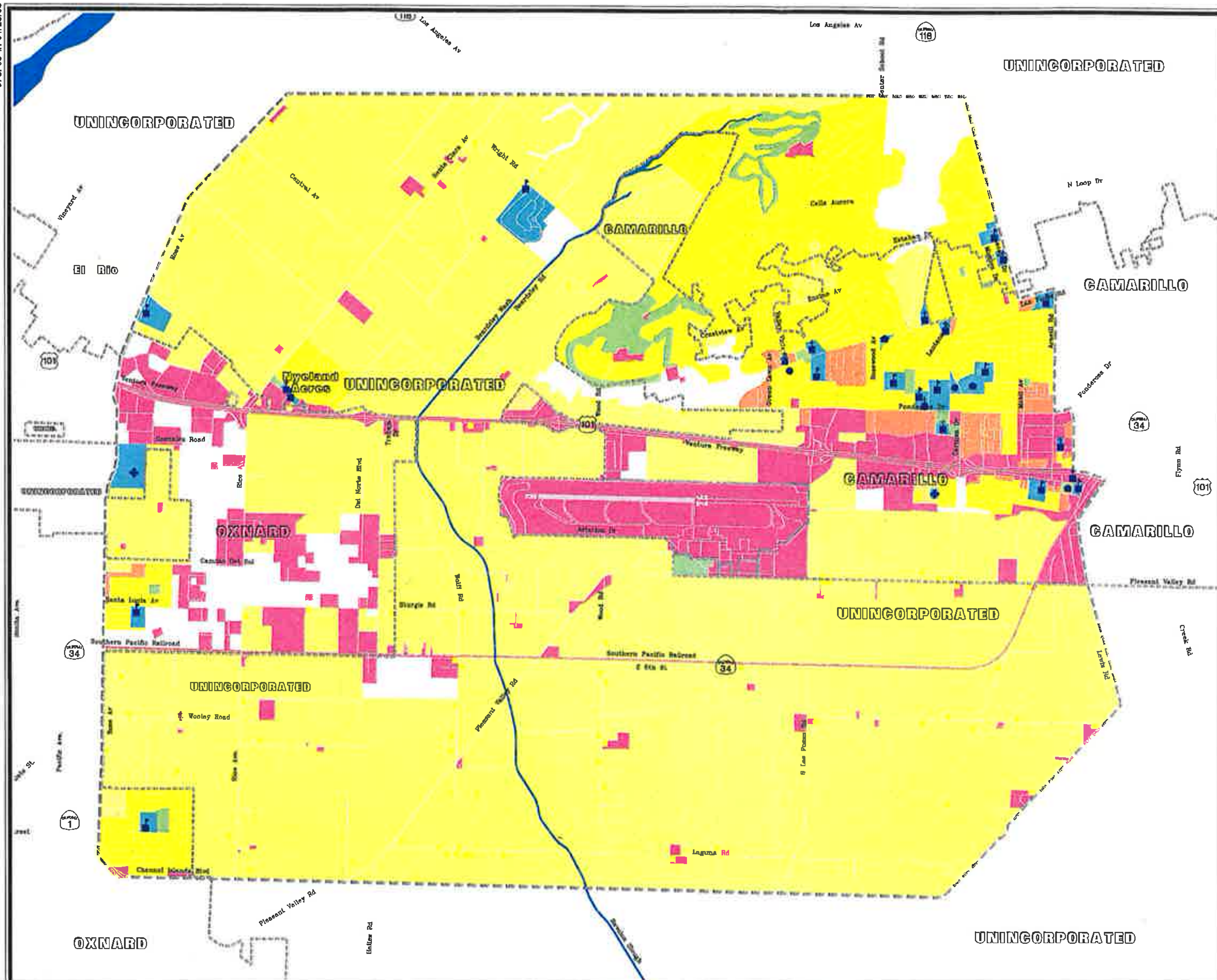
Noise-sensitive institutions, including schools, places of worship, community centers, auditoriums, and museums are scattered through the study area. A dense cluster of noise-sensitive land uses are located north of Ponderosa Drive, north of the airport. Two hospitals are located near the extended centerline, Camarillo Convalescent Hospital to the east and St.John's Regional Medical Center to the west.

The Regional Information Center for the California Historic Resources Inventory was contacted for information about any sites in the study area determined to be of historical significance. No sites in the study area are listed on the National Register of Historic Places, nor are any sites listed as California Historical Landmarks or California Points of Historical Interest.

LAND USE PLANNING POLICIES AND REGULATIONS

The State of California requires all local governments to enact a "general plan" establishing framework policies for future development of the city or county. (See Government Code, Sections 65300, *et seq.*) The local general plan is the most important land use regulatory instrument in California. It establishes overall development policy and provides the legal foundation for all other kinds of land use and development regulation in the community.

97SP05-1H-04/28/98



LEGEND

- Detailed Land Use Study Area
- Municipal Boundary
- Airport Property
- Single-Family Residential
- Multi-Family Residential
- Mobile Home
- Commercial, Industrial, Transportation, and Utilities
- Agriculture
- Parks and Open Space
- Undeveloped
- Noise-Sensitive Institutions
- Places of Worship
- Schools
- City Auditorium/Community Center/ Museum
- Retirement Center/Nursing Home
- Hospital

Source: Aerial Photographs, January 8, 1996, Consultant Field Survey, Fall 1997.

NORTH

0 4000
SCALE IN FEET

CAMARILLO AIRPORT

Exhibit 1H

GENERALIZED EXISTING LAND USE - 1997

through building codes which set detailed standards for construction.

GENERAL PLANS

A community's general plan sets standards and guidelines for future development and provides the legal basis for the zoning ordinance. According to California law, the general plan must contain at least seven elements: land use, circulation, housing, conservation, open space, noise, and safety (Curtin 1996, pp. 9-10). Other elements may be prepared as needed and desired.

Camarillo General Plan - Noise Element

The Noise Element of Camarillo's General Plan was adopted in 1996 (City of Camarillo 1996). It includes a discussion and maps of transportation noise for existing conditions in 1995 and projected conditions for the year 2015. The CNEL noise contours for road and highway noise were developed especially for the Noise Element. Noise contours (CNEL) for Camarillo Airport were taken from the *Airports Comprehensive Land Use Plan Update for Ventura County* (P&D Aviation 1991). Noise contours (CNEL) for NAWS Point Mugu were taken from the Air Installation Compatible Use Zoning (AICUZ) study (Dames & Moore 1992).

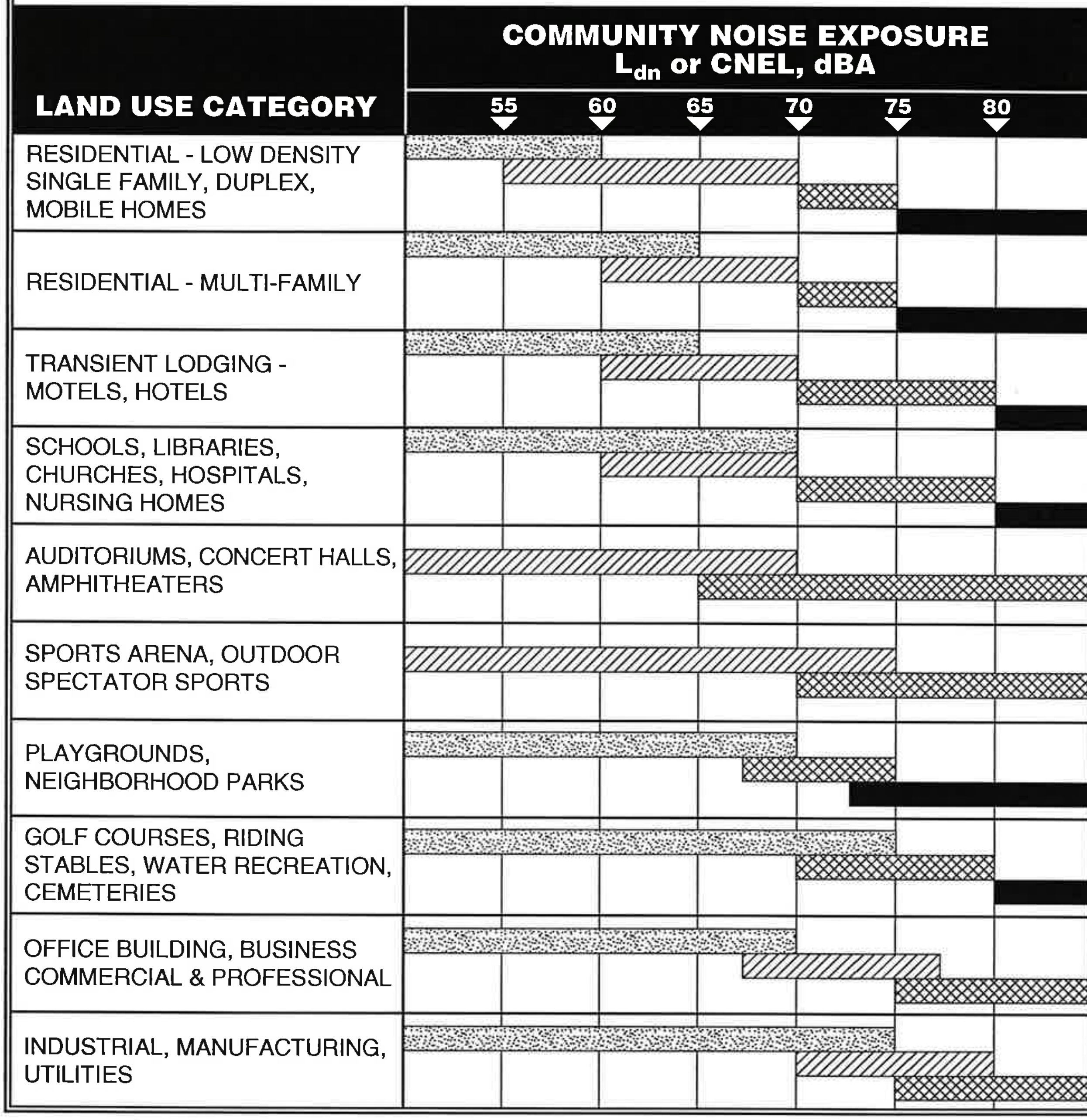
The major source of noise in the community was the Ventura Freeway (U.S. 101). Another significant source was the Southern Pacific Railroad/Fifth Avenue/Lewis Road corridor. Other sources included Camarillo Airport and, in the south part of the planning area, aircraft noise from Point Mugu.

The following goals and policies relating directly or indirectly to airport noise compatibility are included in the Noise Element (City of Camarillo 1996, pp. 417-418).

> **Goal 1:** The City of Camarillo should address the reduction of noise impacts as part of the land use planning process.
>
> *Policy 1.* The City adopt appropriate noise limits for the various land use classifications throughout the community. . . .
>
> *Policy 3.* The City require developers to submit noise assessment reports during the project planning process to identify potential noise impacts to their own developments and on nearby residential and noise sensitive land uses. New developments should be required to incorporate appropriate noise mitigation measures in their project designs, in order to meet the standards contained in this Element, whenever feasible.
>
> *Policy 4.* The City . . . will require that the State noise insulation standards for exterior-to-interior and for party walls and floor/ceiling noise control be applied to new single-family dwellings as well as multi-family structures.

97SP05-1J-9/26/97

LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENTS



NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirement is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

Source: California State Dept. of Health Services. Cited in City of Camarillo 1996, p. 413.

CAMARILLO AIRPORT

Exhibit 1J
CITY OF CAMARILLO'S LAND USE COMPATIBILITY MATRIX

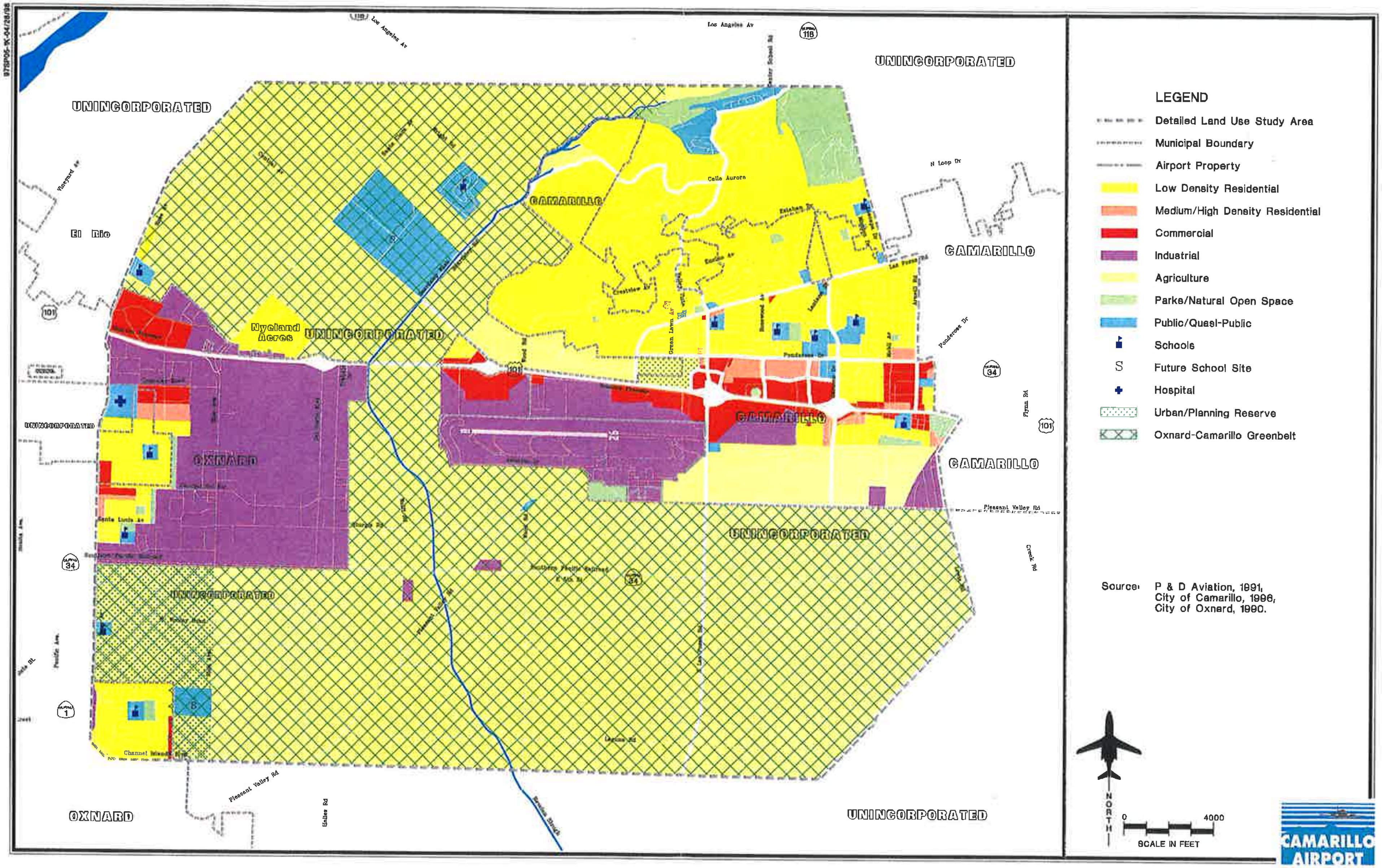


Exhibit 1K
FUTURE LAND USE PER GENERAL PLANS

Drive, is designated for residential use of varying densities. Land at the interchanges of the Ventura Freeway and Las Posas Road and Central Avenue show commercial development. Land off the east end of the airport is designated for a combination of commercial, industrial (research and development), and agriculture.

Oxnard General Plan

The Oxnard General Plan was adopted in 1990. It includes eleven planning elements: growth management, land use, circulation, public facilities, open space/conservation, safety, noise, economic development, community design, parks and recreation, and housing.

The plan discusses regional plans and policies of significance in the Oxnard planning area. Among these are the "Guidelines for Orderly Development." These regional policies were adopted by Ventura County, all municipalities in the County, and the Ventura County Local Agency Formation Commission. These guidelines clarify the relationship between the County and the cities in matters of urban planning and the provision of services. The primary intent of the guidelines is to see that urban development occurs within incorporated areas whenever practical (City of Oxnard 1990, p. III-6).

Growth Management Element. This element of the General Plan has some goals and objectives that relate to airport compatibility planning (City of Oxnard 1990, p. IV-19).

> **A. Goals**
> 2. Maintain the quality of life desired by the residents of Oxnard.
>
> **B. Objectives**
> 2. Insure that new development avoids or fully mitigates impacts on air quality, traffic congestion, noise and resource protection. . .
>
> 5. Create an appropriate balance between urban development and preservation of agricultural uses within the Planning Area.

The Growth Management Element also includes a number of principles, policies, and implementation measures. A policy of relevance to the Camarillo Airport Noise Compatibility Study is to maintain the Oxnard-Camarillo Greenbelt Agreement. It designates land west of the airport for permanent agriculture/ open space. This is shown in **Exhibit 1K**.

Land Use Element. This element includes the following goals and objectives which are relevant to the airport compatibility planning process (City of Oxnard 1990, p. V-24).

> **A. Goals**
> 1. A balanced community meeting housing, commercial and employment needs consistent with the holding capacity of the City.
>
> 2. Preservation of scenic views, natural topography, natural physical amenities, and air quality.

43. Land within the airport hazard area is to be designated permanent open space as shown on the Land Use Map.

Open space areas are designated on the 2020 Land Use Map in the General Plan. This is shown for the Oxnard portion of the Camarillo Airport study area in **Exhibit 1K**. Open space is designated northwest and southwest of the airport. A narrow band of open space is designated immediately west of the airport.

Noise Element. The Noise Element includes several goals and policies related to noise and land use compatibility planning. These do not relate specifically to Camarillo Airport because the noise analysis in the Noise Element concluded that existing and projected noise from Camarillo Airport would not enter the Oxnard Planning Area. Nonetheless, these policies are relevant in declaring Oxnard's general policy stance with respect to noise compatibility issues. Specific goals, objectives, and policies of interest are quoted below (City of Oxnard 1999, p. IX-16).

A. Goals
1. A quiet environment for the residents of Oxnard.

B. Objectives
1. Provide acceptable noise levels for residential and other noise-sensitive land uses consistent with State guidelines.

2. Protect noise sensitive uses from areas with high ambient noise levels.

3. Integrate noise considerations into the community planning process to prevent noise/land use conflicts.

C. Policies
5. Municipal policies shall be consistent with the Ventura County Airport Land Use Commission's adopted land use plan. . .

7. The City shall prohibit the development of noise-sensitive land uses within the Oxnard Airport 65 dB(A) CNEL contour.

8. The City shall continue to enforce State Noise Insulation Standards for proposed projects in suspected high noise environments. The Planning Division shall notify prospective developers that, as a condition of permit issuance, they must comply with noise mitigation measures, which are designed by an acoustical engineer. No building permits will be issued without City staff approval of the acoustical report/design.

Ventura County General Plan

The Ventura County General Plan was adopted in 1988 and has been amended several times since then. The Plan includes several documents. The overall framework of goals and policies is in a document called *Goals, Policies*

> **2.10.2 Policies**
> To avoid accidents, land in airport approach and departure zones shall be designated Agriculture or Open Space on the General Plan Land Use Map . . .

California law provides for the establishment of airport land use commissions (ALUC) in each county with a public use airport. The Ventura County Transportation Commission acts as the ALUC for Ventura County. It has established an *Airports Comprehensive Land Use Plan* for all airports in the County, including Camarillo. The land use plan includes policies promoting airport noise compatibility, safety compatibility, and airspace protection. The plan is currently being updated.

Hazards -- Flood. Ventura County's flood hazard goals and policies are intended to reduce risks of damage and injury due to floods (Ventura County 1996a, p. 43). In areas of greatest risk, only open space uses are to be permitted. In other areas of flood hazard, development is to be protected from a 100-year flood by being raised above the flood elevation. To the extent that flood hazard areas coincide with airport noise areas, these flood hazard policies also indirectly promote airport compatibility objectives.

Hazards -- Noise. The County General Plan declares that the County should attempt to eliminate or avoid the exposure of County residents to adverse noise impacts (Ventura County 1996a, p. 49). It notes that noise-sensitive land uses are considered to be residential, educational and health facilities, research institutions, certain recreational and entertainment facilities, and churches. The Plan sets forth the following policies with respect to development in areas exposed to aircraft noise (Ventura County 1996a, p. 50).

> **2.16.2 Policies**
> 1.(3) Noise sensitive uses proposed to be located near airports:
> a. Shall be prohibited if they are in a CNEL 65 or greater noise contour.
> b. Shall be permitted in the CNEL 60 to CNEL 65 noise contour area only if means will be taken to ensure interior noise levels of CNEL 45 or less.

Land Use. The County General Plan includes general land use goals, policies, and programs and sets of specialized goals, policies, and programs in the following policy areas: land use map designations, population and housing, and employment and commerce/ industry. One general goal is specifically relevant to airport land use compatibility planning:

> **3.1.1 Goals**
> 4. Ensure that land uses are appropriate and compatible with each other and guide development in a pattern that will minimize land use conflicts between adjacent land uses.

In the Camarillo Airport study area, the County's future land use designations in most of the unincorporated area outside the City's Sphere of Influence is primarily agricultural, a use that is

Commission is authorized to issue variances from the zoning regulations, after a public hearing, in case of special circumstances applicable to the property, if the granting of the variance will not adversely affect the general plan for the City (Section 19.66.020). The Planning Commission's decisions may be appealed to the City Council. The Council must hold a public hearing before ruling on the appeal.

Amendments to the zoning map may be made from time to time. These may be initiated by the Planning Commission, City Council, or property owner. The Planning Commission holds a hearing on the request and makes a recommendation. If it recommends against adopting the amendment, the decision stands, although it may be appealed. In the case of a favorable recommendation or an appeal, the City Council must hold a hearing and make the final decision on the proposed zoning map change.

Changes to the zoning text may be initiated by the Planning Commission or City Council. The Planning Commission must hold a hearing on the proposal and make a recommendation to the Council. The Council must also hold a hearing before making a final decision.

Table 1D summarizes the provisions of the Camarillo Zoning Ordinance as they apply to airport noise compatibility planning. The Ordinance provides for 14 zoning districts, including one agricultural district, four residential districts, five commercial districts, three industrial districts, and one open space district. Noise-sensitive land uses permitted in each zoning district are noted in the table. Uses noted as "permitted" are enabled to operate after the issuance of the required permits by City officials.

Uses noted as "conditional uses" are subject to a special review and approval process. Conditional uses may be established only after the issuance of a conditional use permit by the Planning Commission after holding a public hearing. Decisions of the Planning Commission may be appealed to the City Council, and the Council must hold a public hearing before reaching a decision. The Commission or Council may attach special conditions on the permit as deemed necessary to protect the public health, safety, and general welfare.

Noise-sensitive land uses are permitted in all districts except the L-M and M-2 Manufacturing districts. The three conventional residential districts (R-E, R-1, and RPD) provide for more and a greater variety of noise-sensitive uses than the other districts. These uses include residential, boarding houses, group homes, day care facilities, and non-residential institutions. The commercial, M-1, Light Manufacturing, and O-S districts permit a variety of noise-sensitive institutions (*e.g.*, schools, churches, and hospitals) and businesses (*e.g.*, motion picture studios).

TABLE 1D (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
City of Camarillo

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Conditional or Administrative Uses**	
RPD, Residential Planned Development	One-family dwelling; Day care; Public elementary and junior high schools; Attached residential units.	Larger day care facilities; Second residential units; Apartment projects; Two-family dwellings; Multi-family dwellings; Churches; Rest, convalescent and nursing homes; Homes for the aged.	1 to 30 units per acre.
MHPD, Mobile home Park Development	One-family dwelling; Public school.	Mobile home park; Mobile home subdivision; Church.	7 units per acre
R-C, Recreation Commercial	Church; Elementary, junior high, high schools, colleges; Museums; Temporary mobile home housing for caretaker.	Campgrounds and trailer parks; Movie sets or locations.	N.A.
P-O, Professional Office	Hospitals; Libraries.	Churches; Educational institutions; Sanitariums or convalescent homes; Colleges or universities; Day care nurseries; Indoor theaters.	N.A.
C-N, Commercial Neighborhood	Churches; Libraries; Nursery, children's day; Reading room.	Day care nurseries.	N.A.
CPD, Commercial Planned Development	Auditoriums; Churches; Day care nurseries; Hospitals and sanitariums; Music conservatories and studios; Schools; Theaters, indoor.	Theaters, outdoor.	N.A.

TABLE 1E
Summary of Zoning Provisions for Noise-Sensitive Land Uses
City of Oxnard

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Special**	
R-1, Single-Family	Single-family dwelling; Residential care facility; Children's day care facility; Adult day care facility; Manufactured housing; Second units; Bed and breakfast.	Churches; Townhouse condominiums.	6,000 s.f.
R-2, Multiple-Family	Multiple-family dwellings; Other uses per R-1, except manufactured housing and mobile homes.	Convents; Schools; Residential care facility; Adult day care facility; Children's day care facility; Condominiums; Residential stock cooperatives.	3,500 s.f.
MH-PD, Mobile Home Planned Development	Mobile home parks; Residential mobile homes.	None.	6.5 homes per acre
R-3, Garden Apartment	Garden apartments; Others per R-2.	Hospitals; Bed and breakfast inns; Others per R-2.	2,400 s.f.
R-4, High Rise Residential	High rise or high density apartments; Others per R-3.	Same as R-3.	1,500 s.f.
C-O, Commercial Office	None.	Hospitals; Hotels.	N.A.
C-1, Neighborhood Shopping Center	None.	None.	N.A.

TABLE 1E (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
City of Oxnard

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Special**	
BRP, Business and Research Park	None.	Motels, hotels; Hospitals.	N.A.
Airport Hazard Overlay Zone	Per underlying zone.	Per underlying zone.	Per underlying zone.

