NOISE CONTROL AND LAND USE COMPATIBILITY STUDY

PHASE TWO REPORT

Los Angeles International Airport

Participants:

Los Angeles County AIRPORT LAND USE COMMISSION

City of Los Angeles DEPARTMENT OF AIRPORTS

County of Los Angeles
City of El Segundo
City of Hawthorne

City of Inglewood
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LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL/LAND USE COMPATIBILITY STUDY

PHASE TWO REPORT

JANUARY 1983

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LAX NOISE CONTROL AND/
LAND USE COMPATIBILITY STUDY

February 1983

TO: LAX ANCLUC Steering Committee

FROM: Norman Murdoch, Planning Director
Los Angeles County Department of Regional Planning

Clifton Moore, General Manager
Los Angeles City Department of Airports

SUBJECT: LAX ANCLUC - Phase II Final Report

We are pleased to transmit to you the Final Phase II Report of the LAX Airport Noise Control/Land Use Compatibility Study, and offer our sincere appreciation for your assistance in its preparation. As you are aware, the primary focus of the report is the identification and prioritization of airport/land use compatibility issues, and the initial assessment of potential mitigation measures. The work effort represented is a significant milestone, and constitutes a necessary and vital precursor to the third and final phase of the ANCLUC Study - that of formulating a recommended noise control/land use compatibility program for LAX and its environs.

As in the development of the Phase I Background Report , the attached document was prepared through the collective efforts of all ANCLUC participants, including the Los Angeles City Department of Airports, the Los Angeles County Department of Regional Planning, and the cities of Inglewood, El Segundo, Hawthorne and Los Angeles. Other Study participants, including the Federal Aviation Administration Air Transport Association, SCAG, Airline Pilots Association, Civil Aeronautics Board and CALTRANS Division of Aeronautics, provided valuable technical assistance in the completion of various Phase