The Code provides for 19 zoning districts, including five residential districts, five commercial districts, three manufacturing districts. It also provides for a "community reserve" district and a "business and research park" district. The ordinance provides for three planned development districts which permit the use of flexible development standards subject to the approval of a detailed development plan. The ordinance also has an "airport hazard overlay" district. It provides for special review of development projects proposed within the airport influence area around Oxnard Airport. Developers of property within this overlay zone are required to prepare an aircraft hazard and land use risk assessment relating to the proposed use. The proposed project also must be submitted to the Federal Aviation Administration and the Oxnard Airport Authority for review before Planning Commission action on the proposal.

Uses noted as "permitted" are enabled to operate after the issuance of any necessary permits by City officials. Before issuing permits, those officials would confirm zoning compliance.

Uses noted as "special uses" are subject to a special review process and issuance of a special use permit. Special use permits can be issued only after a public hearing before the Planning Commission. The Commission may attach conditions to the issuance of a permit. Decisions of the Planning Commission may be appealed to the City Council.

Noise-sensitive land uses are permitted outright or as special uses in all zoning districts except the C-1, Neighborhood Commercial, and M-2, Heavy Manufacturing, districts. Most of the noise-sensitive uses permitted in the commercial and manufacturing districts are institutional uses such as schools, churches, museums, assembly halls, hospitals, and similar uses. A limited number of noise-sensitive commercial uses, including hotels, theaters, and broadcasting studios, are also permitted

TABLE 1F
Summary of Zoning Provisions for Noise-Sensitive Land Uses
Ventura County

Zoning District	Noise-Sensitive Uses: Permitted	Noise-Sensitive Uses: Conditional	Minimum Lot Size Per Dwelling (sq. ft.)
O-S, Open Space	Farm worker dwellings; Family day care homes; Single-family dwellings.	Mobile home; Farm labor group quarters; Colleges and universities; Correctional institutions; Campgrounds; R.V. parks; Retreats.	10 acres
A-E, Agricultural Exclusive	Farm worker dwellings; Family day care homes; Single-family dwellings.	Mobile home; Farm labor group quarters.	40 acres
R-A, Rural Agricultural	Farm worker dwellings; Family day care homes; Single-family dwellings.	Boarding houses; Bed and breakfast inns; Day care centers; Intermediate care homes; Places of worship; Mobile home; Colleges and universities; Schools; Correctional institutions; Libraries; Mobile home parks; Camps; Campgrounds; R.V. parks; Retreats.	1 acre
R-E, Rural Exclusive	Family day care homes; Single-family dwellings.	Boarding houses; Bed and breakfast inns; Day care centers; Intermediate care homes; Places of worship; Mobile home; Schools; Libraries; Mobile home parks; Camps; Campgrounds; R.V. parks; Retreats.	10,000 s.f.

TABLE 1F (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
Ventura County

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Conditional**	
C-O, Commercial Office	None	Intermediate and residential care center; Places of worship; Colleges and universities; Schools; Hospitals; Libraries and information centers.	N.A.
C-1, Neighborhood Commercial	None	Day care center; Places of worship; Professional, vocational, art, craft schools; Libraries and information centers; Dwelling for superintendent or owner.	N.A.
C-P-D, Commercial Planned Development	None	Art galleries, museums, and botanical gardens; Day care center; Intermediate and residential care center; Places of worship; Broadcasting stations; Colleges and universities; Schools; Hospitals; Hotels, motels, and boarding houses; Libraries and information centers; Dwelling for superintendent or owner.	N.A.
M-1, Industrial Park	None	Day care center; Places of worship; Broadcasting stations; Colleges and universities; Schools; Dwelling for superintendent or owner; Dwelling for caretaker.	N.A.

regulations in the study area. None have special standards related to airport land use compatibility.

BUILDING CODES

Building codes regulate the construction of buildings, ensuring that they are built to safe standards. Building codes may be used to require sound insulation in new residential, office, and institutional building construction when warranted by existing or potential high aircraft noise levels.

Most features of building codes intended for energy efficiency also provide acoustical insulation. Caulking of joints, continuous sheathing, dead air spaces, and use of materials with high R-values are construction techniques which can attenuate aircraft noise while conserving energy used for home heating and cooling. Other measures which are not always justifiable for energy efficiency alone, are vent baffling and year-round, closed-window ventilation systems. Surprisingly, some highly energy-efficient storm window designs are less efficient for sound insulation than other older style designs.

Building codes apply to existing buildings only when remodeling or expansion is contemplated. Therefore, amendments to building codes are of little value in correcting noise sensitivity problems in completely developed areas. In those circumstances, sound insulation programs must be instituted retroactively.

Camarillo, Oxnard, and Ventura County all administer building codes. None has special provisions relating to sound insulation of residential buildings in the vicinity of airports.

The Camarillo General Plan includes a policy stating that the California noise insulation standards, which apply to multi-family housing and hotels exposed to aircraft noise above 60 CNEL, will also be applied by the City to single-family housing within the 60 CNEL contour. (See the discussion on page 1-26.) Interior sound levels must be attenuated to no greater than 45 CNEL. Without specific construction standards in the building code, the general plan requirement serves as a performance standard, compliance with which a builder must demonstrate.

SUMMARY

The information discussed in this chapter provides a foundation upon which the remaining elements of the planning process will be constructed. Information on current airport facilities and utilization serve as a basis for the development of aircraft noise analyses during the next phase of the study. The land use information in the airport environs will allow the assessment of the impact of airport noise on local residents. This information will, in turn, provide guidance to the assessment of potential noise abatement and land use management procedures necessary to reduce the impact of aircraft noise on existing and potential future residents of the study area.

Ventura County, 1996a. *Ventura County General Plan: Goals, Policies and Programs*. Adopted by the Ventura County Board of Supervisors, May 24, 1988, with amendments through December 17, 1996.

Ventura County, 1996b. *Ventura County General Plan: Land Use Appendix*. Adopted by the Ventura County Board of Supervisors, May 24, 1988, with amendments through December 10, 1996.

Ventura County, 1996c. *Coastal Area Plan of the Ventura County General Plan*. Adopted by the Ventura County Board of Supervisors, November 18, 1980, with amendments through December 10, 1996.

CAMARILLO AIRPORT
Part 150 Noise Exposure Maps

Chapter Two
AVIATION NOISE

Chapter Two

AVIATION NOISE

This chapter describes the methodology and key input assumptions that will be used to develop noise exposure maps for Camarillo Airport. Noise contour maps will be prepared for three study years: 1998, 2003, and 2018. The 1998 noise contour map will show the current noise levels based on current operations. The 2003 map will be based on forecast operation levels presented in the 1996 Airport Master Plan. The 1998 and 2003 maps are the basis for the official "Noise Exposure Maps" required under F.A.R. Part 150.

One additional noise contour map will be developed for the year 2018 to present a long term view of potential future noise exposure at Camarillo Airport.

The aircraft noise analysis relies on complex analytical methods and uses numerous technical terms. A Technical Information Paper included in the last section of this document, The Measurement and Analysis of Sound, presents helpful background information on noise measurement and analysis.

AIRCRAFT NOISE ANALYSIS METHODOLOGY

The standard methodology for analyzing the prevailing noise conditions at airports involves the use of a computer simulation model. The Federal Aviation Administration (FAA) has approved two models for use in F.A.R. Part 150 Noise Compatibility Studies — NOISEMAP and the Integrated Noise Model (INM). NOISEMAP is used most often at military airports, while the INM is most commonly used at civilian airports.

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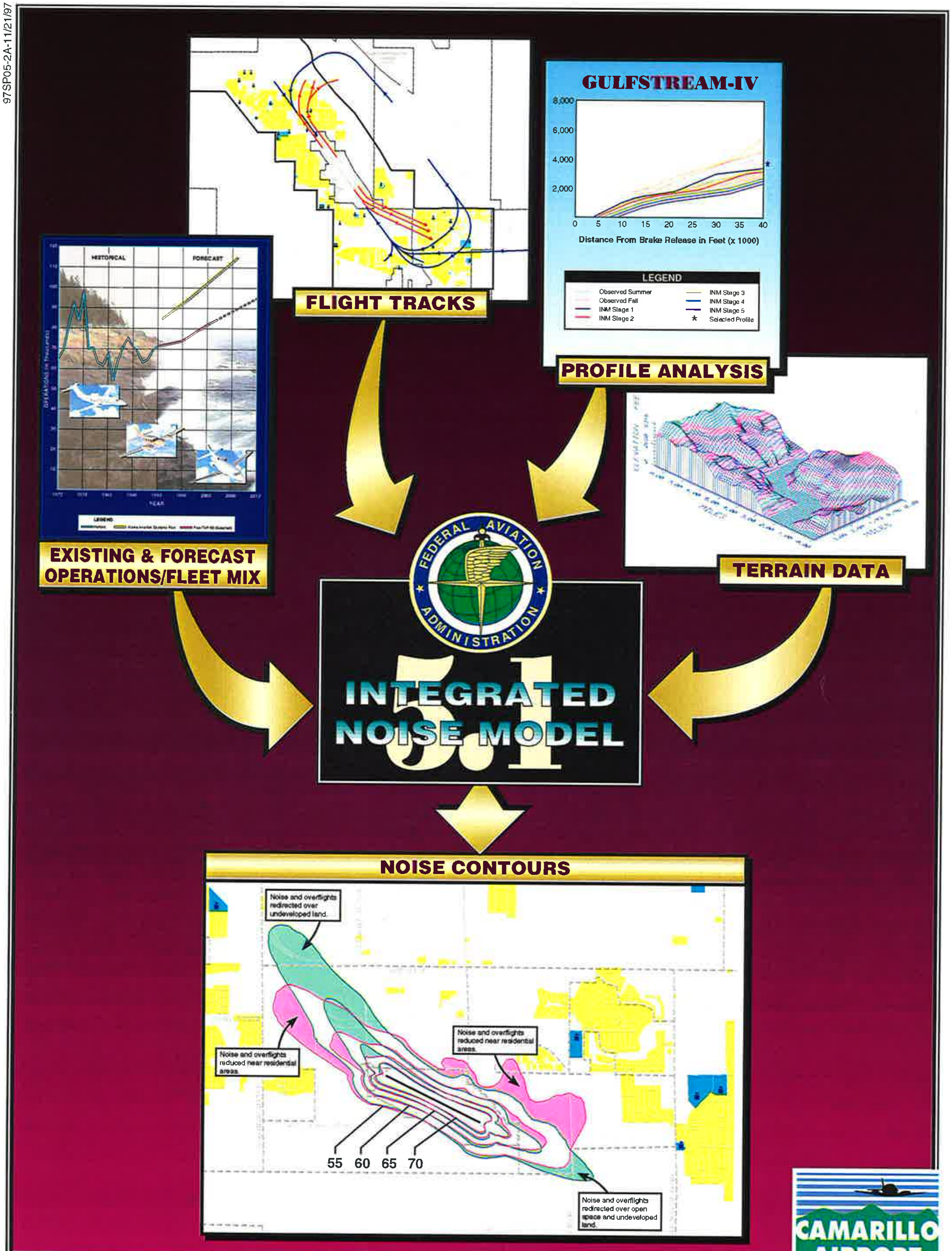

CAMARILLO AIRPORT

Exhibit 2A
INM PROCESS

forecasts of future 2003 and 2018 activity prepared for this study were used for noise modeling. These are briefly summarized in **Table 2A**.

Average daily aircraft operations were calculated by dividing total annual operations by 365 days. The distribution of these operations among various categories, users, and types of aircraft is critical to the development of the input model data.

TABLE 2A
Operations Summary
Camarillo Airport

Operation Type	Existing 1998[1]	2003[2]	2018[2]
Itinerant			
Air Taxi	1,835	2,300	3,300
General Aviation	89,708	92,000	132,000
Military	37	2,500	2,500
Subtotal	91,580	96,800	137,800
Local			
General Aviation - prop	74,764	101,480	144,480
Helicopter	12,000	16,520	23,520
Ultralight	10,000	10,000	10,000
Subtotal	96,764	128,000	178,000
TOTAL OPERATIONS	188,344	224,800	315,800

[1] Based on airport traffic control tower operation records from November 1996 through October 1997. The ultralight operations were estimated by Coffman Associates. They are not recorded in tower operation records.
[2] Forecast operation levels from Coffman Associates, 1996, p. 2-14.

FLEET MIX

The selection of individual aircraft types is important to the modeling process because different aircraft types generate different noise levels. The noise footprints presented in **Exhibit 2B** and **Exhibit 2C,** illustrate this concept graphically. The footprints represent the noise pattern generated by one departure and one arrival of the given aircraft type. The aircraft illustrated are some of those commonly found at Camarillo Airport.

The business jet and turboprop fleet mix was developed based on airport landing fee reports for aircraft weighing more than 12,500 pounds. The smaller prop aircraft fleet mix was developed using a based aircraft list provided by airport staff. **Table 2B** summarizes the fleet mix data input into the noise analysis by annual aircraft operations.

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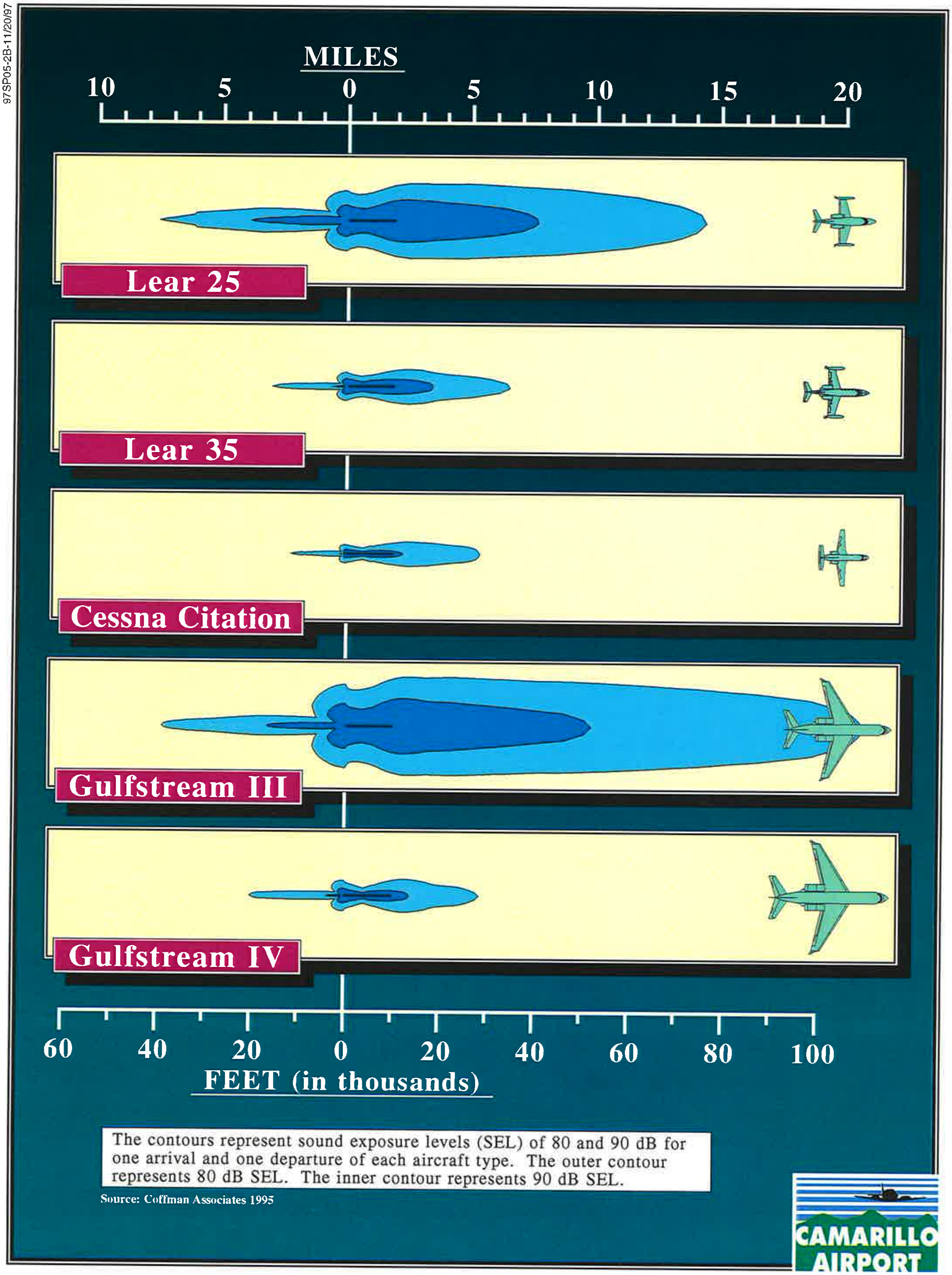

Exhibit 2B
BUSINESS JET NOISE FOOTPRINT COMPARISON

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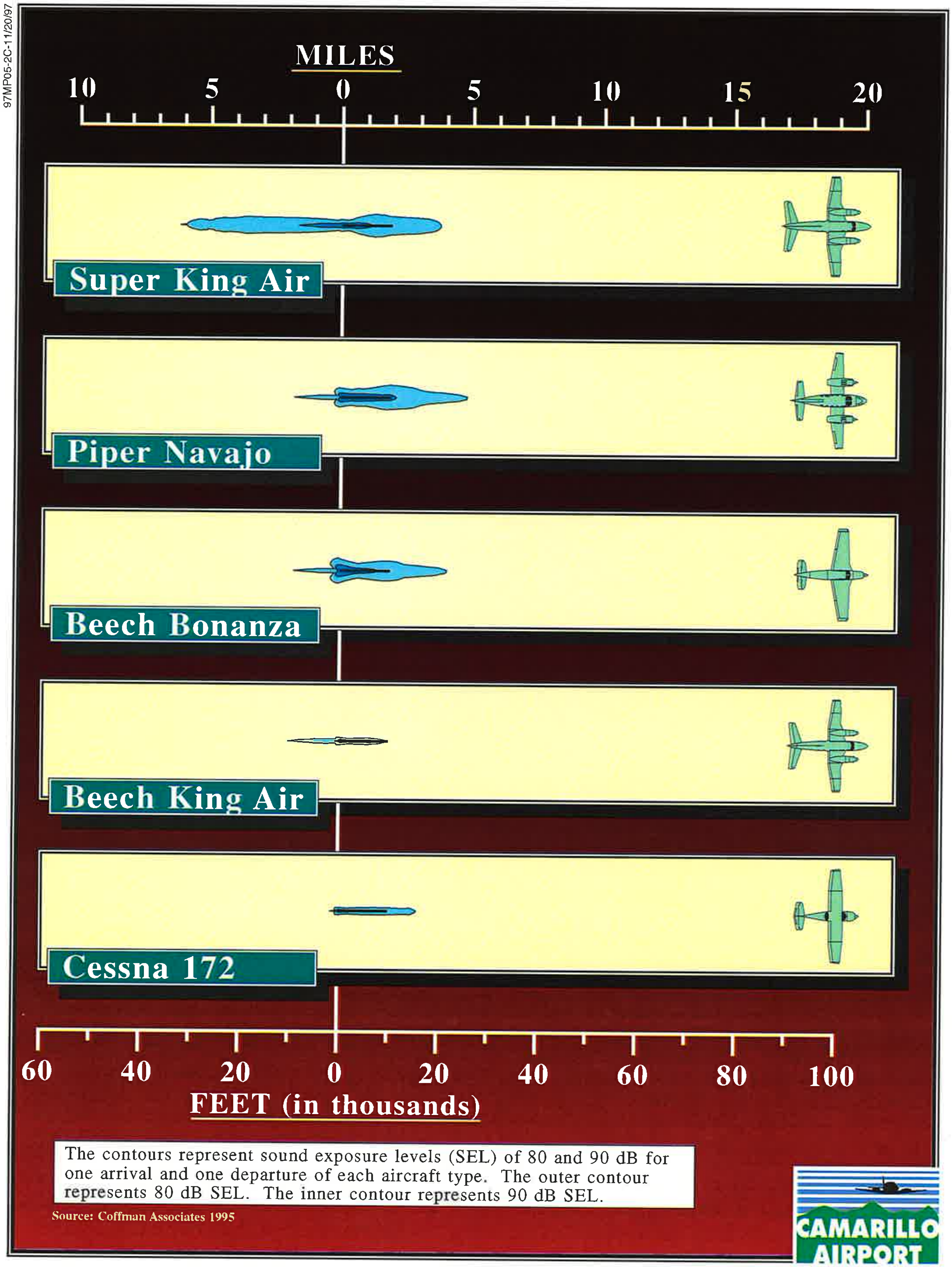


Exhibit 2C
PROPELLER AIRCRAFT NOISE
FOOTPRINT COMPARISON

DATABASE SELECTION

In order to select the proper aircraft from the INM database, a review of the current fleet mix for Camarillo Airport was conducted.

Fixed wing aircraft in the air taxi category include the Beech Super King Air, Beech- 20, Beech-90, Cessna 441, Beech-95, Cessna 200, 300, 400 series, Piper 28, 31, and 32 aircraft. The INM designator DHC6 was used to model the Beech Super King Air. The CNA441 INM designator was used to represent the twin engine turboprops Beech- 20, Beech-90, and the Cessna 441. The Beech-95, Cessna 200, 300, 400 series, Piper 28, 31, and 32 aircraft were modeled with twin engine INM designator BEC58P.

Helicopters in the Camarillo fleet mix include the Bell 206, UH-1, and Robinson 22. Helicopter data for these aircraft were extracted from the FAA's Heliport Noise Model (HNM) to simulate the helicopter air taxi and general aviation activity.

The INM provides data for most of the business turbojet aircraft that frequent Camarillo. The LEAR25 effectively represents the Lear 23 and 24 series aircraft. INM designator GIIB was used to model the Gulfstream III. The LEAR35 effectively represents the Lear 30 and 50 series aircraft. The Gulfstream IV was modeled with the INM designator GIV.

The FAA's substitution list indicates that the general aviation single engine variable pitch propeller model, the GASEPV, represents a number of single engine general aviation aircraft. Among others these include the Beech Bonanza, Cessna 177 and 180, Piper Cherokee Arrow, Piper PA-32, and the Mooney. The general aviation single-engine fixed pitch propeller model, the GASEPF, also represents several single-engine general aviation aircraft. These include the Cessna 150 and 172, Piper Archer, Piper PA-28-140 and 180, and the Piper Tomahawk.

The INM database does not have an ultralight aircraft nor is it included in the FAA's substitution list. Use of the GASEPF in the INM database was approved by the FAA Office of Environment and Energy.

The list recommends the BEC58P, the Beech Baron, to represent the light twin-engine aircraft such as the Piper Navajo, Beech Duke, Cessna 31, and others. The CNA441 effectively represents the light turboprop and twin-engine piston aircraft such as the King Air, Cessna 402, Gulfstream Commander, and others.

Military operations at Camarillo are minimal and constitute less than 1 percent of the total annual operations at the airport. For modeling purposes the operations were divided between the Beech King Air and the Bell 206 helicopter. The INM DHC6 was used for the Beech King Air and the helicopter data was extracted from the HNM to simulate the helicopter activity.

These choices are in accordance with the Pre-Approved Substitution List published by the FAA Office of Environment and Energy (AEE) branch in Washington.

indicated that approximately 85 percent of the aircraft arrive and depart on Runway 26.

FLIGHT TRACKS

Flight track data was derived from discussions with airport traffic controllers and airport users. These discussions were used to develop consolidated flight tracks which describe the average flight route corridors that lead to and from Camarillo Airport.

Although the consolidated flight tracks appear as distinct paths, they actually represent average flight routes and illustrate the areas of the surrounding community where aircraft operations can be expected most often. At a highly utilized general aviation airport such as Camarillo Airport, aircraft traffic is expected over most areas around the airport. Air traffic density generally increases nearer the airport as it is funneled to and dispersed from the runway system. While the observed tracks indicated variances from track to track, there were readily discernable areas of common overflights. The consolidated tracks were developed to reflect these common patterns and to account for the inevitable flight track dispersions around the airport.

Exhibit 2D illustrates the consolidated flight tracks used for modeling noise exposure generated by departing aircraft at Camarillo. The tracks indicated on the exhibit range in use by small to large general aviation aircraft. Typically, aircraft departing Camarillo Airport desire a north/northwest, east/northeast, or south/southeast departure route.

As depicted on the exhibit, aircraft departing Runway 8 with a north/northwest destination have various alternative routes. Some aircraft turn right after departure, gain altitude and maintain the airport traffic pattern through the downwind leg. Once the downwind leg is completed and the aircraft is traveling west past the Runway 8 threshold, the aircraft turns to the north/northwest. The exhibit also depicts a similar but expanded track for use by larger business jet and turboprop aircraft. Small aircraft with a north/northwesterly destination from Runway 8 also turn left near Las Posas Road, circling back to the west then ultimately turning to the north/northwest. Aircraft departing Runway 8 with a east/northeast destination depart straight out according to their instructed heading. Aircraft with south/southeasterly destinations depart Runway 8 then turn to the south.

Aircraft departing Runway 26 with a west, north, or westerly destination depart the runway and turn to their instructed heading. Aircraft with an easterly destination, especially larger aircraft, may elect to depart the runway, turn to the northwest, and turn back to the east in the vicinity of the Saticoy bridge. South, southeast, and easterly departures are generally accomplished with a left turn after departing Runway 26 and maintaining the airport traffic pattern. Aircraft then elect to depart from the airport traffic pattern at a desirable location.

The consolidated arrival flight tracks for Camarillo Airport are presented on **Exhibit 2E**. Generally, the arrival tracks mirror the departing tracks with few exceptions. Aircraft arriving on

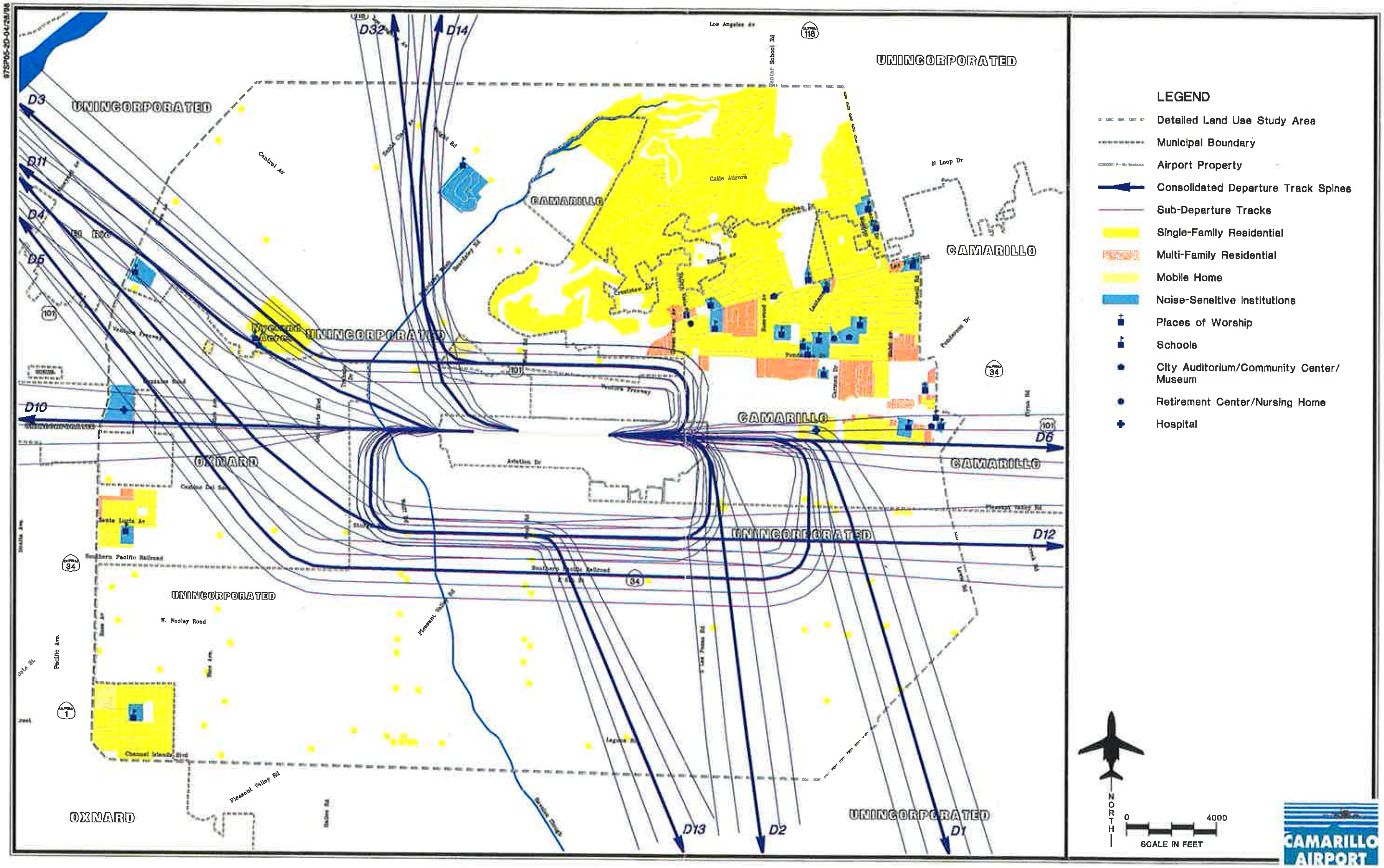
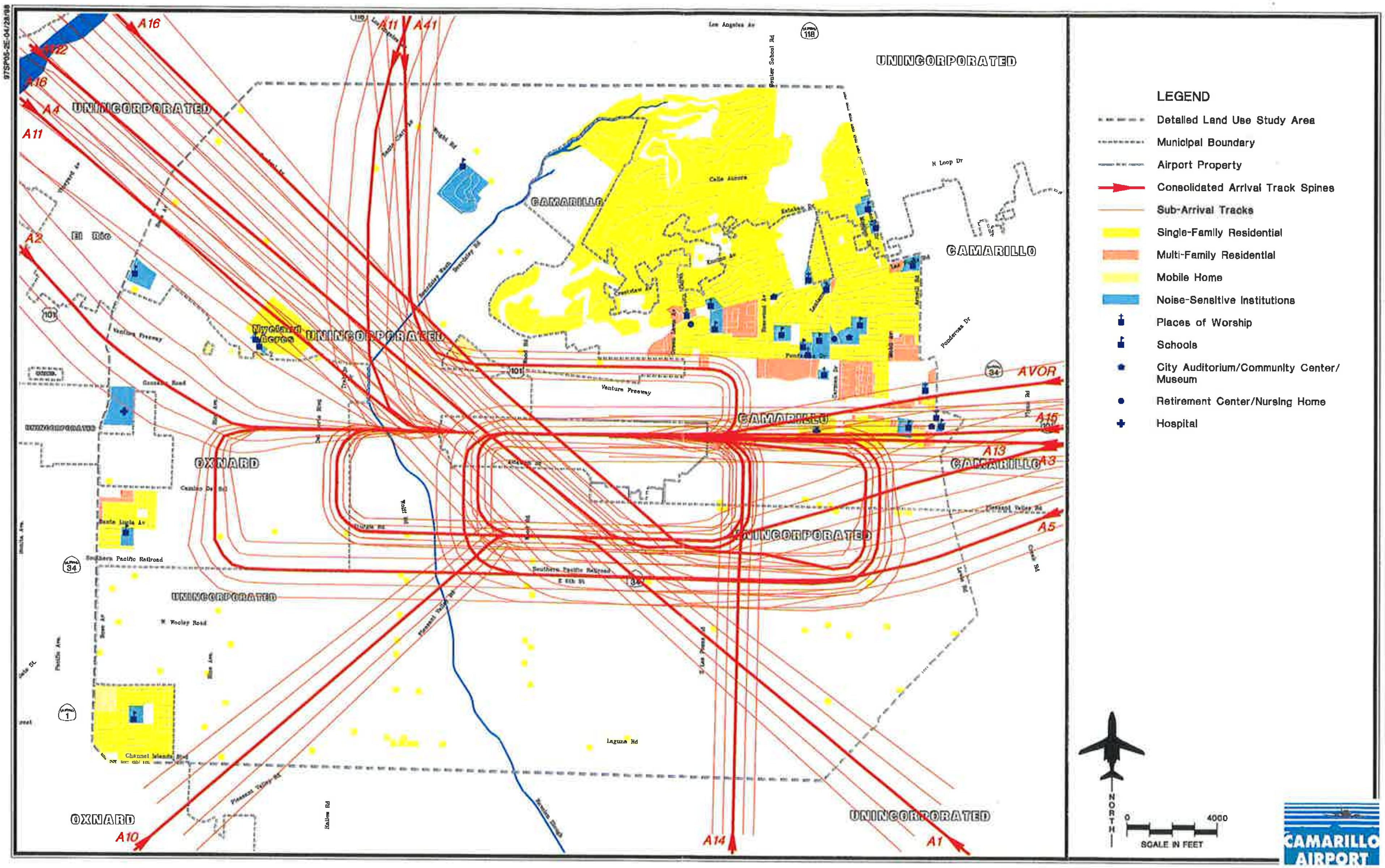


Exhibit 2D
DEPARTURE TRACKS

97SP05-2E-04/28/98



CAMARILLO AIRPORT

Exhibit 2E
ARRIVAL TRACKS

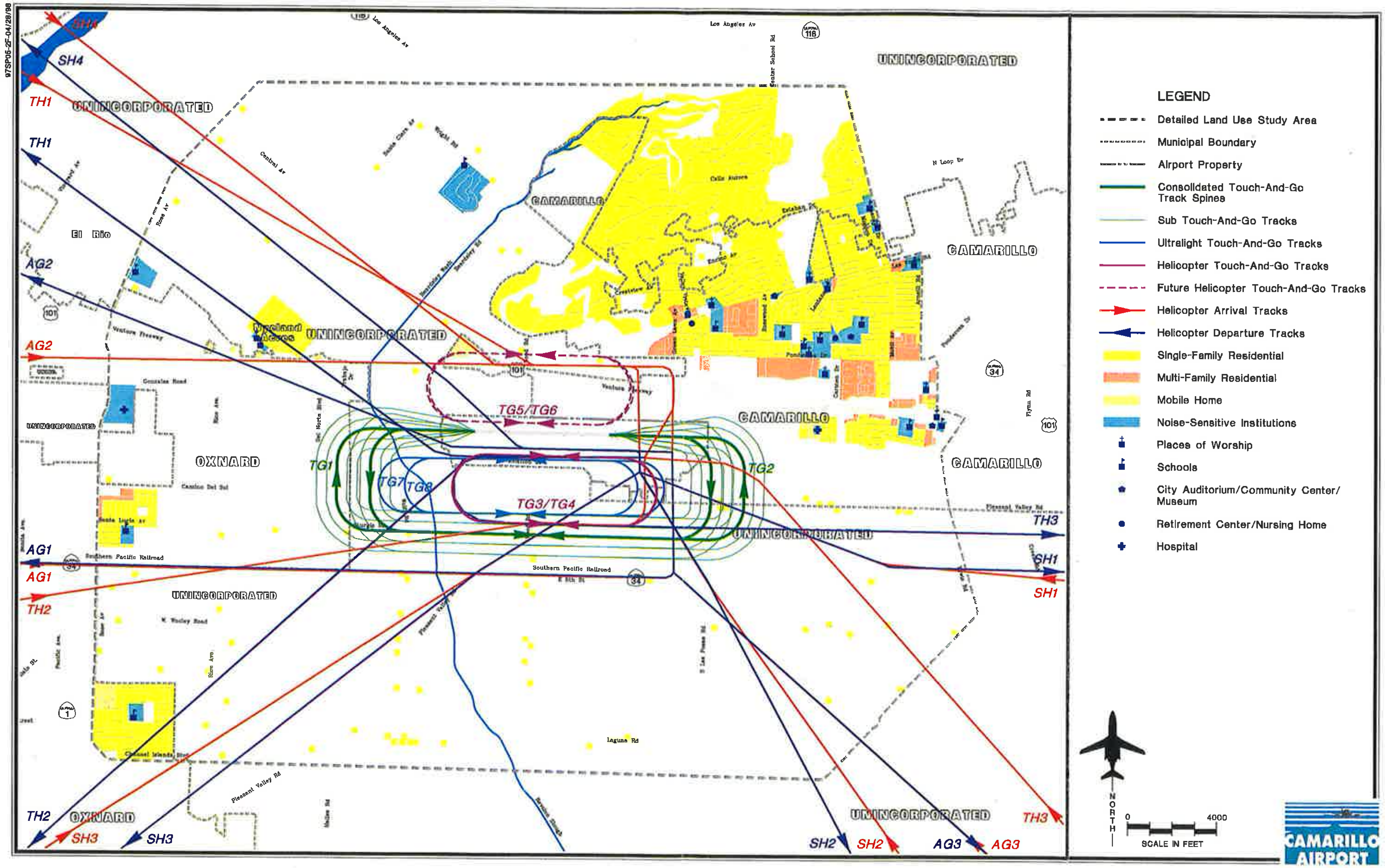


Exhibit 2F
HELICOPTER AND TOUCH-AND-GO TRACKS

percentages were then used to assign the different aircraft types to the flight tracks. These assignments resulted in the majority of the traffic being assigned to the arrival east of the airport and departure tracks west of the airport. This is in keeping with the standard procedures at Camarillo. Helicopter traffic and touch-and-go traffic were also assigned to tracks based on the same methodology.

To determine the specific number of aircraft assigned to any one flight track, a long series of calculations was performed. In general, the number of specific aircraft of one group was factored by runway utilization and flight track percentage. The process of track assignments continued until all operations, in all directions, by all types of aircraft using the airport had been evaluated.

FLIGHT PROFILES

The standard arrival profile used in the INM program is a three-degree approach. Conversations with air traffic controllers, the airport management, and the local FBO gave no indication that there was any variation on this standard procedure at Camarillo. Therefore, the standard approach included in the model was used as representative of local operating conditions.

INM Version 5.1 which was used in this analysis actually computes the takeoff profiles based on the user-supplied airport elevation and the average annual temperature entries in the input batch. At Camarillo Airport, the elevation is 75 feet mean sea level (MSL) and the average annual temperature is 65.8 degrees F. If other than standard conditions (temperature of 59 degrees F. and elevations of zero feet MSL) are specified by the user, the profile generator automatically computes the takeoff profiles using the airplane performance coefficients in the data base and the equations in the Society of Automotive Engineers Aerospace Information Report 1845 (SAE/AIR 1845).

The INM computes separate departure profiles (altitude at a specified distance from the airport with associated velocity and thrust settings) for each of the various types of aircraft using the airport

INM OUTPUT

Output data selected for calculation by the INM were annual average noise contours in CNEL. F.A.R. Part 150 requires that 65, 70 and 75 CNEL contours must be mapped in the official Noise Exposure Maps. In addition, the 60 CNEL noise contour is also mapped in this study as a guideline for future noise abatement and land use planning. This section presents the results of the contour analysis for current and forecast noise exposure conditions, as developed from the Integrated Noise Model.

1998 NOISE EXPOSURE CONTOURS

Exhibit 2G presents the plotted results of the INM contour analysis for 1998 conditions using input data described in the preceding pages. The surface areas within each contour are presented in **Table 2D**.

The overall shape of the noise pattern around the airport reflects the prevalence of departures on Runway 26. The contours are longer and wider to the west reflecting the higher portion of departures in this direction. A small extension of the 60 CNEL noise contour is present to the south reflecting the helicopter activity. A small node in the 65 CNEL noise contour is caused by the ultralight aircraft operating from a small strip of pavement south of the parallel taxiway.

To the south and east, the 60 CNEL contour remains on airport property. The 60 CNEL extends approximately 3,000 feet west of the airport. The 60 CNEL contour bows out approximately 1,000 feet from airport property on the north.

The 65 CNEL noise contour has a similar shape to the 60 CNEL contour. Small portions of the 65 CNEL noise contour extend off airport property to the north and west.

The 70 and 75 CNEL noise contours remain close to the runway and are elongated about the runway centerline. These contours remain on airport property.

2003 NOISE EXPOSURE CONTOURS

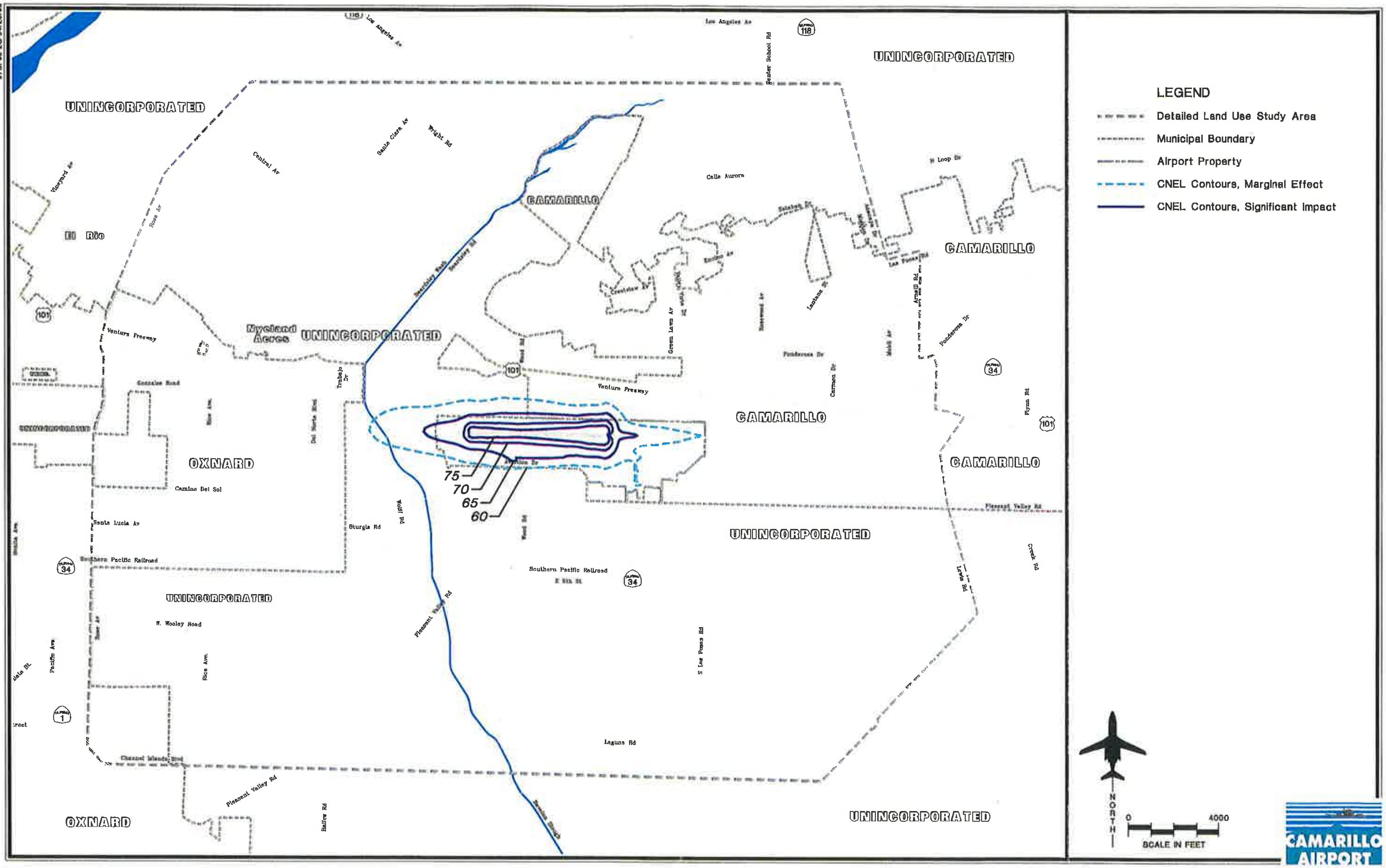
The 2003 noise contours represent the estimated noise conditions based on the forecasts of future operations without any changes in operational procedures. This analysis provides a near-future baseline that can subsequently be used to judge the effectiveness of proposed noise abatement procedures. **Exhibit 2H** presents the plotted results of the INM contour analysis for 2003 conditions using input data described in the preceding pages.

Generally the 2003 noise contours are similar in shape to their 1998 counterparts. This is due to the use of similar modeling input assumptions for the consistency of the baseline case. The contours are slightly larger than the 1998 contours due to the forecast increase in operations.

The surface areas of the 2003 noise exposure are presented for comparison in **Table 2D**.

2018 NOISE EXPOSURE CONTOURS

The 2018 noise contours represent the estimated noise conditions based on the forecasts of future operations with one change in operational procedures. Helicopter pads for training activity proposed in the Airport Master Plan are located north of the runway. This extends the 60 CNEL noise contour approximately 1,500 feet north of airport property. The 65 CNEL extends approximately 500 feet north of airport property. The 70 CNEL is wider than the 1998 and 2003 noise contour counterparts off the sides of the runway due to the presence of helicopter activity north of the runway. The 75 CNEL is similar in shape to the 1998 and 2003 noise contours. **Exhibit 2J** presents the plotted results of the INM contour analysis for 2018 conditions using input data described in the preceding pages.



CAMARILLO AIRPORT
Exhibit 2G
1998 NOISE EXPOSURE

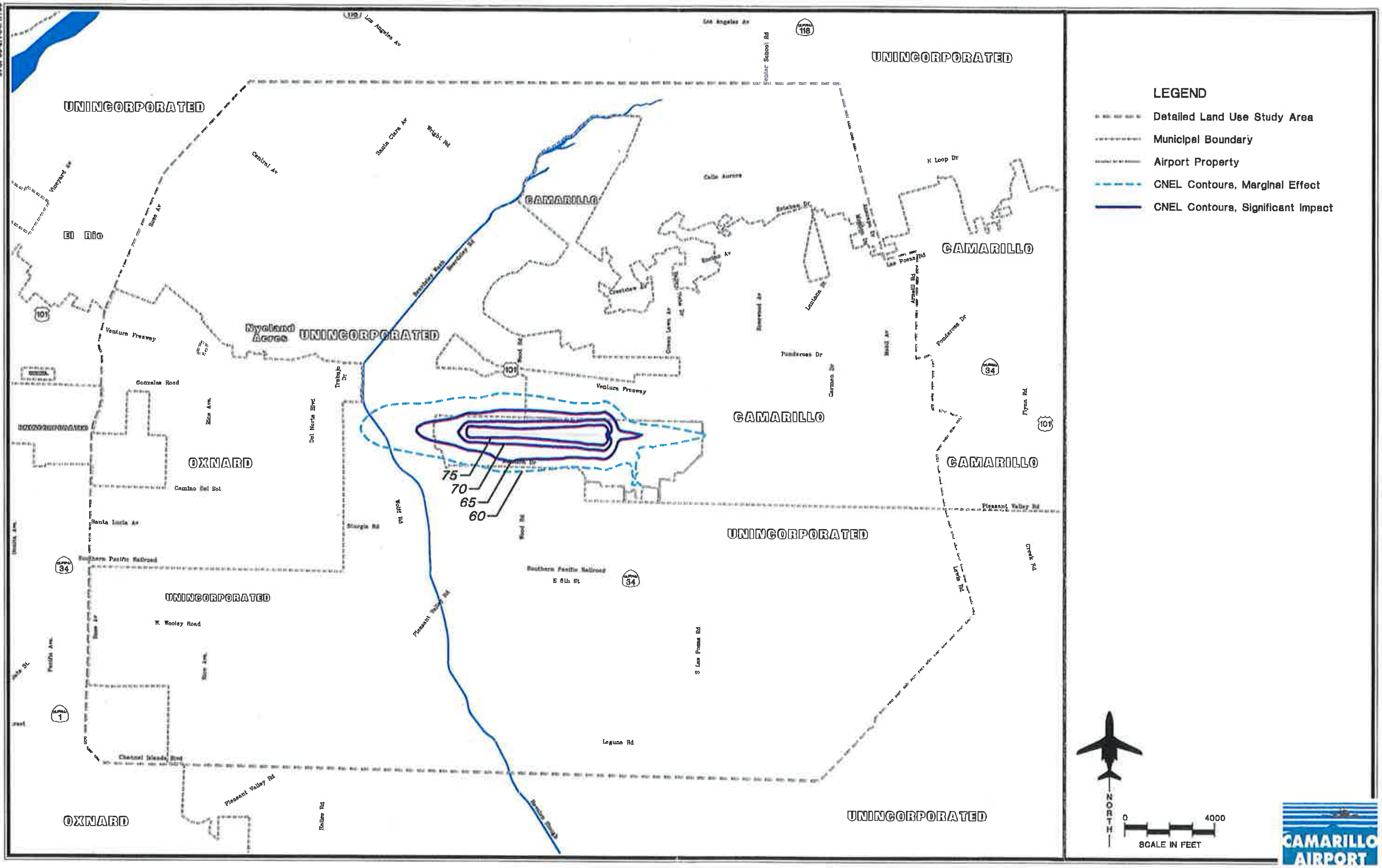


Exhibit 2H
2003 NOISE EXPOSURE

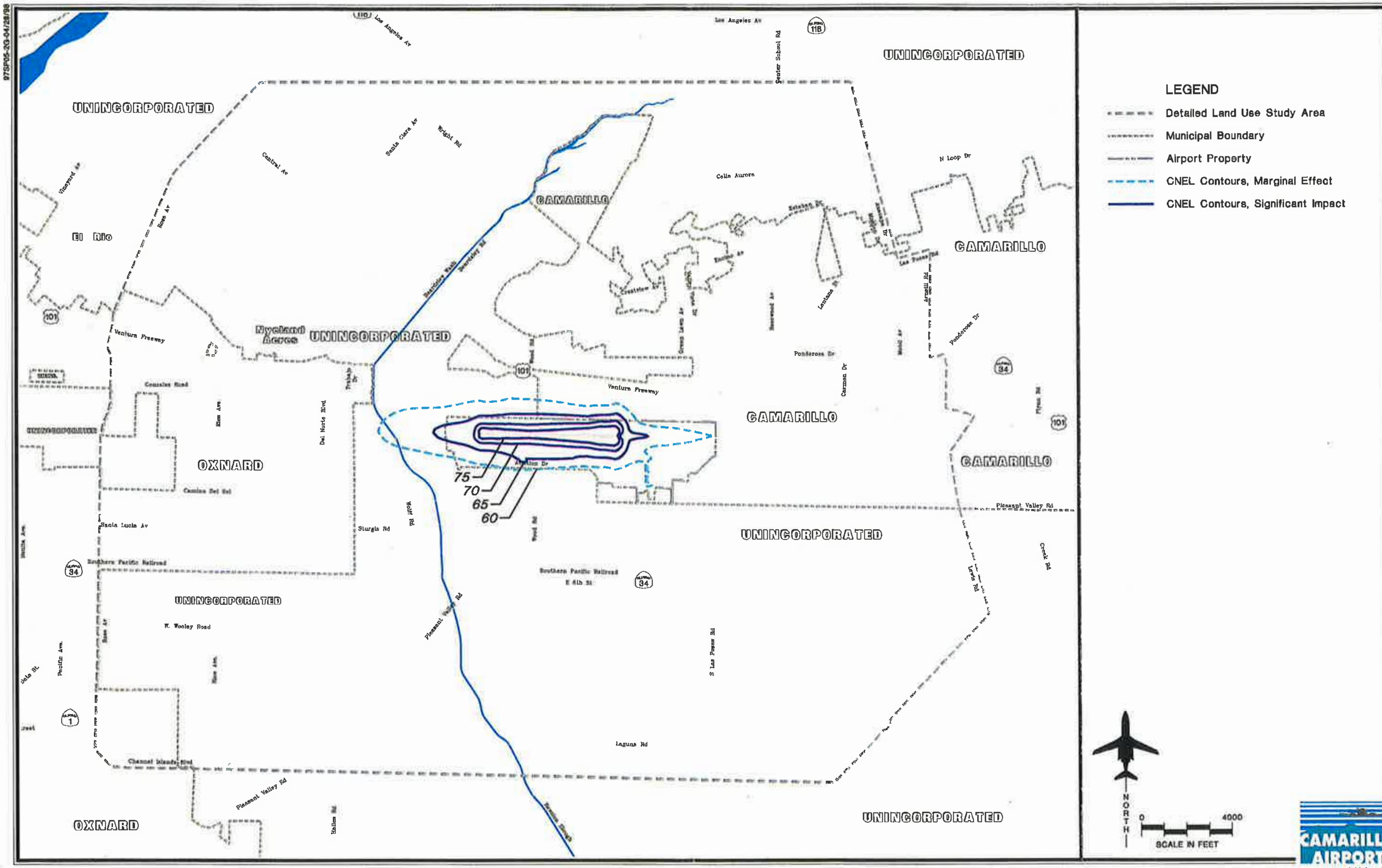


Exhibit 2G
1998 NOISE EXPOSURE

97SP05-2G-04/28/98

The contours are slightly larger than the 1998 contours due to the forecast increase in operations. However, the 2018 noise contours are smaller than the 2003 noise contours. This is due the retirement of older Stage 2 business jets from the fleet by the year 2018.

The surface areas of the 2018 noise exposure are presented for comparison in **Table 2D**.

TABLE 2D
Comparative Areas of Noise Exposure
Camarillo Airport

	Area in Square Miles		
CNEL Contour	**1998**	**2003**	**2018**
60	1.11	1.25	1.20
65	0.51	0.57	0.52
70	0.23	0.26	0.26
75	0.11	0.13	0.10

SUMMARY

The information presented in this chapter defines the noise patterns for current and future aircraft activity, without additional abatement measures, at Camarillo Airport.

The current contours are based on an average day's activity for the 1996-97 operational year and are presented as the 1998 noise exposure contours. The five-year noise exposure level around the airport can be expected to increase slightly as the airport becomes busier in the future.

It is stressed that CNEL contour lines drawn on a map do not represent absolute boundaries of acceptability or unacceptability in personal response to noise, nor do they represent the actual noise conditions present on any specific day, but rather the conditions of an average day derived from annual average information.

CAMARILLO AIRPORT
Part 150 Noise Exposure Maps

Chapter Three
NOISE IMPACTS

Chapter Three

NOISE IMPACTS

The impacts of aircraft noise on existing and future land use and population are examined in this chapter. The effects of noise on people 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 is 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, making it very difficult to predict how any person is likely to react to environmental noise. The average response among a large group of people, however, is much less variable and has been found to correlate well with cumulative noise dosage metrics such as Leq, DNL, and CNEL. 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," behind the last tab in this workbook.

This chapter deals with the following topics:

- Land Use Compatibility
- Noise Impacts

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

97SP05-3A-11/19/97

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 responsbility 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.

CAMARILLO AIRPORT

Exhibit 3A
F.A.R. PART 150
LAND USE COMPATIBILITY GUIDELINES

Many uses are considered compatible in areas subject to noise between 65 DNL and 75 DNL if prescribed levels of noise level reduction can be achieved through sound insulation. These include hospitals, nursing homes, churches, auditoriums, and concert halls.

STATE OF CALIFORNIA LAND USE COMPATIBILITY STANDARDS

In California, the CNEL (community noise equivalent level) metric is used instead of the DNL metric. The two are actually very similar. DNL accumulates the total noise occurring during a 24-hour period, with a 10 decibel weight applied to noise occurring between 10:00 p.m. and 7:00 a.m. The CNEL metric is the same except that it also adds a 4.8 decibel weight for noise occurring between 7:00 p.m. and 10:00 p.m. There is little actual difference between the two metrics in practice. Calculations of CNEL and DNL from the same data generally yield values with less than a 0.7 decibels difference (Metropolitan Transportation Commission 1983, p. 37).

California law sets the standard for the acceptable level of aircraft noise for persons residing near airports as 65 CNEL (California Code of Regulations, Title 21, Chapter 2.5, Subchapter 6, Sections 5000 et seq.). Four types of land uses are defined as incompatible with noise above 65 CNEL: residences, schools, hospitals and convalescent homes, and places of worship. These land uses are regarded as compatible if they have been insulated to assure an interior sound level, from aircraft noise, of 45 CNEL. They are also to be considered compatible if an avigation easement over the property has been obtained by the airport operator.

California noise insulation standards apply to ***new*** hotels, motels, apartment buildings and other dwellings not including detached single family homes. They require that "interior noise levels attributable to outdoor sources shall not exceed 45 decibels (based on the DNL or CNEL metric) in any habitable room." (California Code of Regulations, Title 24, Part 2, Appendix Chapter 35.)

LOCAL LAND USE COMPATIBILITY GUIDELINES

The Noise Element of the Camarillo General Plan includes a land use compatibility matrix correlating the acceptability of various land uses with different noise exposure levels. One measure of the General Plan requires developers of homes and noise-sensitive developments seeking to locate within the 60 CNEL contour to prepare noise study reports (City of Camarillo 1996, p. 420). Another measure notes that the City shall enforce the State standard that any new developments within the 60 CNEL contour must reduce noise from exterior sources to 45 CNEL in any habitable room, with windows and doors closed. The City policy extends this requirement to single-family homes in addition to hotels and multi-family buildings (City of Camarillo 1996, p. 420.)

NOISE IMPACTS

CURRENT NOISE EXPOSURE

Exhibit 3B, 1998 Aircraft Noise and Land Use, shows the location of noise-sensitive land uses and the 1998 noise contours at Camarillo Airport. Noise-sensitive land uses shown on the exhibit are based on the FAA's land use compatibility guidelines presented in **Exhibit 3A**.

The 60 CNEL contour extends approximately 4,500 feet off the west end of the runway and 4,300 feet off the east end. At its widest point, the contour is 3,000 feet wide. The shape of the contour reflects the predominance of departures to the west and arrivals from the east. The wide contour on the west side is characteristic of a noise contour dominated by departures. The narrow contour to the east reflects the dominance of aircraft arrivals from that direction.

The 65 CNEL contour extends 2,000 feet off the west end of the runway and just beyond the airport property line. The contour is contained on airport property on the south and east and barely escapes airport property on the north side. The maximum width of the contour is about 2,000 feet.

The 70 and 75 CNEL contours are completely contained on airport property. The shape of the contour on the east end reflects the dominance of takeoff noise from Runway 26 departures caused by the initial application of takeoff thrust.

As **Exhibit 3B** shows, no residences or other noise-sensitive land uses are exposed to noise above 60 CNEL. An enlargement of the 1998 noise exposure contours can be found at the end of the chapter on **Exhibit 3E**.

The acreage within the 1998 noise exposure contours is depicted on **Table 3A**. As seen on **Table 3A**, approximately 245 acres within the 60+ CNEL noise contours fall outside of airport property. However, there are no noise-sensitive land uses within that area.

FUTURE NOISE EXPOSURE

Exhibit 3C shows the noise projected at Camarillo for the year 2003. Existing noise-sensitive land uses are shown on the exhibit as are areas designated in the General Plan for future residential development. No existing or future noise-sensitive land uses are within the noise contours. The noise contours for the year 2003 are similar in shape to the 1997 contours but are slightly larger. This is because of the projected increase in operations during the period.

The 60 CNEL contour extends 4,800 feet beyond the west end of the runway. It extends 4,600 feet east of the opposite end of the runway. At its widest point, the contour is 3,500 feet wide.

The 65 CNEL contour extends 2,500 feet west of the runway and 1,000 feet beyond the west property line. To the east, the contour extends 1,800 feet off

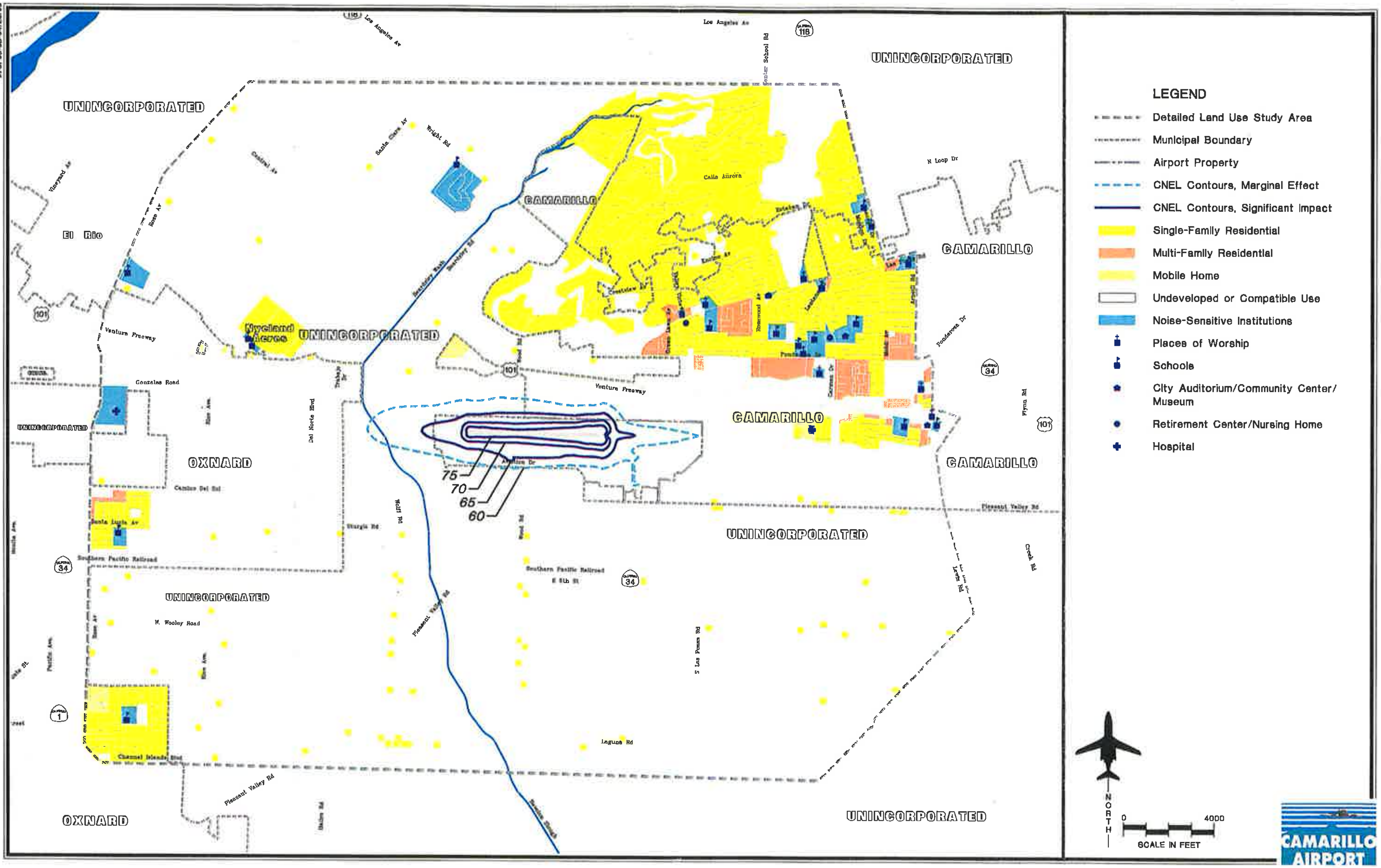


Exhibit 3B
1998 AIRCRAFT NOISE AND LAND USE

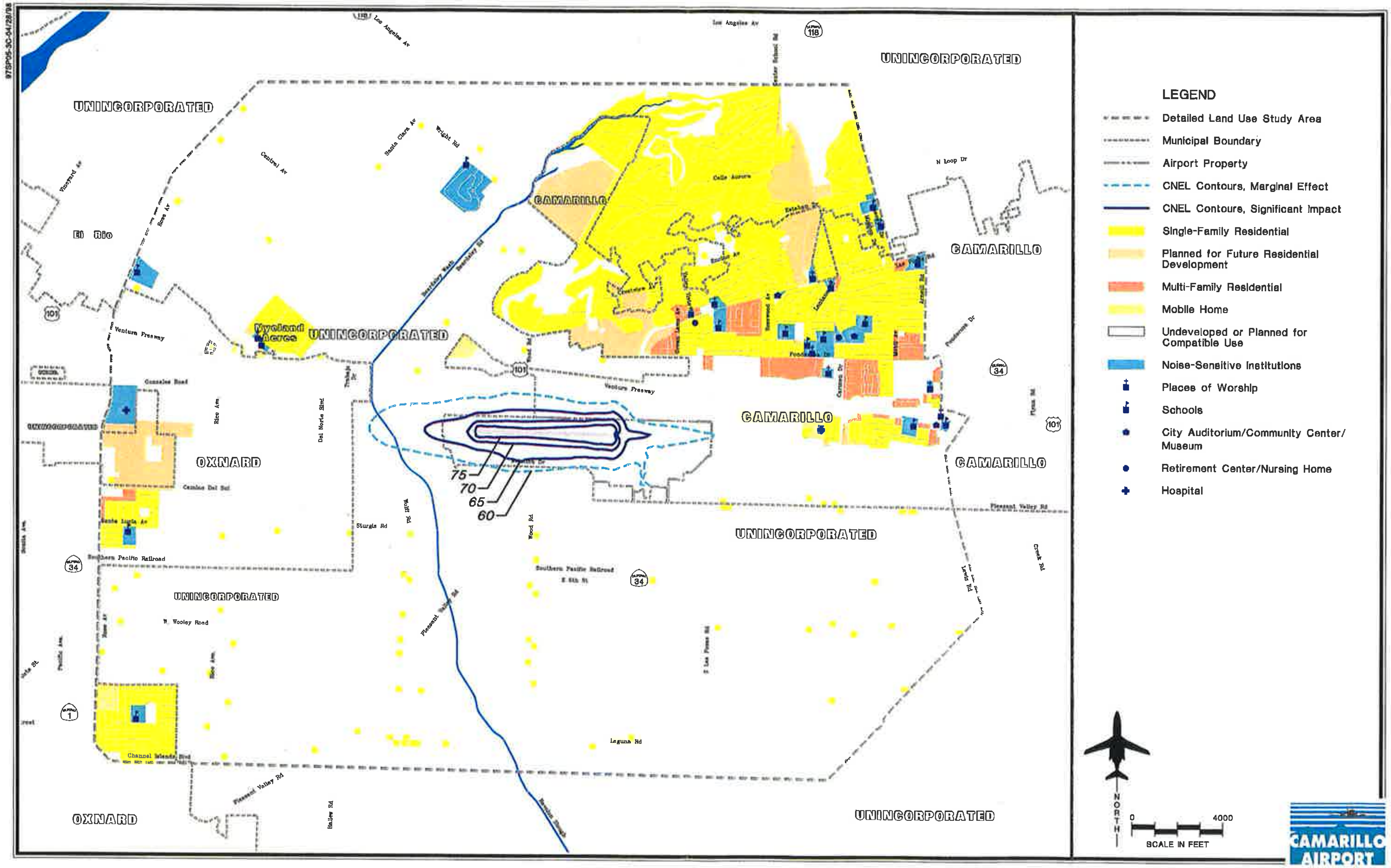
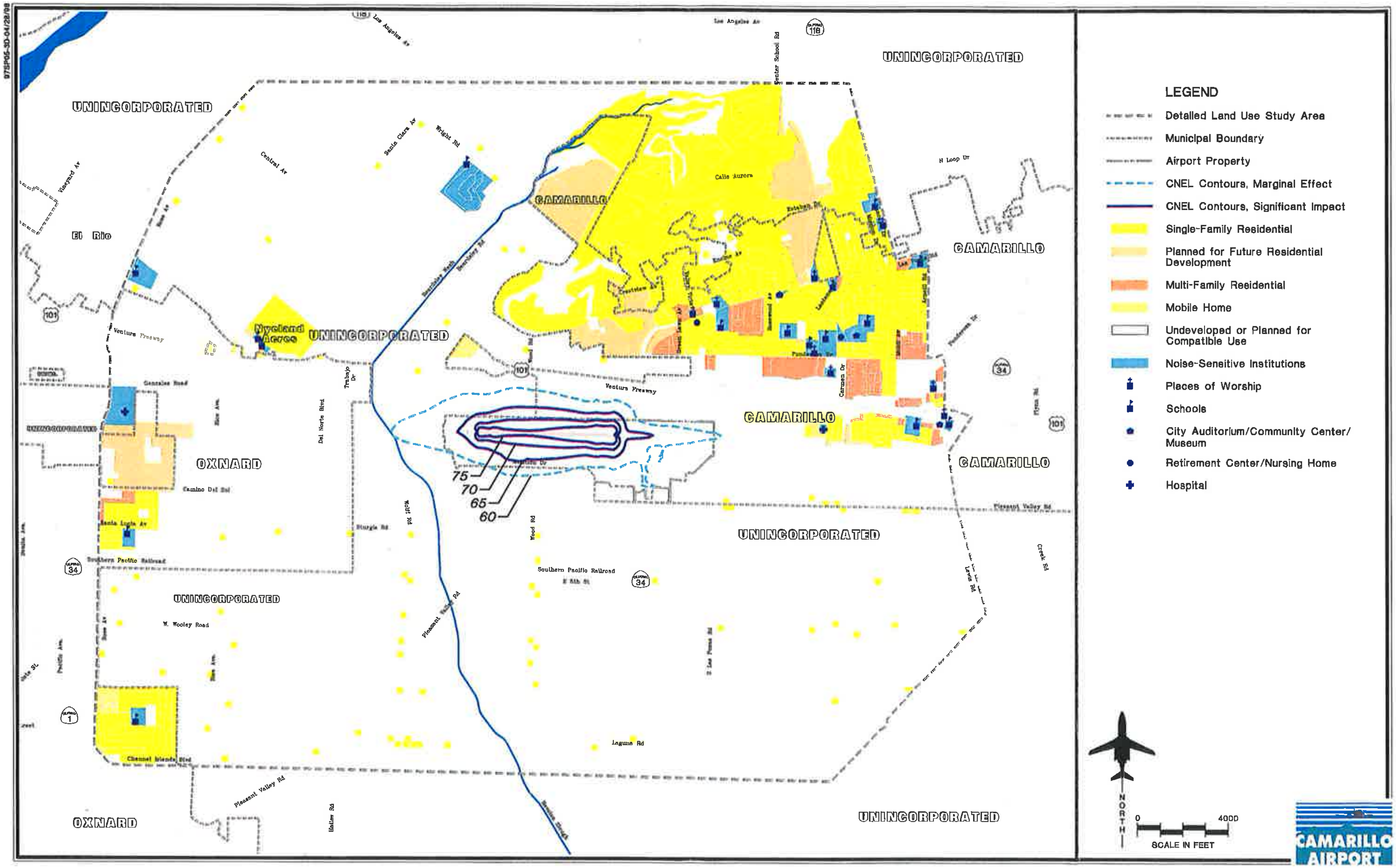


Exhibit 3C
2003 AIRCRAFT NOISE AND LAND USE



CAMARILLO AIRPORT

Exhibit 3D

2018 AIRCRAFT NOISE AND LAND USE

airport. (The noise contour on the west side is driven by departure noise.)

The second important factor is the projected increase in total operations at the airport. Even with the transition to quieter Stage 3 jets, the size of the noise contour ***east*** of the airport remains generally unchanged. This is because the difference between Stage 2 and Stage 3 approach noise is not nearly as great as the difference in departure noise. The effect of the quieter Stage 3 jets on the east side is matched by the projected increase in aircraft operations, so the contour remains basically unchanged on the east side.

The 65 CNEL contour extends about 800 feet west of the runway end and 1,800 feet east of the runway. The contour extends up to 500 feet north of the airport boundary.

As in the 1998 and 2003 cases, the 70 and 75 CNEL contours remain on airport property. An enlargement of the 2018 noise exposure contours can be found at the end of the chapter on **Exhibit 3E**.

The acreage within the 2018 noise exposure contours is depicted on **Table 3B**. The total area within the 60+ CNEL noise contours not within airport property decreases from 308.8 acres in 2003 to 282.8 in 2018. As previously discussed, this is due to the retirement of Stage 2 business jets from the fleet mix over the next 20 years. Noise-sensitive land uses continue to remain outside the 60+ CNEL noise exposure contours in 2018.

TABLE 3B
Future Noise Exposure Area In Acres
Camarillo Airport

CNEL Range	Total Area Inside Contours	Area Inside Airport Property	Area Outside Airport Property	Noise-Sensitive Area*
2003				
60-65	435.3	175.2	260.1	0
65-70	198.6	149.9	48.7	0
70-75	83.0	83.0	0.0	0
75 +	80.9	80.9	0.0	0
Total	797.8	489.0	308.8	0
2018				
60-65	436.2	202.8	233.4	0
65-70	166.1	116.8	49.4	0
70-75	96.9	96.9	0.0	0
75+	66.7	66.7	0.0	0
Total	765.9	483.2	282.8	0

* Area occupied by noise-sensitive land uses including residential and institutional uses.

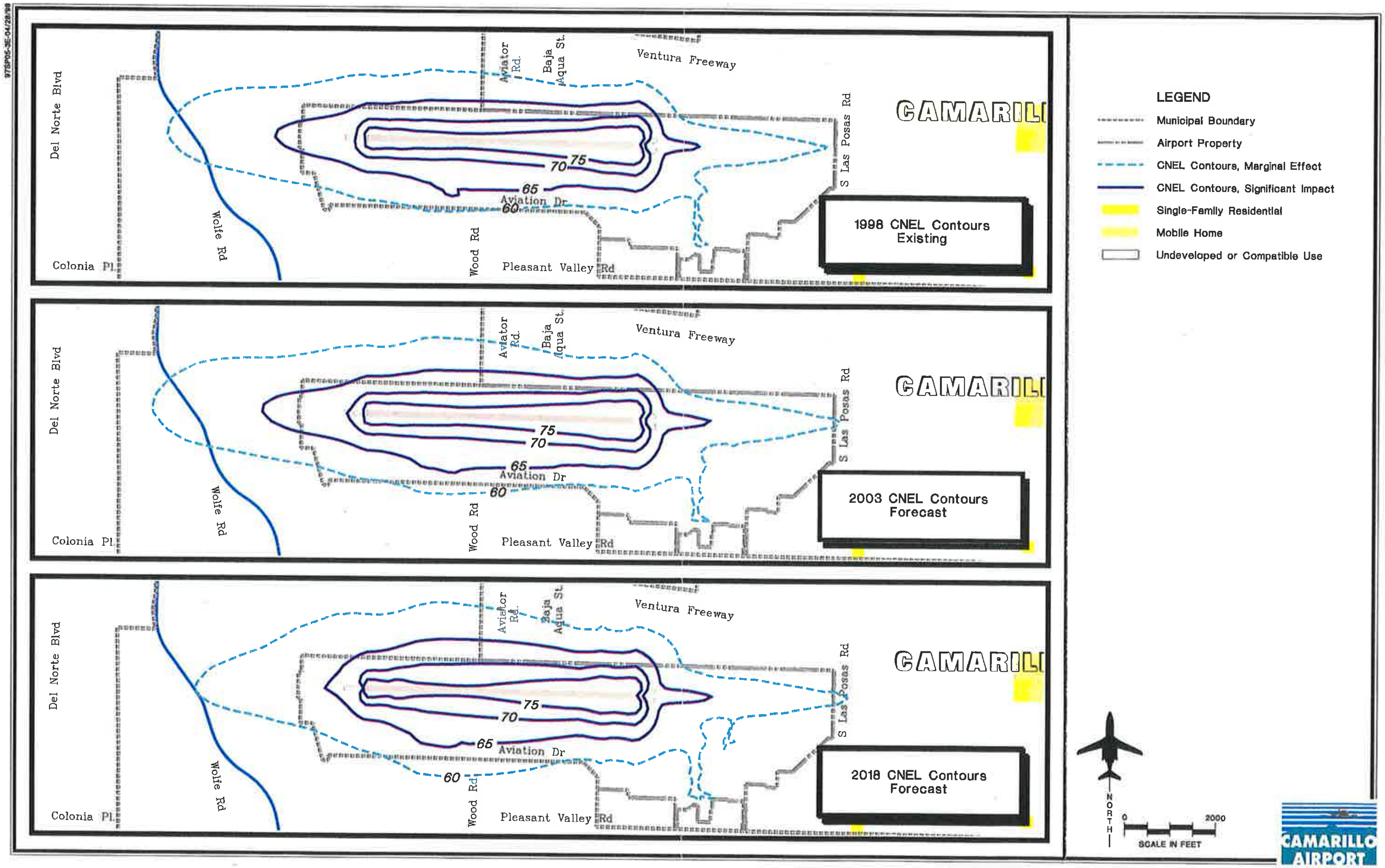


Exhibit 3E
AIRCRAFT NOISE AND LAND USE

References

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CAMARILLO AIRPORT
Part 150 Noise Exposure Maps

Appendix A
WELCOME TO THE PLANNING ADVISORY COMMITTEE

WELCOME TO THE PLANNING ADVISORY COMMITTEE

The Ventura County Department of Airports and its consultants, Coffman Associates and CommuniQuest, are pleased to welcome you to the Planning Advisory Committee (PAC) for the F.A.R. Part 150 Noise Compatibility Study. We very much appreciate the interest you have in this project. Over the next several months you will be able to make an important contribution to the study. We believe that you, in turn, will find your participation with the committee to be an interesting and profitable experience.

WHAT IS THE ROLE OF THE COMMITTEE?

The PAC will play an important role in the Noise Compatibility Study. We want to benefit from your unique viewpoints, to have access to the people and resources you represent, to work with you in a creative atmosphere, and to gain your support in achieving results. Specifically, your role in the PAC is as follows:

- **Sounding Board** - The consultants need a forum in which to present information, findings, ideas, and recommendations during the study. Everyone involved with the study will benefit from this forum because it allows diverse interests an opportunity to experience the viewpoints, ideas, and concerns of other members directly.

- **Linkage to the Community** - Each of you represent one or more constituent interests — neighbor-hood residents, local businesses, public agencies, and aviation users.

you to arrange your schedule. We will initially schedule meetings in the afternoon and will continue to do so if the time is generally acceptable.

To keep you informed of the proceedings at the PAC meetings, we will prepare summary minutes and will distribute them soon after each meeting. These will be particularly helpful if you are unable to attend a meeting.

In the evening after each PAC meeting, we will hold a public information workshop so that we may report to the community at large and elicit their views and input. We invite you to attend these evening workshops. They will be organized to maximize the opportunity for two-way communication. At these important meetings, you will have the chance to hear from local citizens and share your views and expertise with them.

When they are in the local area, the consultants will make themselves available for small group meetings at private homes, user group meetings, and similar gatherings. Please contact the consultants if you wish to arrange or host such meetings.

Before each PAC meeting, the consultant will distribute working papers to you. These are draft chapters of the Noise Compatibility Study, and they will be a focus for discussion at the meetings. In addition, we will provide an outline of the subjects to be covered in the next phase of the project so that you may interject your ideas and concerns and have them addressed in the next working paper.

To help you keep your materials organized, we will give you a study workbook (a three-ring binder with a special cover and tab dividers) to hold working papers, technical information papers, PAC membership lists, meeting notes, and other resource material. Copies of the final reports will also be provided to each committee member at the end of the study.

SEE YOU AT THE MEETINGS!

Once again, welcome to the PAC and thanks for accepting the invitation to participate. We will do everything we can to make sure your participation is a worthwhile and satisfying experience. All users and neighbors of Camarillo Airport will be better served as a result of these efforts.

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Appendix B
COORDINATION,
CONSULTATION, AND
PUBLIC INVOLVEMENT

CAMARILLO AIRPORT
Part 150 Noise Exposure Maps

Appendix B
COORDINATION, CONSULTATION, AND PUBLIC INVOLVEMENT

As part of the planning process, the public, airport users, and local, state, and Federal agencies were given the opportunity to review and comment on the Noise Exposure Maps and supporting documentation. Materials prepared by the consultant were submitted for local review, discussion, and revision at several points during the process. The Planning Advisory Committee (PAC) reviewed and commented on these submissions and was requested to provide direction for future study efforts. Most comments were made orally during the meetings, but many comments were followed by written confirmation. All comments were appropriately incorporated into this document or otherwise addressed.

The PAC met three times during the preparation of the Noise Exposure Maps. An introductory meeting was held for committee members by Ventura County Aviation Staff July 8, 1997. On December 2, 1997 a meeting was held to introduce the participants, describe the study process, discuss goals and objectives, review Chapter One, Inventory, and hear comments and views pertaining to conditions at the airport. Many comments and questions were raised at the meeting. A number of questions related to the forecasts and methodologies that would be used for the noise analysis. One question related to the potential impact of making NAWS Point Mugu a joint use facility.

The third PAC Meeting was held on January 6, 1998. Working papers on aviation noise and noise impacts were presented and discussed. Many questions and comments were raised about the noise analysis. These included questions

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GLOSSARY OF NOISE COMPATIBILITY TERMS

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GLOSSARY OF NOISE COMPATIBILITY TERMS

A-WEIGHTED SOUND LEVEL - A sound pressure level, often noted as dBA, which has been frequency filtered or weighted to quantitatively reduce the effect of the low frequency noise. It was designed to approximate the response of the human ear to sound.

AMBIENT NOISE - The totality of noise in a given place and time — usually a composite of sounds from varying sources at varying distances.

APPROACH LIGHT SYSTEM (ALS) - An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway on the final approach for landing.

ATTENUATION - Acoustical phenomenon whereby a reduction in sound energy is experienced between the noise source and receiver. This energy loss can be attributed to atmospheric conditions, terrain, vegetation, and man-made and natural features.

AZIMUTH - Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

BASE LEG - A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

CNEL - A scale which takes account of all the A-weighted sound received at a point, from all noise events causing noise levels above some prescribed value. A 4.77 decibel weighting factor is applied to noise events occurring during the evening hours (7:00 p.m. to 10:00 p.m.). A 10 decibel weighting factor is applied to noise events at night (10:00 p.m. to 7:00 a.m.). The CNEL metric is required by California state law for use in airport noise studies.

COMMUNITY NOISE EQUIVALENT LEVEL - See CNEL.

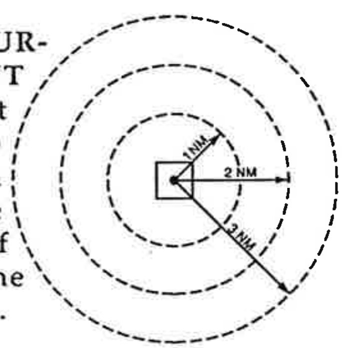
CROSSWIND LEG - A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

DAY-NIGHT AVERAGE SOUND LEVEL - See DNL.

DECIBEL (dB) - The physical unit commonly used to describe noise levels. The decibel represents a relative measure or ratio to a reference power. This reference value is a sound pressure of 20 micropascals which can be referred to as 1 decibel or the weakest sound that can be heard by a person with very good hearing in an extremely quiet room.

DISPLACED THRESHOLD - A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME) - Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL - The 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 a.m. and between 10 p.m. and midnight, local time, as averaged

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noise during that period (with no consideration of a nighttime weighting.) It is a measure of cumulative acoustical energy. Because the time interval may vary, it should be specified by a subscript (such as Leq 8) for an 8-hour exposure to workplace noise) or be clearly understood.

LOCALIZER - The component of an ILS which provides course guidance to the runway.

MERGE - Combining or merging of noise events which exceed a given threshold level and occur within a variable selected period of time.

MISSED APPROACH COURSE (MAC) - The flight route to be followed if, after an instrument approach, a landing is not effected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact, or

2. When directed by air traffic control to pull up or to go around again.

NOISE CONTOUR - A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NONDIRECTIONAL BEACON (NDB) -A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determined his bearing to and from the radio beacon and home on or track to or from the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NONPRECISION APPROACH - A standard instrument approach procedure providing runway alignment but no glide slope or descent information.

PRECISION APPROACH - A standard instrument approach procedure providing runway alignment and glide slope or descent information.

PRECISION APPROACH PATH INDICATOR (PAPI) - A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PROFILE - The physical position of the aircraft during landings or takeoffs in terms of altitude in feet above the runway and distance from the runway end.

PROPAGATION - Sound propagation refers to the spreading or radiating of sound energy from the noise source. Propagation characteristics of sound normally involve a reduction in sound energy with an increased distance from source. Sound propagation is affected by atmospheric conditions, terrain, and man-made and natural objects.

RUNWAY END IDENTIFIER LIGHTS (REIL) - Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY USE PROGRAM - A noise abatement runway selection plan designed to enhance noise abatement efforts with regard to airport communities for arriving and departing aircraft. These plans are developed into runway use programs and apply to all turbojet aircraft 12,500 pounds or heavier. Turbojet aircraft less than 12,500 pounds are included only if the airport proprietor determines that the aircraft creates a noise problem. Runway use programs are coordinated with FAA offices as outlined in Order 1050.11. Safety criteria used in these programs are developed by the Office of Flight Operations. Runway use programs are administered by the Air Traffic Service as "Formal" or "Informal" programs.

RUNWAY USE PROGRAM (FORMAL) - An approved noise abatement program which is defined and acknowledged in a Letter of Understanding between FAA - Flight Standards, FAA - Air Traffic Service, the airport proprietor, and the users. Once established, participation in the program is

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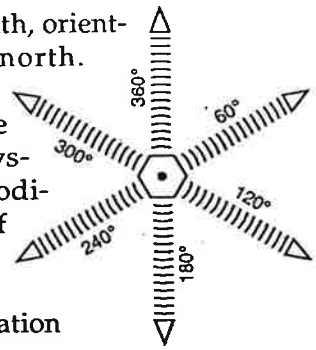
360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.



VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION/TACTICAL AIR NAVIGATION (VORTAC) - A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY - A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH - An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI) - An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating an directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR) - Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VOR - See "Very High Frequency Omnidirectional Range Station."

VORTAC - See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

YEARLY DAY-NIGHT AVERAGE SOUND LEVEL - See DNL.

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TECHNICAL INFORMATION PAPER

THE MEASUREMENT AND ANALYSIS OF SOUND

TECHNICAL INFORMATION PAPER

THE MEASUREMENT AND ANALYSIS OF SOUND

Sound is energy -- energy that conveys information to the listener. Although measuring this energy is a straightforward technical exercise, describing sound energy in ways that are meaningful to people is complex. This TIP explains some of the basic principles of sound measurement and analysis.

NOISE - UNWANTED SOUND

Noise is often defined as unwanted sound. For example, rock-and-roll on the stereo of the resident of apartment 3A is music to her ears, but it is intolerable racket to the next door neighbor in 3B. One might think that the louder the sound, the more likely it is to be considered noise. This is not necessarily true. In our example, the resident of apartment 3A is surely exposed to higher sound levels than her neighbor in 3B, yet she considers the sound as pleasant while the neighbor considers it "noise". While it is possible to measure the sound level objectively, characterizing it as "noise" is a subjective judgement.

The characterization of a sound as "noise" depends on many factors, including the information content of the sound, the familiarity of the sound, a person's control over the sound, and a person's activity at the time the sound is heard.

MEASUREMENT OF SOUND

A person's ability to hear a sound depends on its character as compared with all other sounds in the environment. Three characteristics of

The noise values to be added should be arrayed from lowest to highest. The additive factor derived from the difference between the lowest and next highest noise level should be added to the higher level. An example is shown below.

Example of Sound Level Summation

Sound Levels to be Added	Summation Process	
59 dB	Add 2.5 to 60 = 62.5	
60 dB		
66.5 dB		Add 1.5 to 66.5 = 68

59 dB + 60 dB + 66.5 dB = 68 dB

Logarithmic math also produces interesting results when averaging sound levels. As the example below shows, the loudest sound levels are the dominant influence in the averaging process. In the example, two sound levels of equal duration are averaged. One is 100 dB the other 50 dB. The result is not 75 as it would be with linear math but 97 dB. This is because 100 dB contains 100,000 times the sound energy as 50 dB.

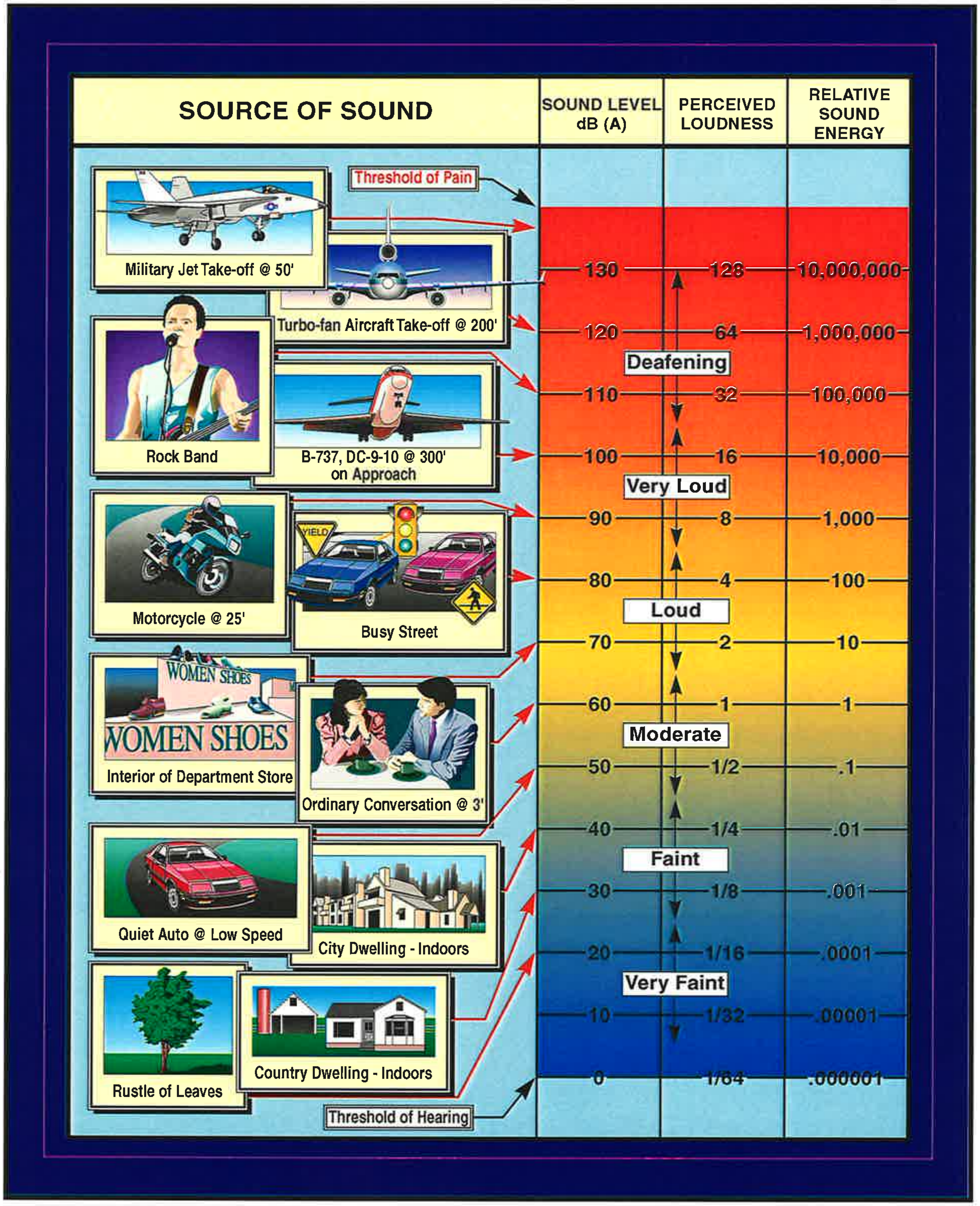
Example Of Sound Level Averaging

Assume two sound levels of equal duration: 100 dB and 50 dB. What is the average sound level?

$$\frac{100dB + 50dB}{2} = 97dB$$

100 dB is 100,000 times more energy than 50 dB!

Another interesting attribute of sound is the human perception of loudness. Scientists researching human hearing have determined that most people perceive a 10 dB increase in sound energy over a given frequency range as roughly a doubling of the loudness. Recalling the logarithmic nature of the decibel scale, this means that most people perceive a ten-fold increase in sound energy as a two-fold increase in loudness (Kryter 1984, p. 188). Furthermore, when comparing sounds over the same frequency range, most people cannot distinguish between sounds varying by less than two or three decibels.



Source: Coffman Associates 1990

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Sound Exhibit A
TYPICAL SOUND LEVELS

One way of doing this is to calculate the value of a steady-state sound which contains the same amount of sound energy as the time-varying sound under consideration. This value is known as the Equivalent Sound Level (Leq). An important advantage of the Leq metric is that it correlates well with the effects of noise on humans. On the basis of research, scientists have formulated the "equal energy rule". It is the total sound energy perceived by a human that accounts for the effects of the sound on the person. In other words, a very loud noise lasting a short time will have the same effect as a quieter noise lasting a longer time if the total energy of both sound events (the Leq value) is the same.

KEY DESCRIPTORS OF SOUND

Four descriptors or metrics are useful for quantifying sound (Newman and Beattie 1985, pp. 9-15). All are based on the logarithmic decibel (dB) scale and incorporate A-weighting to account for the frequency response of the ear.

Sound Level

The sound level (L) in decibels is the quantity read on an ordinary sound level meter. It fluctuates with time following the fluctuations in magnitude of the sound. Its maximum value (Lmax) is one of the descriptors often used to characterize the sound of an airplane overflight. However, Lmax only gives the maximum magnitude of a sound -- it does not convey any information about the duration of the sound. Clearly, if two sounds have the same maximum sound level, the sound which lasts longer will cause more interference with human activity.

Sound Exposure Level

Both loudness and duration are included in the sound exposure level (SEL), which adds up all sound occurring in a stated time period or during a specific event, integrating the total sound over a one-second duration. The SEL is the quantity that best describes the total noise from an aircraft overflight. Based on numerous sound measurements, the SEL from a typical aircraft overflight is usually four to seven decibels higher than the Lmax for the event.

Exhibit B shows graphs of two different sound events. In the top half of the graph, we see that the two events have the same Lmax, but the second event lasts longer than the first. It is clear from the graph that the area under the noise curve is greater for the second event than the first. This means that the second event contains more total sound energy than the first, even though the peak levels for each event are the same. In the bottom half of the graph, the sound exposure levels (SELs) for each event are compared. The SELs are computed by mathematically compress-ing the total sound energy into a one-second period. The SEL for the second event is greater than the SEL for the first. Again, this simply means that the total sound energy for the second event is greater than for the first.

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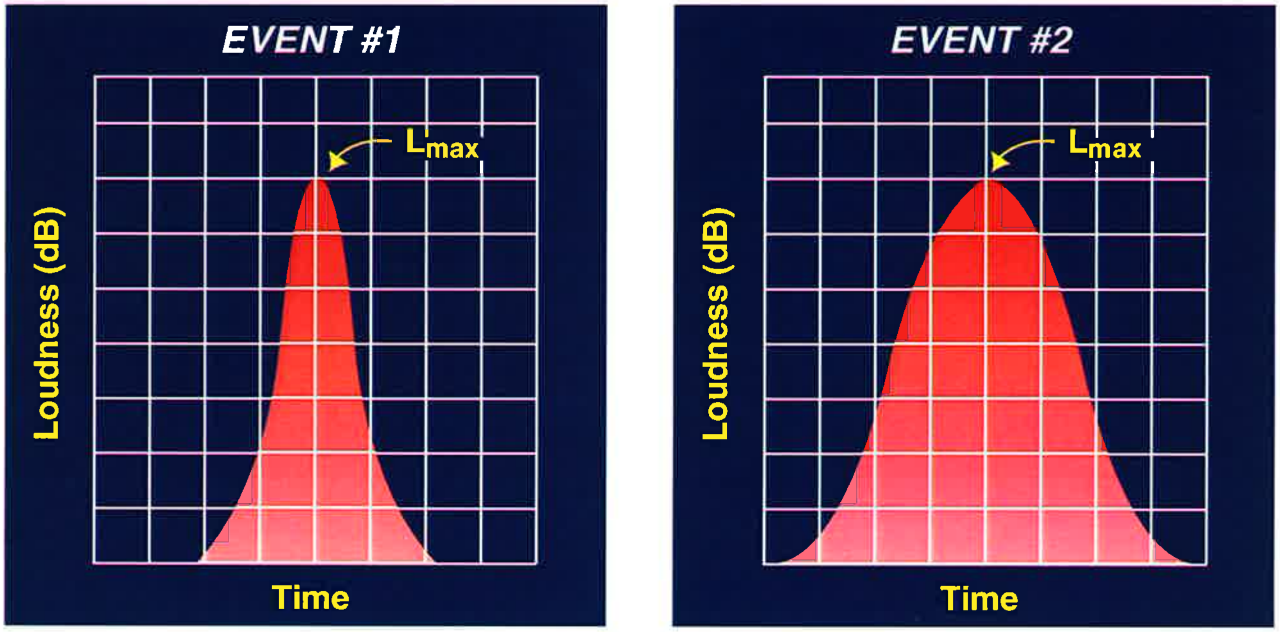
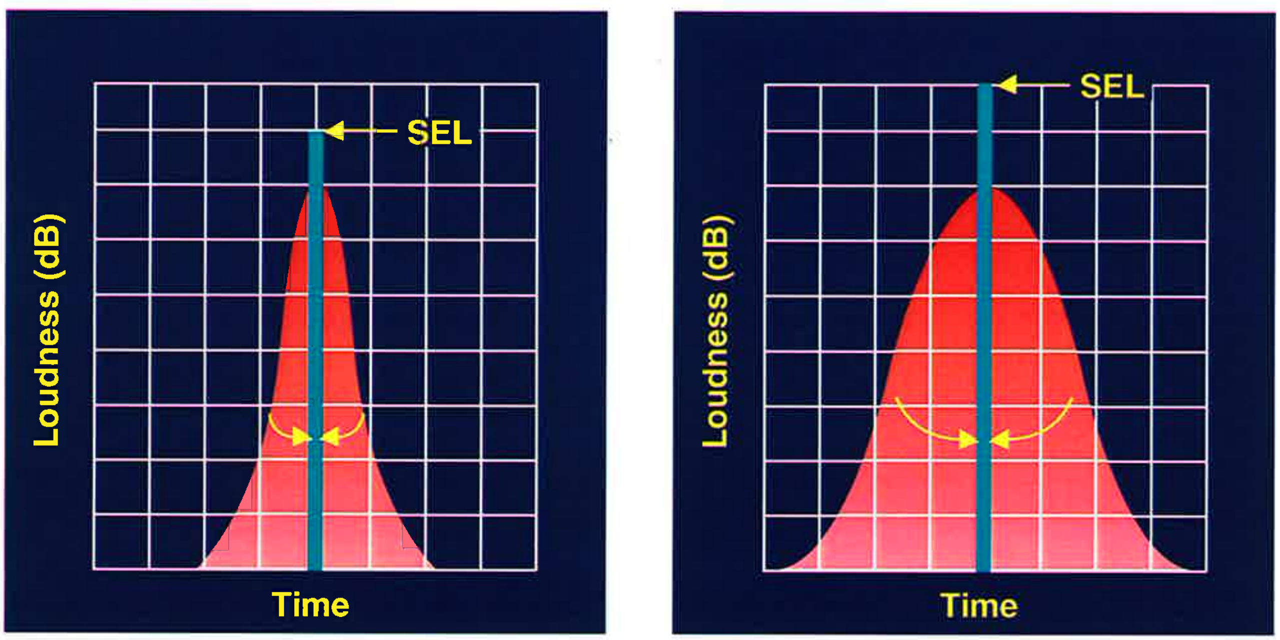


Two sound events with the same maximum sound level (L_{max}).



Different sound exposure levels (SEL) for two sound events with the same L_{max}.

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CAL.Sound Exhibit B
COMPARISON OF L_{max} AND SEL

When the time-of-day weight is expressed in decibels it is called a "decibel weight". This decibel weight is added to the noise level of each noise event. Thus a decibel weight of 10 when added to a 60 decibel nighttime event gives a value of 70 decibels to the event before it is transformed and added into the noise descriptor.

The nighttime decibel weight of 10 is equivalent to a tenfold increase in nighttime sound events. The evening decibel weight of 4.77 is equivalent to a threefold increase in evening sound events. Thus, when computing CNEL, evening events can be increased by 4.77 decibels or multiplied by three. Nighttime events may be increased by 10 decibels or multiplied by 10.

CNEL may be calculated from the hourly noise levels by the following equation:

$$CNEL = 10 Log(1/24[\sum antilog(HNLd/10) + 3\sum antilog(HNLe/10) + 10\sum antilog(HNLn/10)]$$

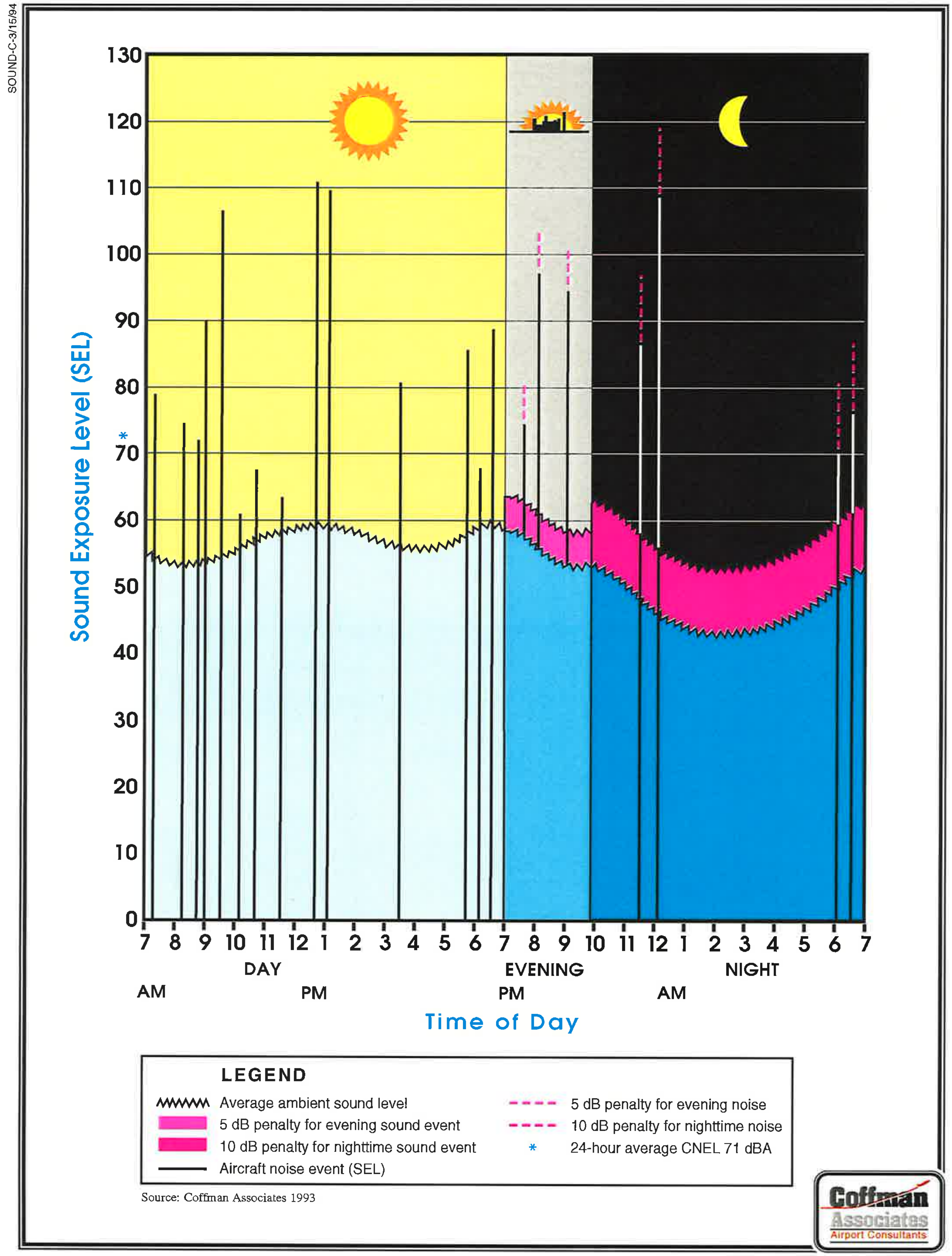
where HNLd, HNLe, and HNLn are the hourly noise levels for the daytime, evening, and nighttime hours. The sum of the evening noise levels is multiplied by three and the sum of the nighttime noise levels is multiplied by 10.

Another way of computing CNEL is described in this equation:

$$CNEL = 10 Log \frac{1}{86400}\left(\int_{day} 10^{LA/10} dt + \int_{evening} 10^{(LA+4.77)/10} dt + \int_{night} 10^{(LA+10)/10} dt\right)$$

where LA is the A-weighted sound level, measured with equipment meeting the requirements for sound level meters (as specified in a standard such as ANSI S1.4-1971), and dt is the duration of time in seconds. The averaging constant of 86,400 is the number of seconds in a day. The integrals are taken over the daytime, evening, and nighttime periods.

Exhibit C shows how the sound during a 24-hour period is weighted and averaged by the CNEL descriptor (or metric). In that example, the sound occurring during the period, including aircraft noise and background sound, yields a CNEL value of approximately 71. As a practical matter, this is a reasonably close estimate of the aircraft noise alone because, in this example, the background noise is low enough to contribute only a little to the overall CNEL value during the period of observation.



CAL.Sound Exhibit C

TYPICAL NOISE PATTERN AND CNEL SUMMATION

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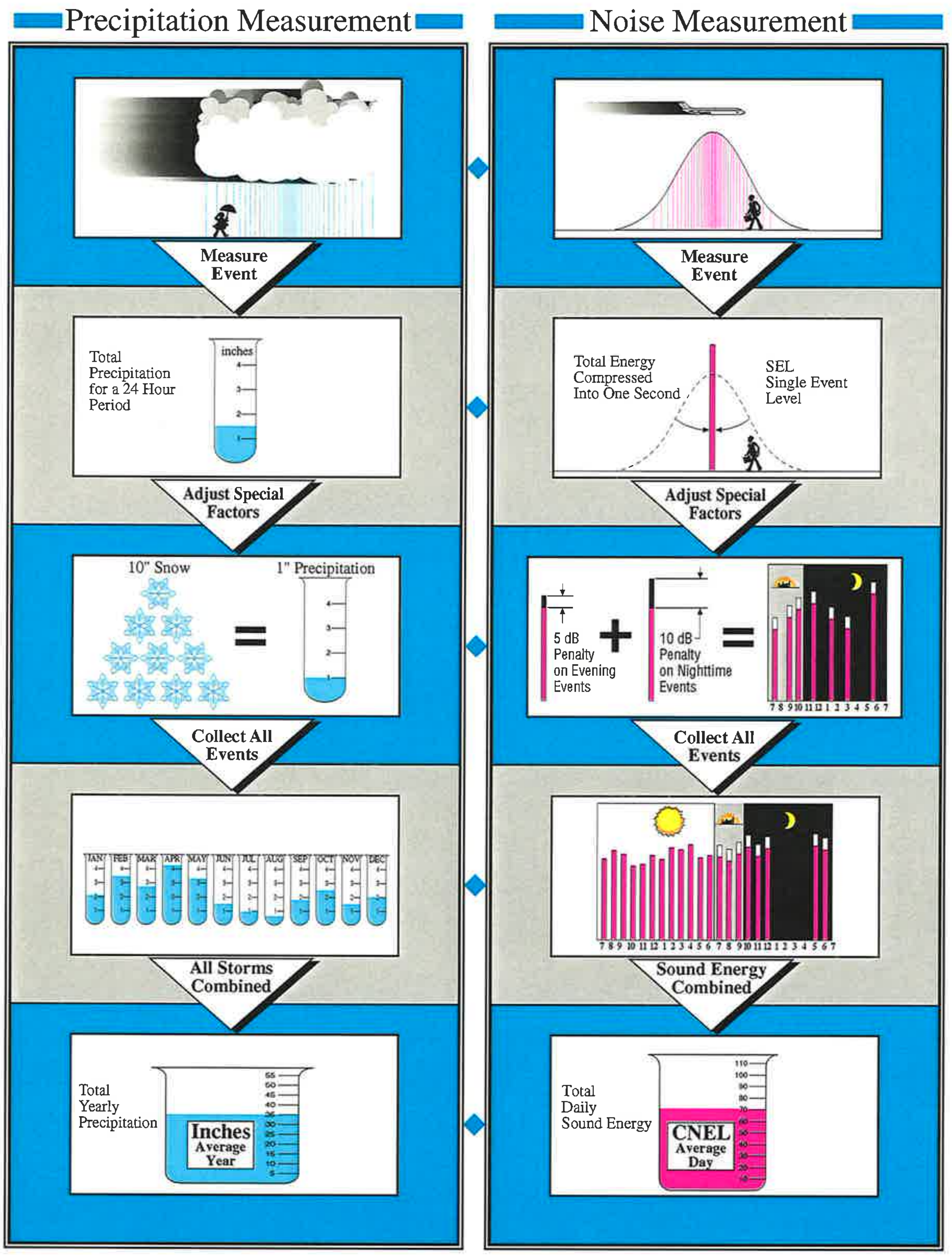

Source: Coffman Associates 1990

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CAL.Sound Exhibit D
PRECIPITATION AND NOISE MEASUREMENT COMPARISON

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EFFECTS OF NOISE EXPOSURE

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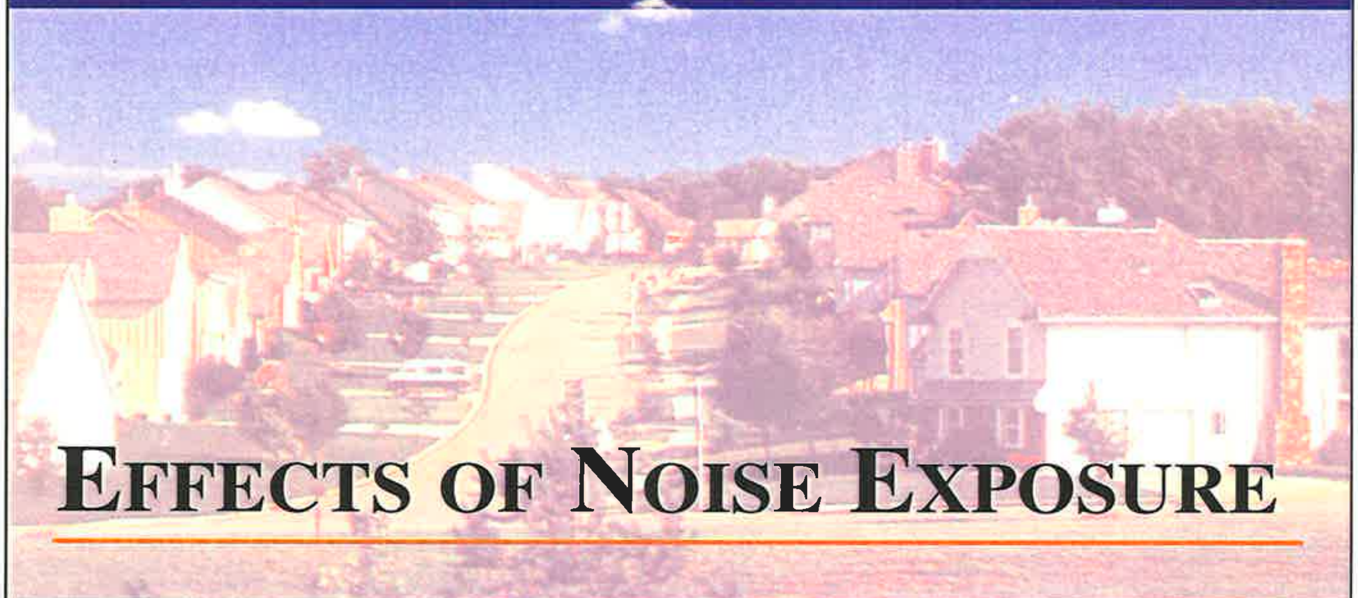


EFFECTS OF NOISE EXPOSURE

Aircraft noise can affect people both physically and psychologically. It is difficult, however, to make sweeping generalizations about the impacts of noise on people because of the wide variations in individual reactions. While much has been learned in recent years, some physical and psychological responses to noise are not yet fully understood and continue to be debated by researchers.

EFFECTS ON HEARING

Hearing loss is the major health danger posed by noise. A study published by the U.S. Environmental Protection Agency (1974) found that exposure to noise of 70 Leq or higher on a continuous basis, over a very long time, at the human ear's most damage-sensitive frequency may result in a very small but permanent loss of hearing. (Leq is a pure noise dosage metric, measuring cumulative noise energy over a given time.)

In *Aviation Noise Effects* (Newman and Beattie, 1985, pp. 33-42) three studies are cited which examined hearing loss among people living near airports. They found that, under normal circumstances, people in the community near an airport are at no risk of suffering hearing damage from aircraft noise.

The Occupational Safety and Health Administration (OSHA) has established standards for permissible noise exposure in the work place to guard against the risk of hearing loss. Hearing protection is required when noise levels exceed the legal limits. The standards, shown in **Table 1**, establish a sliding scale of permissible noise levels by duration of exposure. The standards permit noise levels of up to 90 dBA for eight hours per day without requiring hearing continuing, there is insufficient scientific evidence to support these concerns (Newman and Beattie 1985, pp. 59-62).

Taylor and Wilkins (1987, p. 4/10) offer the following conclusions in their review of the research.

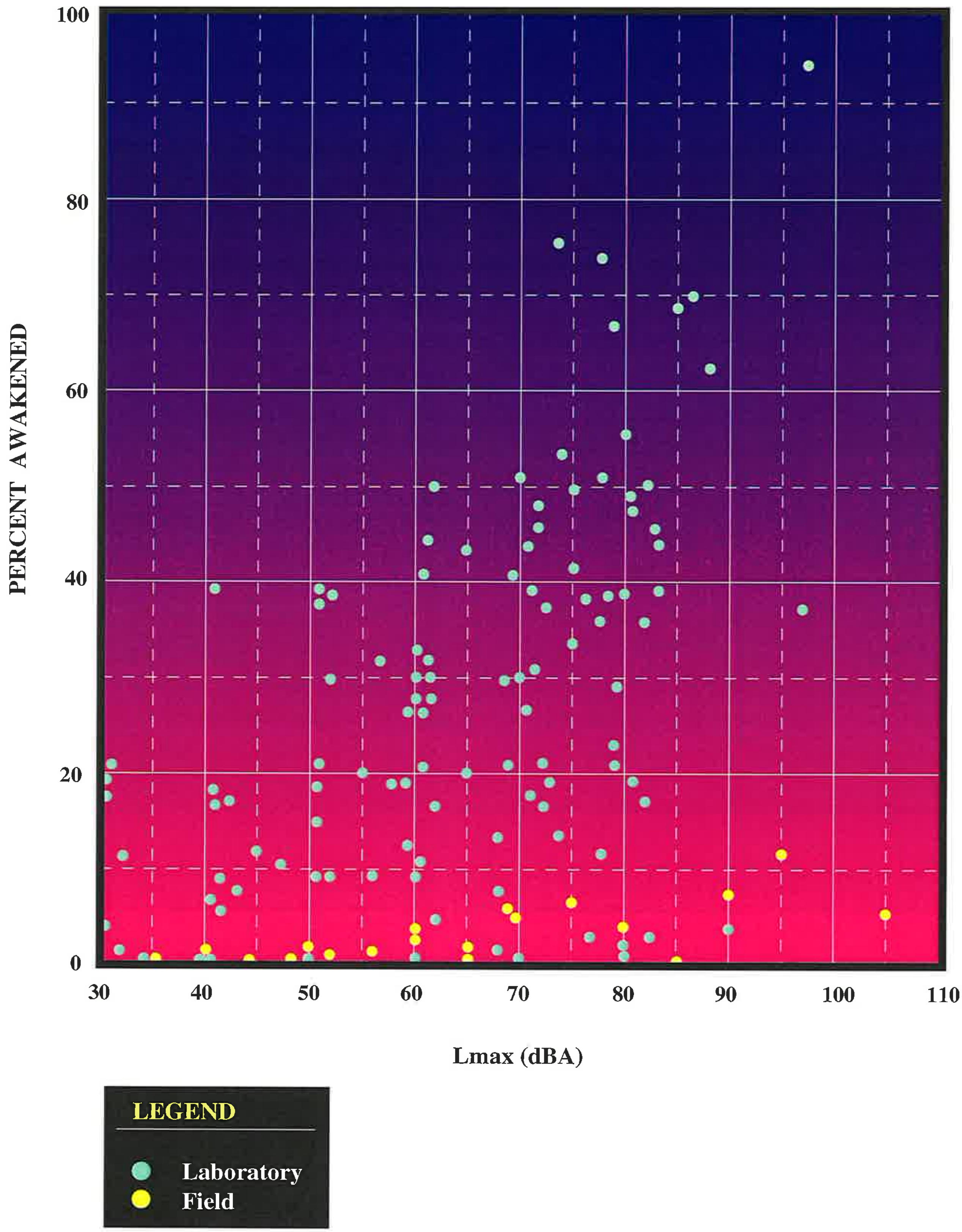
> The evidence of non-auditory effects of transportation noise is more ambiguous, leading to differences of opinion regarding the burden of prudence for noise control. There is no strong evidence that noise has a direct causal effect on such health outcomes as cardiovascular disease, reproductive abnormality, or psychiatric disorder. At the same time, the evidence is not strong enough to reject the hypothesis that noise is in some way involved in the multicausal process leading to these disorders. . . . But even with necessary improvements in study design, the inherent difficulty of isolating the effect of a low dose agent such as transportation noise within a complex aetiological system will remain. It seems unlikely, therefore, that research in the near future will yield findings which are definitive in either a positive or negative direction. Consequently, arguments for transportation noise control will probably continue to be based primarily on welfare criteria such as annoyance and activity disturbance.

Recent case studies on mental illness and hypertension indicate that this conclusion remains valid. Yoshida and Nakamura (1990) found that long-term exposure to sound pressure levels above 65 DNL may contribute to reported ill effects on mental well-being. This case study, however, concluded that more research is needed because the results also contained some contrary effects, indicating that in some circumstances, ill effects were negatively correlated with increasing noise.

Griefahn (1992) studied the impact of noise exposure ranging from 62 dBA to 80 dBA on people with hypertension. She found that there is a tendency for vasoconstriction to increase among untreated hypertensive people as noise level increases. However, she also found that beta blocking medication prevented any increase in vasoconstriction attributable to noise. She concluded that while noise may be related to the onset of hypertension, especially in the presence of other risk factors, hypertensive people do not run a higher risk of ill-health effects if they are properly treated.

SLEEP DISTURBANCE

There is a large body of research documenting the effect of noise on sleep disturbance, but the long-range effects of sleep disturbance caused by nighttime airport operations are not well understood. It is clear that sleep is essential for good physical and emotional health, and noise can interfere with sleep, even when the sleeper is not consciously awakened. While the long-term effect of sleep deprivation on mental and physical function is not clear, it is known to be harmful. It is also known that sleepers do not fully adjust to noise disruption over time. Although they may awaken less often and have fewer conscious memories of disturbance, noise-induced shifts in sleep levels continue to occur.



Source: Pearsons, K.S. et al. 1990.

Effects Exhibit A
COMPARISON OF AWAKENING DUE TO NOISE EVENTS FROM LABORATORY VERSUS FIELD STUDIES

homes are fully habituated to their environment, including the noise levels.

Finegold et al. (1994) reviewed the data in the Pearsons report of 1990 and developed a regression analysis. As shown in **Exhibit B**, an exponential curve was found to fit the categorized data reasonably well. They recommend that this curve be used as a provisional means of predicting potential sleep disturbance from aircraft noise. They caution that because the curve was derived using Pearsons' laboratory, as well as in-home, data, the predictions of sleep disruption in an actual community setting derived from this curve are likely to be high.

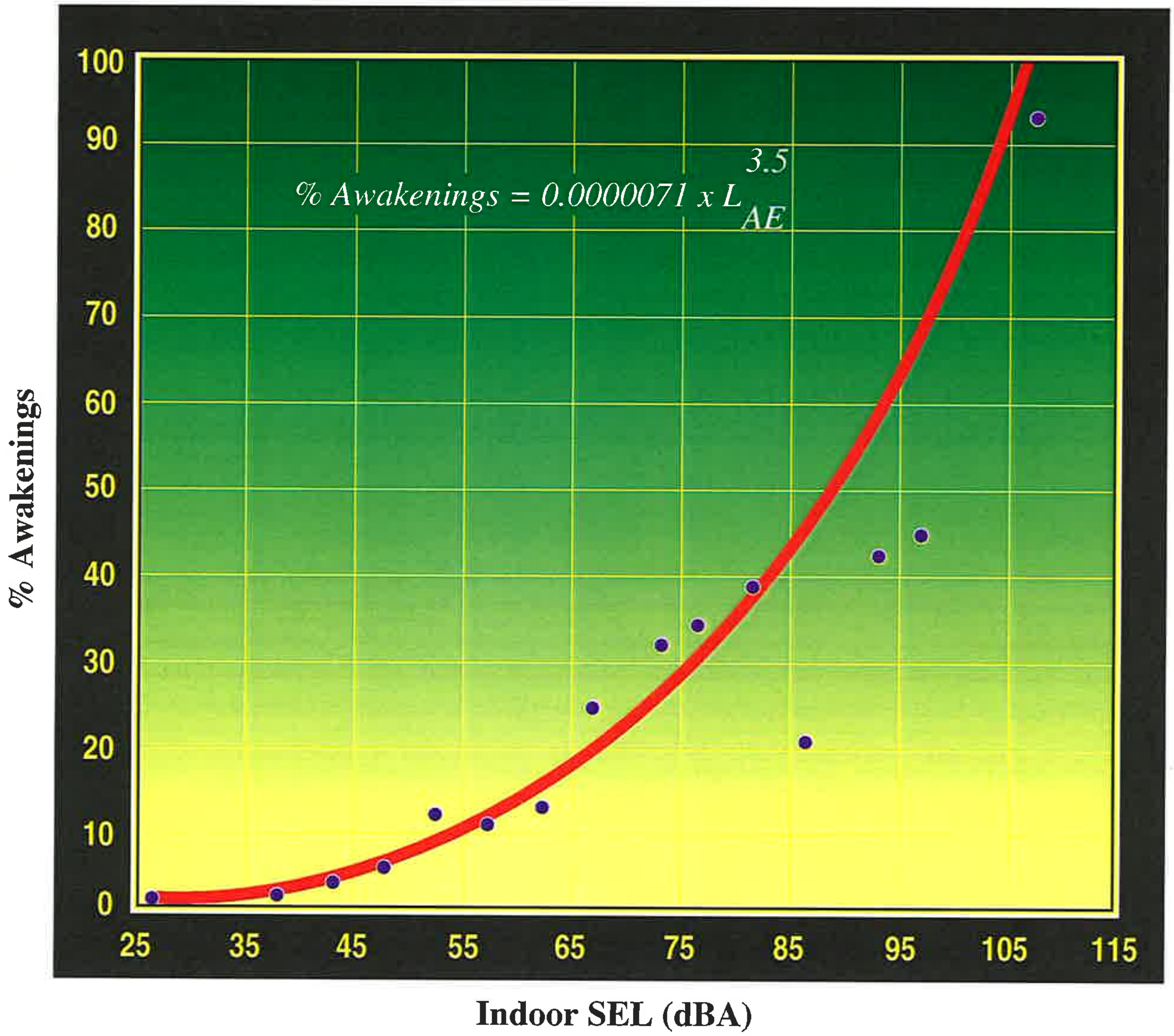
The findings of many of these sleep disturbance studies, while helping to answer basic research questions, are of little usefulness to policy makers and airport residents. For them, the important question is, "When does sleep disturbance caused by environmental noise become severe enough to constitute a problem in the community?" Kryter (1984, pp. 434-443) reviews in detail one important study that sheds light on this question. The Directorate of Operational Research and Analysis (DORA) of the British Civil Aviation Authority conducted an in-depth survey of 4,400 residents near London's Heathrow and Gatwick Airports over a four-month period in 1979 (DORA 1980). The study was intended to answer two policy-related questions: "What is the level of aircraft noise which will disturb a sleeping person?" and "What level of aircraft noise prevents people from getting to sleep?"

Analysis of the survey results indicated that the best correlations were found using cumulative energy dosage metrics, namely Leq. Kryter notes that support for the use of the Leq metric is provided by the finding that some respondents could not accurately recall the time association of a specific flight with an arousal from sleep. This suggests that the noise from successive overflights increased the general state of arousability from sleep.

With regard to difficulty in getting to sleep, the study found 25 percent of the respondents reporting this problem at noise levels of 60 Leq, 33 percent at 65 Leq, and 42 percent at 70 Leq. The percentage of people who reported being awakened at least once per week by aircraft noise was 19 percent at 50 Leq, 24 percent at 55 Leq, and 28 percent at 60 Leq. The percentage of people bothered "very much" or "quite a lot" by aircraft noise at night when in bed was 22 percent at 55 Leq and 30 percent at 60 Leq. Extrapolation of the trend line would put the percentage reporting annoyance at 65 Leq well above 40 percent.

DORA concluded with the following answers to the policy-related questions: (1) A significant increase in reports of sleep arousal will occur at noise levels at or above 65 Leq; (2) A significant increase in the number of people reporting difficulty in getting to sleep will occur at noise levels at or above 70 Leq. Kryter disagrees with these findings. He believes that a more careful reflection upon the data leads to the conclusion that noise levels

EFFECTS B-8/1/94



***Note:** Based on laboratory and field data reported in Pearsons et al. 1989.*

Source: Finegold et al. 1994.

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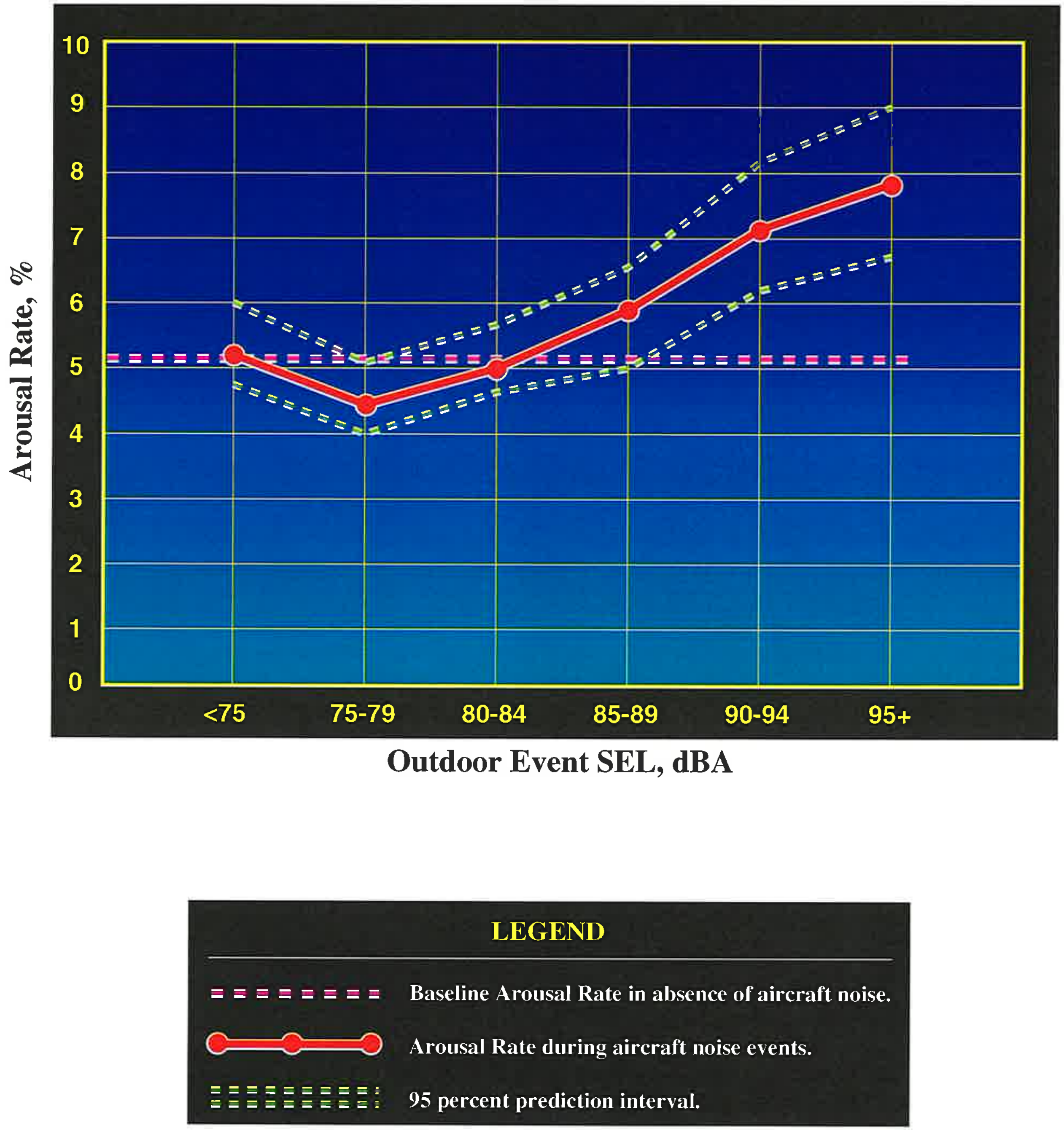
Effects Exhibit B
FINEGOLD'S SLEEP DISTURBANCE CURVE

EFFECTS C-7/1/94



Note: Estimates controlled for the effects of individual arousability

Source: Ollerhead, J.B. et al. 1992, p.25.

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Effects Exhibit C
RELATIONSHIP BETWEEN AVERAGE SLEEP DISTURBANCE AND AIRCRAFT NOISE LEVEL

residents near airports, especially when it is accompanied by high audible sound levels, it rarely carries enough energy to damage safely constructed structures. High-impulse sounds such as blasting, sonic booms, and artillery fire are more likely to cause damage than continuous sounds such as aircraft noise. A document published by the National Academy of Sciences suggested that one may conservatively consider noise levels above 130 dB lasting more than one second as potentially damaging to structures (CHABA 1977). Aircraft noise of this magnitude occurs on the ramp and runway and seldom, if ever, occurs beyond the boundaries of a commercial or general aviation airport.

The risk of structural damage from aircraft noise was studied as part of the environmental assessment of the Concorde supersonic jet transport. The probability of damage from Concorde overflights was found to be extremely slight. Actual overflight noise from the Concorde at Sully Plantation near Dulles International Airport in Fairfax County, Virginia was recorded at 115 dBA. No damage to the historic structures was found, despite their age. Since the Concorde causes significantly more vibration than conventional commercial jet aircraft, the risk of structural damage caused by aircraft noise near airports is considered to be negligible (Hershey et al. 1975; Wiggins 1975).

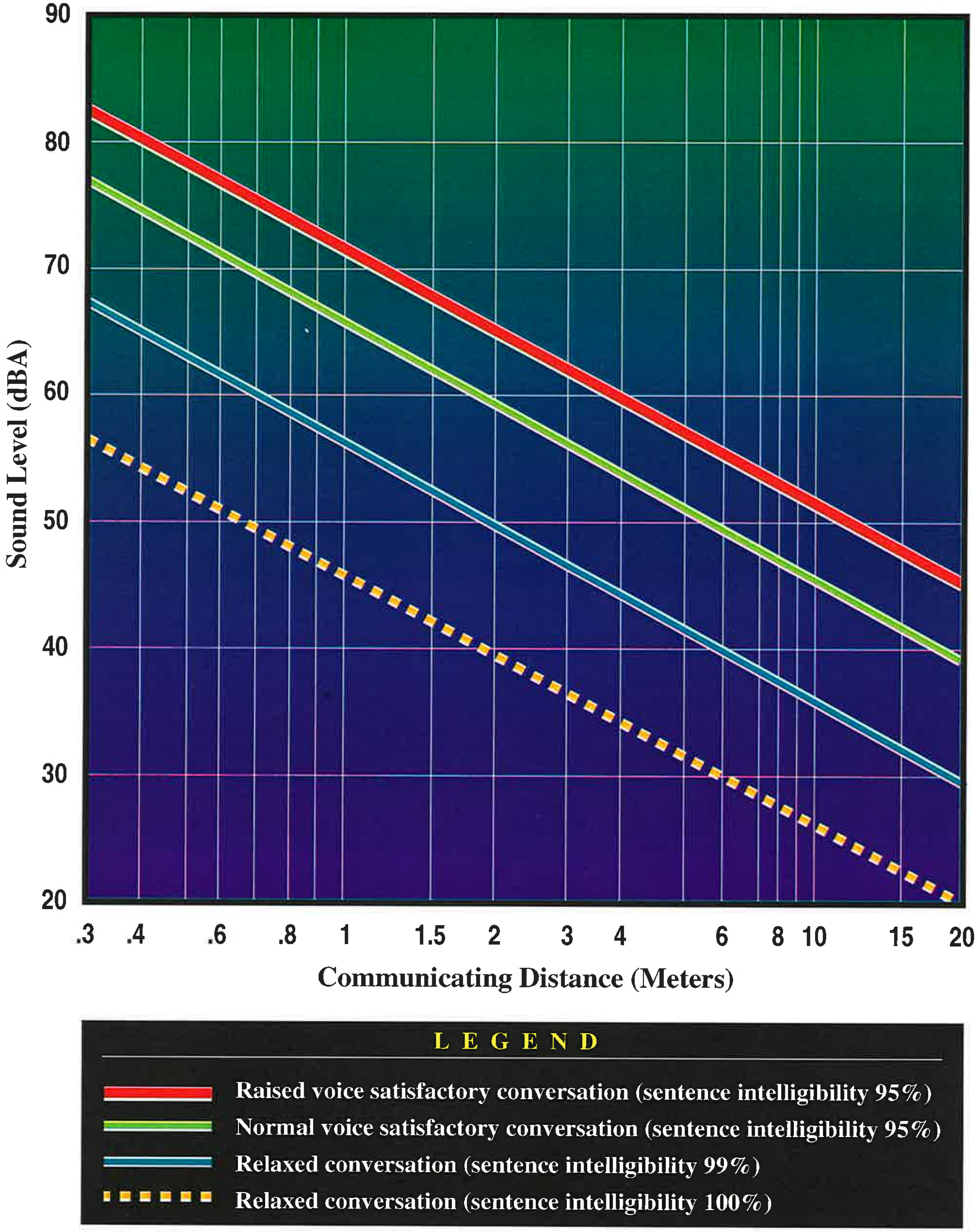
OTHER ANNOYANCES

The psychological impact of aircraft noise is a more serious concern than direct physical impact. Studies conducted in the late 1960s and early 1970s found that the interruption of communication, rest, relaxation, and sleep are important causes for complaints about aircraft noise. Disturbance of television viewing, radio listening, and telephone conversations are also sources of serious annoyance.

Exhibit D shows the relationship between sound levels and communicating distance for different voice levels. Assuming a communicating distance of 2 meters, communication becomes unsatisfactory with a steady noise level above about 65 decibels. At 65 decibels, a raised voice is required to maintain satisfactory conversation. Another way to interpret this is that a raised voice would be interrupted by a sound event above 65 decibels. A normal voice would be interrupted, at two meters, by a sound event of 60 decibels.

Exhibit E shows the impact of aircraft noise on conversation and radio or television listening. These results, summarized by Schultz (1978), were derived from surveys conducted in London, France, Munich, and Switzerland. Differences in the amount of disturbance reported in each study are based on how each survey defined disturbance. The British study counted mild disturbance, the French moderate disturbance, and the German and Swiss great disturbance.

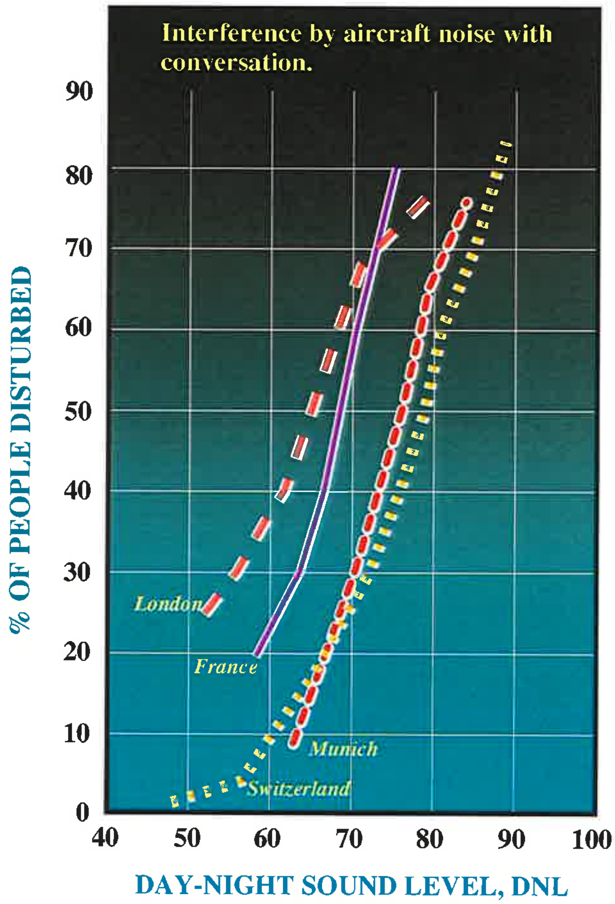
In the case of conversation disruption, nine percent were greatly annoyed by noise of 60 DNL in the Swiss study. About 12 to

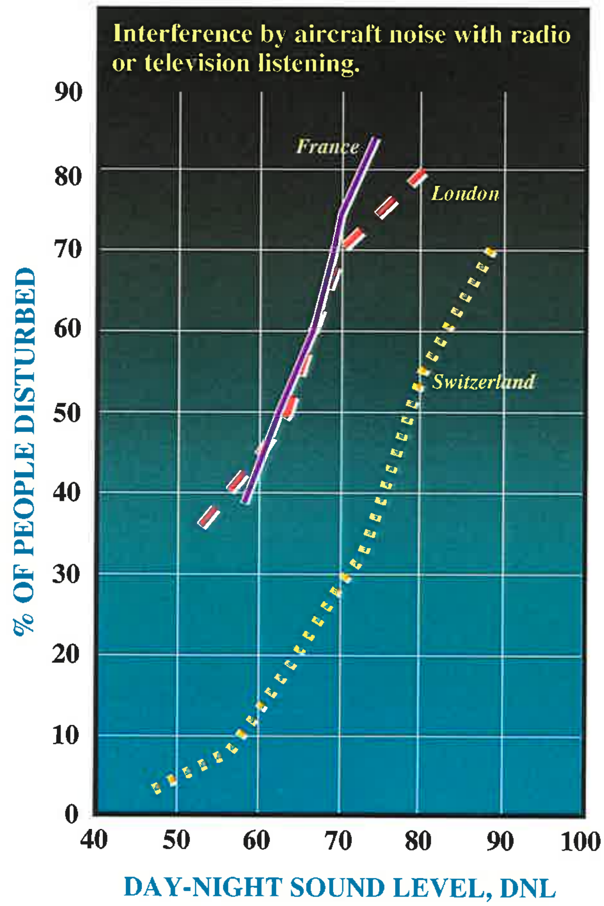


Source: U.S. Environmental Protection Agency, 1974. Cited in Caltrans, 1993.

Effects Exhibit D
MAXIMUM DISTANCES OUTDOORS OVER WHICH CONVERSATION IS SATISFACTORILY INTELLIGIBLE IN STEADY NOISE

EFFECTS E-8/1/94





NOTE:

Differences in amount of interference reported are related to how individual surveys defined interference. London counted mild disturbance, France moderate disturbance, and Munich and Switzerland great disturbance.

Source: Schultz, T. J. 1978.

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Effects Exhibit E
INTERFERENCE BY AIRCRAFT
NOISE WITH VARIOUS ACTIVITIES

(See DORA 1980; Fidell et al. 1989; Finegold et al. 1992 and 1994; Great Britain Committee on the Problem of Noise 1963; Kryter 1970; Richards and Ollerhead 1973; Schultz 1978; U.S. EPA 1974.) These studies have produced similar results, finding that annoyance is most directly related to cumulative noise exposure, rather than single-event exposure.

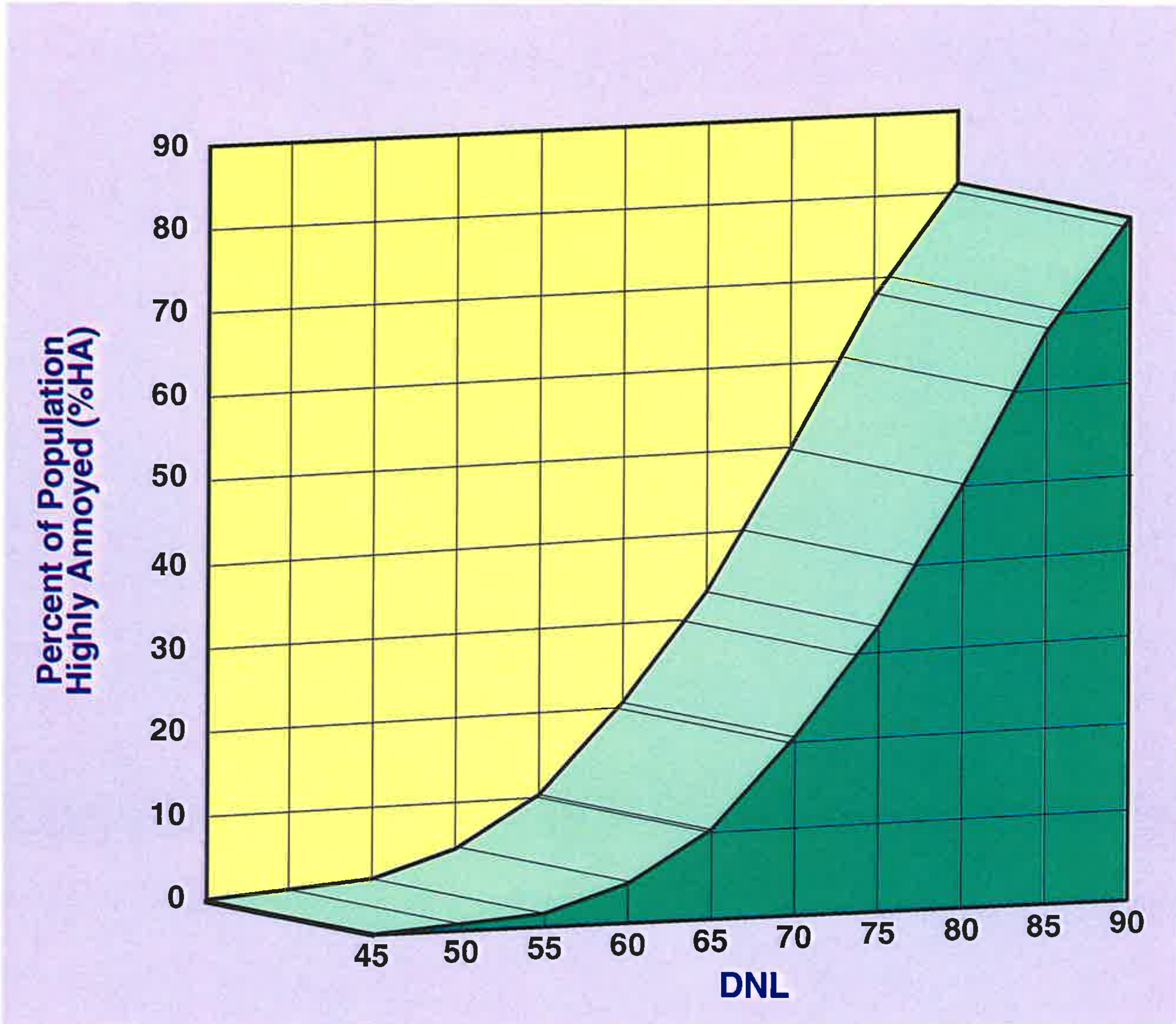
Annoyance has been found to increase along an S-shaped or logistic curve as cumulative noise exposure increases, as shown in **Exhibit F**. Developed by Finegold et al. (1992 and 1994), it is based on data derived from a number of studies of transportation noise (Fidell 1989). It shows the relationship between DNL levels and the percentage of people who are highly annoyed. Known as the "updated Schultz Curve", because it is based on the work of Schultz (1978), it represents the best available source of data for the noise dosage-response relationship (FICON 1992, Vol. 2, pp. 3-5; Finegold et al. 1994, pp. 26-27).

The updated Schultz Curve shows that annoyance is measurable beginning at 45 DNL, where 0.8 percent of people are highly annoyed. It increases gradually to 6.1 percent at 60 DNL. Starting at 65 DNL, the percentage of people expected to be highly annoyed increases steeply from 11.6 percent up to 68.4 percent at 85 DNL. Note that this relationship includes only those reported to be "highly annoyed". Based on other research, the percentages would be considerably higher if they also included those who were "moderately or mildly annoyed" (Richards and Ollerhead 1973; Schultz 1978).

SUMMARY

The effects of noise on people 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 is 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, making it very difficult to predict how any person is likely to react to environmental noise. The average response among a large group of people, however, is much less variable and has been found to correlate well with cumulative noise dosage metrics such as Leq, DNL, and CNEL. The development of aircraft noise impact analysis techniques has been based on this relationship between average community response and cumulative noise exposure.



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

Source: Finegold et al. 1992 and 1994.

PERCENT HIGHLY ANNOYED AT SELECTED NOISE LEVELS

DNL	45	50	55	60	65	70	75	80	85	90
%HA	0.8%	1.6%	3.1%	6.1%	11.6%	20.9%	34.8%	51.7%	68.4%	81.3%

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Effects Exhibit F
PERCENTAGE OF POPULATION HIGHLY ANNOYED
BY GENERAL TRANSPORTATION NOISE

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TECHNICAL INFORMATION PAPER

MEASURING THE IMPACT OF NOISE ON PEOPLE

MEASURING THE IMPACT OF NOISE ON PEOPLE

In aircraft noise analysis, the effect of noise on residents near airports is often the most important concern. While certain public institutions and, at very high noise levels, some types of businesses may also be disturbed by noise, people in their homes are typically the most vulnerable to noise problems.

The most common way to measure the impact of noise on residents is to estimate the number of people residing within the noise contours. This is done by overlaying noise contours on census block maps or on maps of dwelling units. The number of people within each 5 DNL range (e.g. from 65 to 70 DNL, from 70 to 75 DNL, etc.) is then estimated.

This is the approach required in F.A.R. Part 150 noise compatibility studies. While it has the advantage of simplicity, it has one disadvantage: it implicitly assumes that all people are equally affected by noise, regardless of the noise level they experience. Clearly, however, the louder the noise, the greater the noise problem. As noise increases, more people become concerned about it, and the concerns of each individual become more serious.

AVERAGE COMMUNITY RESPONSE TO NOISE

Individual human response to noise is highly variable and is influenced by many factors. These include emotional variables, feelings about the necessity or preventability of the noise, judgments about the value of the activity creating the noise, an individual's activity at the time the noise is heard, general sensitivity to noise, beliefs about the impact of noise on health, and feelings of fear associated with the noise.

A similar graph is shown in **Exhibit B**. Developed by Finegold et al. (1992 and 1994), it is based on data derived from a number of studies of transportation noise (Fidell 1989). It shows the relationship between DNL levels and the percentage of people who are highly annoyed. Known as the "updated Schultz Curve", because it is based on the work of Schultz (1978), it represents the best available source of data for the noise dosage-response relationship (FICON 1992, Vol. 2, pp. 3-5; Finegold et al. 1994, pp. 26-27).

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THE DEVELOPMENT OF WEIGHTING FUNCTIONS

Recognizing the tendency of annoyance response rates to increase systematically as noise increases, researchers in the 1960s began developing weighting functions to help estimate the total impact of noise on a population (CHABA 1977, p, B-1). The population impacted by noise at a given level would be multiplied by the appropriate weighting function. The higher the noise level, the higher the weighting function. The results for all noise levels would be added together. The sum would be a single number purported to represent the net impact of noise on the affected population.

The CHABA report (p. VII-5) recommended the use of the original Schultz curve as the basis for developing weighting functions. It recommended that weighting functions be developed by calculating the percentage of people likely to be highly annoyed by noise at various DNL levels. These values were then converted to weighting functions by arbitrarily setting the function for 75 DNL at 1.00. Functions for the other noise levels were set in proportion to the percent highly annoyed. The results of applying these weighting functions to a population was known as the "sound level weighted population" impacted by noise, or the "level-weighted population".

UPDATED LEVEL-WEIGHTED POPULATION FUNCTIONS

As discussed above, the original Schultz curve has been updated to take into account additional studies of community response to noise. The updated curve is shown in **Exhibit B**. Coffman Associates has updated the weighting functions developed by CHABA (1977, p. B-7) to correspond with the updated Schultz curve. Table 1 shows the percentage of people likely to be highly annoyed by aircraft noise for 5 DNL increments ranging from 45 to 80 DNL. It also shows weighting functions for use in calculating level-weighted population. These were developed by setting the

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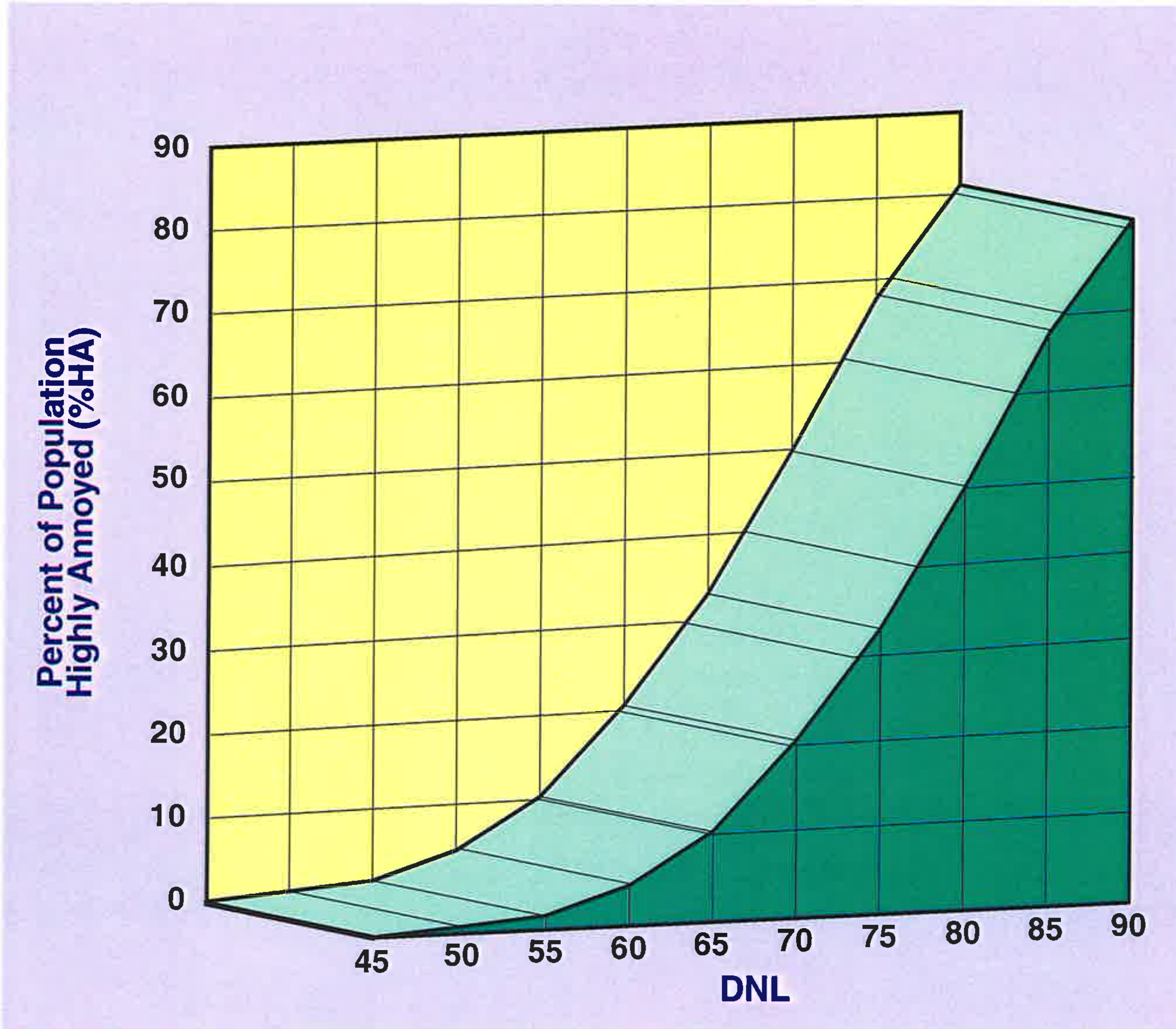

Equation for Curve: $\% HA = \frac{100}{1 + e^{(11.13 - .14 Ldn)}}$

Source: Finegold et al. 1992 and 1994.

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LWP Exhibit B
PERCENTAGE OF POPULATION HIGHLY ANNOYED
BY GENERAL TRANSPORTATION NOISE

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TECHNICAL INFORMATION PAPER

NOISE AND LAND USE COMPATIBILITY GUIDELINES

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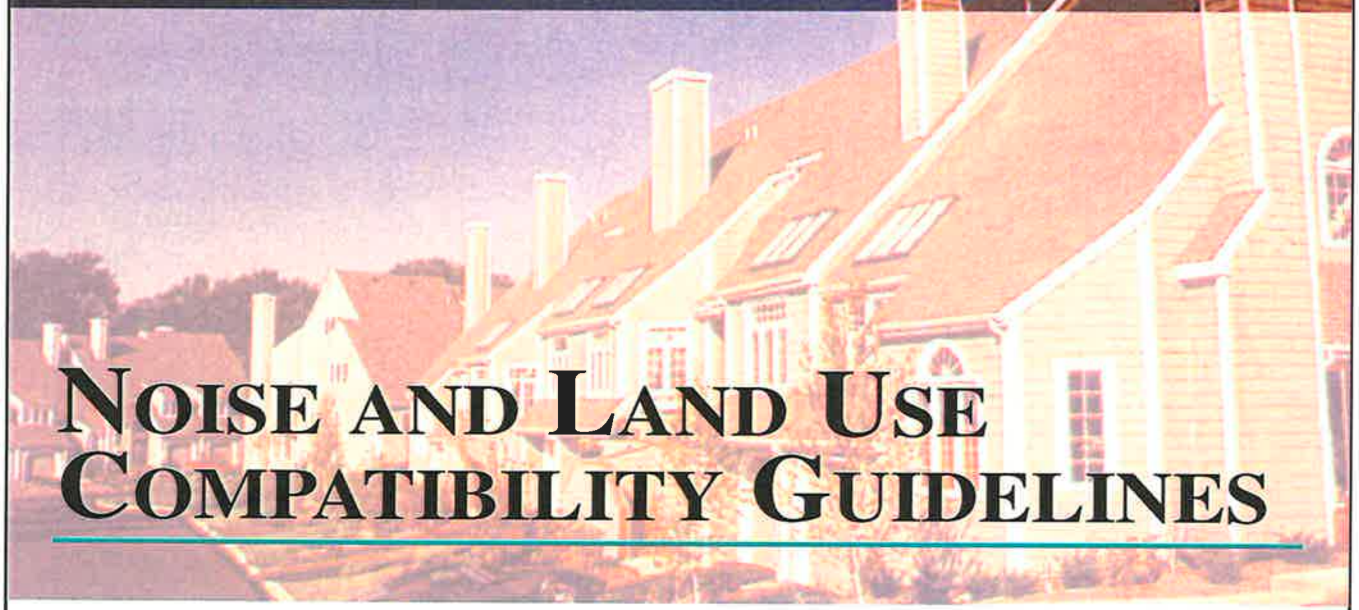
Technical Information Paper



Noise and Land Use Compatibility Guidelines

Aircraft noise is often the most noticeable environmental effect an airport will produce on the surrounding community. If the sound is sufficiently loud or frequent in occurrence, it may interfere with various activities or be considered objectionable.

Individual human response to noise is highly variable and is influenced by many factors. Despite the variation among individuals, the average response among a group of people is much less variable. This enables us to make reasonable evaluations of the average impacts of aircraft noise on a community.

According to the scientific research, noise response is most readily correlated with noise as measured with cumulative noise metrics. A variety of cumulative noise exposure metrics have been used in research studies over the years. In the United States, the DNL (day-night noise level) metric has been widely used. DNL accumulates the total noise occurring during a 24-hour period, with a 10 decibel penalty applied to noise occurring between 10:00 p.m. and 7:00 a.m. DNL correlates well with average community response to noise. (For more information on noise measurement, see the TIP entitled, "The Measurement and Analysis of Sound".)

The results of studies on community noise impacts show that the number of people expressing concerns with noise increases as the noise level increases. The level of concern increases along an S-shaped curve, as shown in **Exhibit A.** Research has shown that even at extremely high noise levels, there are at least some people, albeit a small percentage, who are not annoyed. Conversely, it also shows that at even very low noise levels, at least some people will be annoyed.

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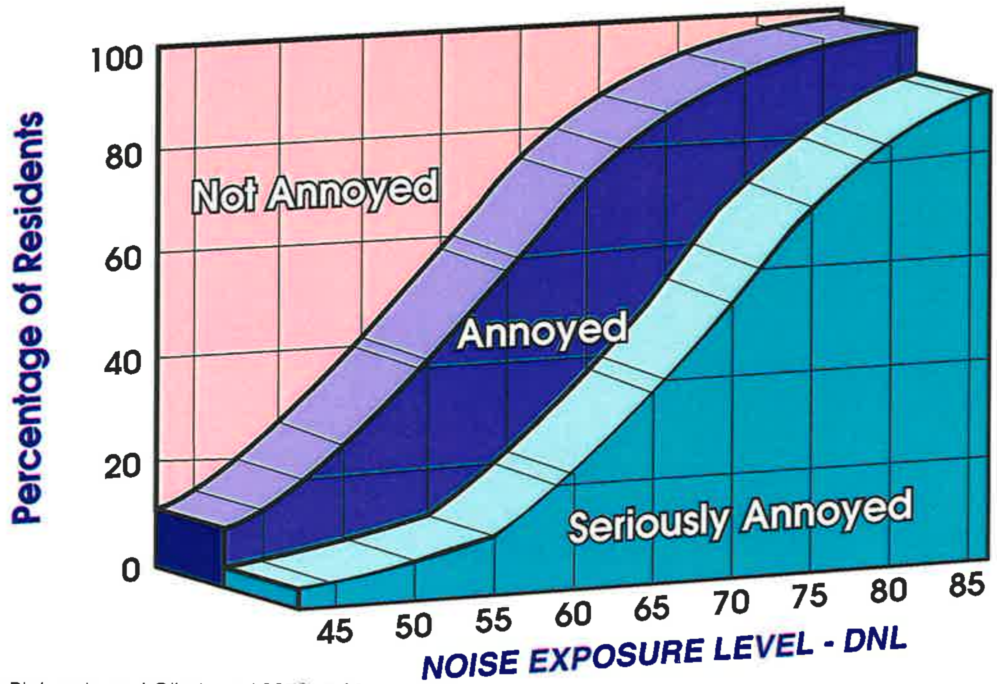
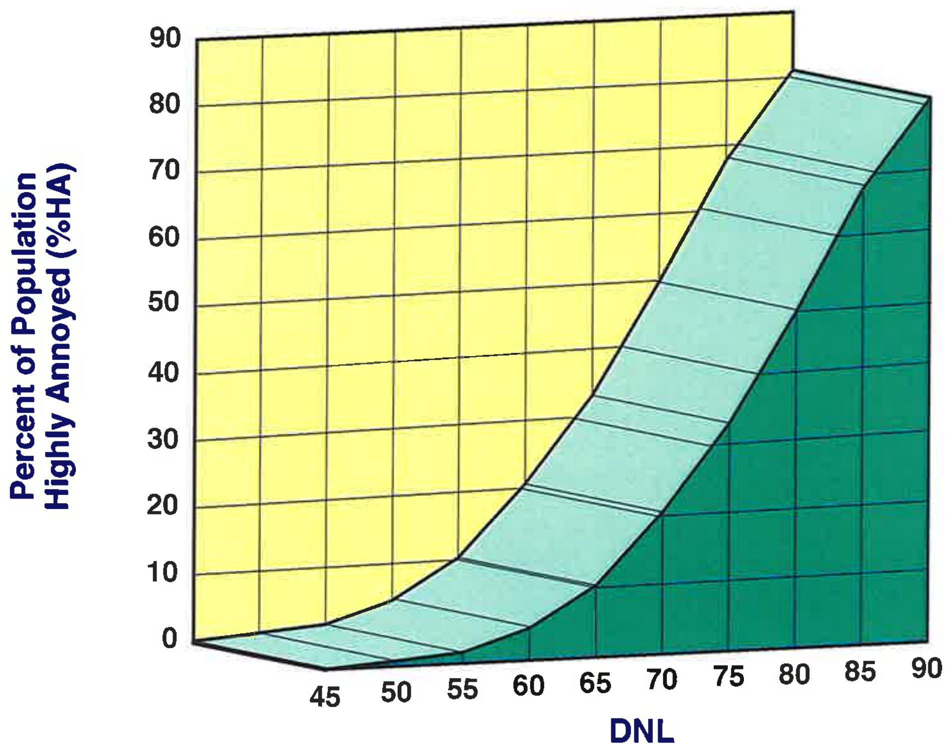
LAND USE A-7/22/94



Source: Richards and Ollerhead 1973, p.31



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

Source: Finegold et al. 1992 and 1994.

UPDATED SCHULTZ CURVE

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Land Use Exhibit A
ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL AREAS

The concept of "land use compatibility" has arisen from this systematic variation in human tolerance to aircraft noise. Since the 1960s, many different sets of land use compatibility guidelines have been proposed and used. This section reviews some of the more well known guidelines.

FEDERAL LAND USE COMPATIBILITY GUIDELINES

FAA-DOD Guidelines

In 1964, the Federal Aviation Administration (FAA) and the U.S. Department of Defense (DOD) published similar documents setting forth guidelines to assist land use planning in areas subjected to aircraft noise from nearby airports. These are presented in **Table 1.** The guidelines establish three zones, describing the expected responses to aircraft noise from residents of each zone. In Zone 1, corresponding to areas exposed to noise below 65 DNL, essentially no complaints would be expected, although noise could be an occasional nuisance. In Zone 2, corresponding to 65 to 80 DNL, individuals may complain, perhaps vigorously. In Zone 3, corresponding to 80 DNL and above, vigorous complaints would be likely and concerted group action could be expected.

TABLE 1
Chart for Estimating Response of Communities Exposed to Aircraft Noise
1964 FAA-DOD Guidelines

Noise Rating	Zone	Description of Expected Response
Less than 65 Ldn 100 CNR	1	Essentially no complaints would be expected. The noise may, however, interfere occasionally with certain activities of the residents.
65 to 80 Ldn 100 to 115 CNR	2	Individuals may complain, perhaps vigorously. Concerted group action is possible.
Greater than 80 Ldn 115 CNR	3	Individual reactions would likely include repeated, vigorous complaints. Concerted group action might be expected.

Note: CNR stands for "community noise rating", a cumulative noise descriptor similar to Ldn which is no longer in general use.

Source: U.S. DOD 1964. Cited in Kryter 1984, p. 616.

HUD Guidelines

In 1971, the U.S. Department of Housing and Urban Development published noise assessment guidelines for evaluating the acceptability of sites for housing assistance. The guidelines, shown in **Table 2,** establish four classes of noise impact. The first two categories refer to areas outside the 65 DNL contour, the first at a distance exceeding the distance between the 65 and 75 DNL contours, the second at a lesser distance. Housing be considered. LUG Zone C is subject to significant exposure, and various land use controls are recommended. In LUG Zone D, severe exposure, containment of the area within airport property, or other positive control measures, are suggested.

TABLE 3
Summary of Noise Levels Identified as Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety
1974 EPA Guidelines

Effect	Level	Area
Hearing Loss	74 Ldn +	All areas
Outdoor activity interference and annoyance	55 Ldn +	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	59 Ldn +	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	45 Ldn +	Indoor residential areas
	49 Ldn +	Other indoor areas with human activities such as schools, etc.

Note: All Leq values from EPA document converted by FAA to Ldn for ease of comparison (Ldn = Leq (24) + 4 dB).

Source: U.S. EPA 1974. Cited in FAA 1977a, p. 26.

In LUG Chart II, **Exhibit C**, most noise-sensitive uses are suggested as appropriate only within LUG Zone A. These include single-family and two-family dwellings, mobile homes, cultural activities, places of public assembly, and resorts and group camps. Uses suggested for Zones A and B include multi-family dwellings and group quarters; financial, personal, business, governmental, and educational services; and manufacturing of precision instruments. In Zones C and D, various manufacturing, trade, service, resource production, and open space uses are suggested.

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LAND USE		LUG ZONE[1]	
SLUCM NO.	NAME	SUG-GESTED	STUDY
10	Residential.	A-B	
11	Household units.		
11,11	Single units--detached.	A	
11,12	Single units--semiattached.	A	
11,13	Single units--attached row.	B	
11,21	Two units--side-by-side.	A	
11,22	Two units--one above the other.	A	
11,31	Apartments--walk up.	B	
11,32	Apartments--elevator.	B-C	
12	Group quarters.	A-B	
13	Residential hotels.	B	
14	Mobile home parks or courts.	A	
15	Transient lodgings.	C	
19	Other residential.	A-C	
20	Manufacturing.[2]	C-D	
21	Food and kindred products--manufacturing.		
22	Textile mill products--manufacturing.	C-D	
23	Apparel and other finished products made from fabrics, leather, and similar materials--manufacturing.	C-D	
24	Lumber and wood products (except furniture)--manufacturing.	C-D	
25	Furniture and fixtures--manufacturing.	C-D	
26	Paper and allied products--manufacturing.	C-D	
27	Printing, publishing, and allied industries.	C-D	
28	Chemicals and allied products--manufacturing.	C-D	
29	Petroleum refining and related industries.[3]	C-D	
30	Manufacturing (Continued).[2]		
31	Rubber and miscellaneous plastic products--manufacturing.	C-D	
32	Stone, clay, and glass products--manufacturing.	C-D	
33	Primary metal industries.	D	
34	Fabricated metal products--manufacturing.	D	
35	Professional, scientific, and controlling instruments: photographic and optical goods; watches and clocks--manufacturing.	B	
39	Miscellaneous manufacturing.	C-D	
40	Transportation, communication, and utilities.		
41	Railroad, rapid rail transit, and street railway transportation.	D	
42	Motor vehicle transportation.	D	
43	Aircraft transportation.	D	
44	Marine craft transportation.	D	
45	Highway and street right-of-way.	D	
46	Automobile parking.	D	
47	Communication.	A-D	
48	Utilities.	D	
49	Other transportation communication and utilities.	A-D	

LAND USE		LUG ZONE[1]	
SLUCM NO.	NAME	SUG-GESTED	STUDY
50	Trade.[4]		
51	Wholesale trade.	C-D	
52	Retail trade--building materials, hardware, and farm equipment.	C	
53	Retail trade--general merchandise.	C	
54	Retail trade--food.	C	
55	Retail trade--automotive, marine craft, aircraft, and accessories.	C	
56	Retail trade--apparel and accessories.	C	
57	Retail trade--furniture, home furnishings, and equipment.	C	
59	Retail trade--eating and drinking. Other retail trade.	C-D	
60	Services.[4]		
61	Finance, insurance, and real estate services.	B	
62	Personal services.	B	
63	Business services.	B	
64	Repair services.	C	
65	Professional services.	B-C	
66	Contract construction services.	C	
67	Governmental services.	B	
68	Educational services.	A-B	
69	Miscellaneous services.	A-C	
70	Cultural, entertainment, and recreational.		
71	Cultural activities and nature exhibitions.	A	
72	Public assembly.	A	
73	Amusements.	C	
74	Recreational activities.[5]	B-C	
75	Resorts and group camps.	A	
76	Parks.	A-C	
79	Other cultural, entertainment, and recreational.[5]	A-B	
80	Resource production and extraction.		
81	Agriculture.	C-D	
82	Agricultural related activities.	C-D	
83	Forestry activities and related services.	D	
84	Fishing activities and related services.	D	
85	Mining activities and related services.	D	
89	Other resource production and extraction.	C-D	
90	Undeveloped land and water areas.		
91	Undeveloped and unused land area (excluding noncommercial forest development).	D	
92	Noncommercial forest development.	D	
93	Water areas.	A-D	
94	Vacant floor area.	A-D	
95	Under construction.	A-D	
99	Other undeveloped land and water areas.	A-D	

1. Refer to Land Use Guidance Chart I, Exhibit C-1.
2. Zone "C" suggested maximum except where exceeded by self generated noise.
3. Zone "D" for noise purposes; observe normal hazard precautions.
4. If activity is not in substantial, air-conditioned building, go to next higher zone.
5. Requirements likely to vary - individual appraisal recommended.

SLUCM: *Standard Land Use Coding Manual*, U.S. Urban Renewal Administration and Bureau of Public Roads, 1965.

Source: FAA 1977b, p. 14.

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Land Use Exhibit C
LAND USE GUIDANCE CHART II:
LAND USE NOISE SENSITIVITY INTERPOLATION

TABLE 4
Suggested Land Use Compatibility Guidelines
1980 Federal Interagency Committee on Urban Noise

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
10	**Residential**							
11	Household Units							
11.11	Single Units - detached	Y	Y*	25[1]	30[1]	N	N	N
11.12	Single Units - semi-detached	Y	Y*	25[1]	30[1]	N	N	N
11.13	Single Units - attached row	Y	Y*	25[1]	30[1]	N	N	N
11.21	Two Units - side by side	Y	Y*	25[1]	30[1]	N	N	N
11.22	Two Units - one above the other	Y	Y*	25[1]	30[1]	N	N	N
11.31	Apartments - walk up	Y	Y*	25[1]	30[1]	N	N	N
11.32	Apartments - elevator	Y	Y*	25[1]	30[1]	N	N	N
12	Group Quarters	Y	Y*	25[1]	30[1]	N	N	N
13	Residential Hotels	Y	Y*	25[1]	30[1]	N	N	N
14	Mobile Home Park or Courts	Y	Y*	N	N	N	N	N
15	Transient Lodgings	Y	Y*	25[1]	30[1]	35[1]	N	N
16	Other Residential	Y	Y*	25[1]	30[1]	N	N	N
20	**Manufacturing**	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
21	Food and kindred products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
22	Textile mill products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
23	Apparel and other finished products made from fabrics, leather, and similar materials - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
24	Lumber and wood products (except furniture) - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
25	Furniture and fixtures - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
26	Paper and allied products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
27	Printing, publishing, and allied industries	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
28	Chemicals and allied products manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
29	Petroleum refining and related industries	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
30	**Manufacturing (Continued)**							
31	Rubber and misc. plastic products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
32	Stone, clay, and glass products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
33	Primary metal industries	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
34	Fabricated metal products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
39	Miscellaneous manufacturing	Y	Y	Y	25	30	N	N
40	**Transportation, communication, and utilities**							
41	Railroad, rapid rail transit, transit and street railway transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
42	Motor vehicle transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
43	Aircraft transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N

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TABLE 4 (Continued) Suggested Land Use Compatibility Guidelines 1980 Federal Interagency Committee on Urban Noise		Noise Zones/DNL Levels in Ldn						
SLUCM No.	Land Use Name	A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
80	**Resource Production and extraction**							
81	Agriculture (except livestock)	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
81.5 to 81.7	Livestock farming and animal breeding	Y	Y	Y[8]	Y[9]	N	N	N
82	Agricultural-related activities	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
83	Forestry activities and related services	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
84	Fishing activities and related services	Y	Y	Y	Y	Y	Y	Y
85	Mining activities and related services	Y	Y	Y	Y	Y	Y	Y
89	Other source production and extraction	Y	Y	Y	Y	Y	Y	Y

NOTES

1a) Although local conditions may require residential use, it is discouraged in C-1 and strongly discouraged in C-2. The absence of viable alternative development options should be determined and an evaluation indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones should be conducted prior to approvals.

b) Where the community determines that residential uses must be allowed measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB (Zone C-1) and 30 dB (Zone C-2) should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10, 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels.

c) NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, design and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level sources. *Measures that reduce noise at a site should be used wherever practical in preference to measures which only protect interior spaces.*

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

5 If noise sensitive use indicated NLR; if not use is compatible.

6 No buildings.

7 Land use compatible provided special sound reinforcement systems are installed.

8 Residential buildings require a NLR of 25.

9 Residential buildings require a NLR of 30.

10 Residential buildings not permitted.

11 Land use not recommended, but if community decides use is necessary, hearing protection devices should be worn by personnel.

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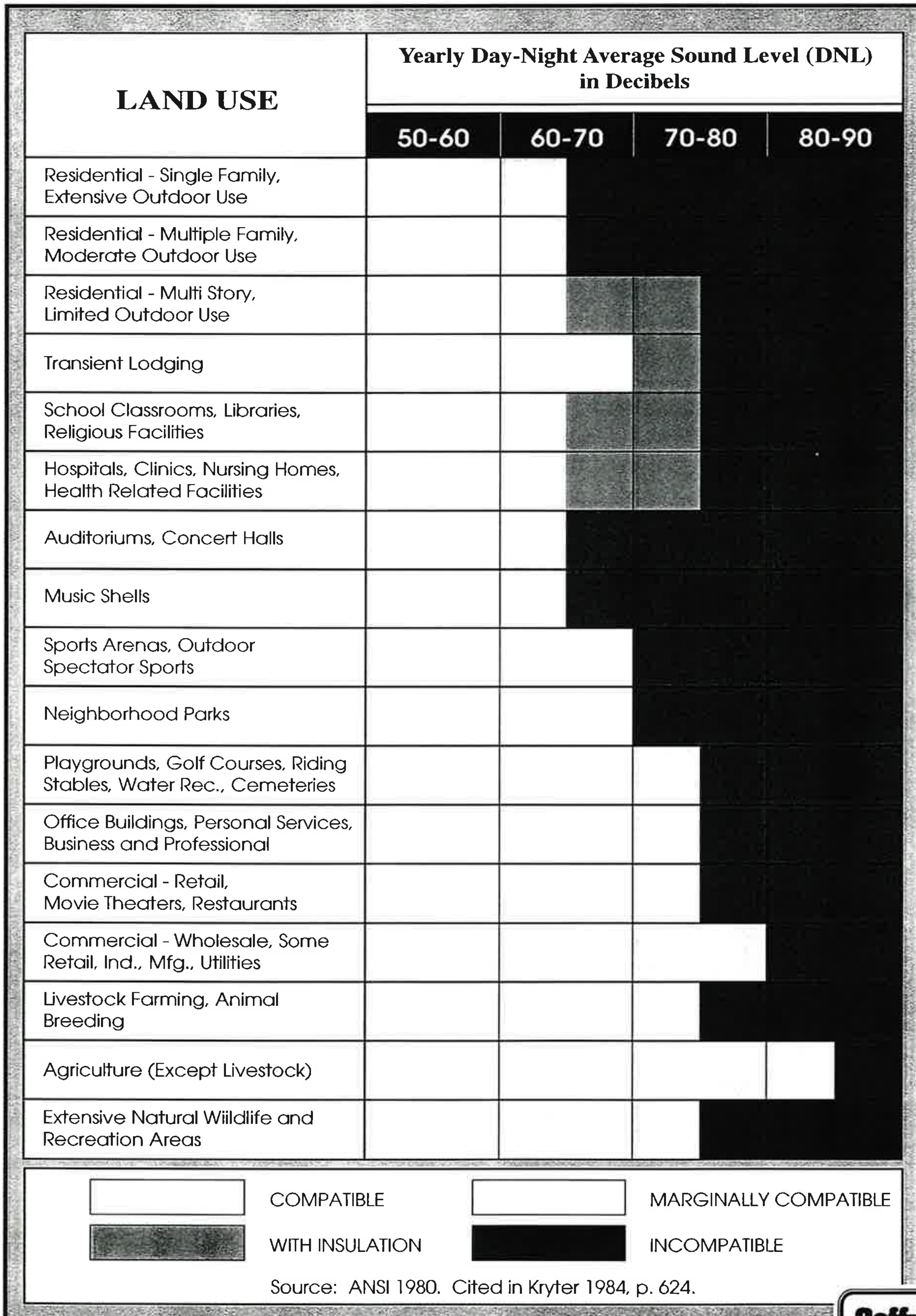
94SP02-LU D-3/15/94



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Land Use Exhibit D
LAND USE COMPATIBILITY WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVEL AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED

LAND USE E-9/13/94

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 responsbility 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.

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Land Use Exhibit E

F.A.R. PART 150 LAND USE COMPATIBILITY GUIDELINES

TABLE 5
Oregon Land Use Compatibility Guidelines

DNL Range	Impact Zone	Land Use Guidelines
55-65	Moderate Noise Impact	In urban areas, noise-sensitive uses may be marginally compatible. Sound insulation may be required. Outdoor activities more severely impacted. In rural areas, noise-sensitive uses may be incompatible.
65-70	Substantial Noise Impact	Uses which should be excluded are: residences, schools, churches, hospitals, residences. If these uses exist or are permitted, sound insulation and noise easements should be required.
70 +	Severe Noise Impact	Property should be acquired by airport.

Note: Noise-sensitive property includes: property used for sleeping, schools, churches, hospitals, and public libraries.

Source: ODOT 1981, pp. 77-78, 163.

California Guidelines

In California, the CNEL (community noise equivalent level) metric is used instead of the DNL metric. They are actually very similar. DNL accumulates the total noise occurring during a 24-hour period, with a 10 decibel penalty applied to noise occurring between 10:00 p.m. and 7:00 a.m. The CNEL metric is the same except that it also adds a 4.77 decibel penalty for noise occurring between 7:00 p.m. and 10:00 p.m. There is little actual difference between the two metrics in practice. Calculations of CNEL and DNL from the same data generally yield values with less than a 0.7 decibels difference (Caltrans 1983, p. 37).

California law sets the standard for the acceptable level of aircraft noise for persons residing near airports as 65 CNEL (California Code of Regulations, Title 21, Chapter 2.5, Subchapter 6, Sections 5000 et seq.). Four types of land uses are defined as incompatible with noise above 65 CNEL: residences, schools, hospitals and convalescent homes, and places of worship. These land uses are regarded as compatible if they have been insulated to assure an interior sound level, from aircraft noise, of 45 CNEL. They are also to be considered compatible if an avigation easement over the property has been obtained by the airport operator.

California noise insulation standards apply to new hotels, motels, apartment buildings and other dwellings not including detached single family homes. They require that "interior noise levels attributable to outdoor sources shall not exceed 45 decibels (based on the DNL or further evidence that a change in the definition of the threshold of significant noise impact may be gathering momentum.

FICON REPORT

In August 1992, the Federal Interagency Committee on Noise (FICON 1992) issued its final report. FICON included representatives of the Departments of Transportation, Defense, Justice, Veterans Affairs, Housing and Urban Development; the Environmental Protection Agency; and the Council on Environmental Quality. FICON was formed to review federal policies for the assessment of aircraft noise in environmental studies. The Committee advocated the continued use of the DNL metric as the principal means of assessing long-term aircraft noise exposure. It further reinforced the designation of 65 DNL as the threshold of significant impact on non-compatible land use. FICON recognized, however, the potential for noise impacts down to the 60 DNL level, providing guidance for analyzing noise between 60 and 65 DNL in reports prepared under the National Environmental Policy Act. This includes environmental assessments and environmental impact statements. (It does not include F.A.R. Part 150 studies.) FICON offered this explanation for this action (FICON 1992, p. 3-5).

> There are a number of reasons for moving in this direction at this time. First, the Schultz curve [see the bottom panel in **Exhibit A**] recognizes that some people will be highly annoyed at relatively low levels of noise. This is further evidenced from numerous public response forums that some people living in areas exposed to DNL values less than 65 dB believe they are substantially impacted (U.S. EPA 1991). Secondly, the FICON Technical Subgroup has shown clearly that large changes in levels of noise exposure (on the order of 3 dB or more) below DNL 65 dB can be perceived by people as a degradation of their noise environment. Finally, there now exist computational techniques that allow for cost-effective calculation of noise exposure and impact data in the range below DNL 65 dB.

The specific FICON recommendation was as follows (FICON 1992, p. 3-5):

> If screening analysis shows that noise-sensitive areas will be at or above DNL 65 dB and will have an increase of DNL 1.5 dB or more, further analysis should be conducted of noise-sensitive areas between DNL 60-65 dB having an increase of DNL 3 dB or more due to the proposed airport noise exposure.

FICON further recommended that if any noise-sensitive areas between 60 and 65 DNL are projected to have an increase of 3 DNL or more as a result of the proposed airport noise exposure, mitigation actions should be included for those areas (FICON 1992, p. 3-7). The FICON recommendations represent the first uniform guidelines issued by the federal government for the consideration of aircraft noise impacts below the 65 DNL level. At this time, these remain recommendations and are not official policy.

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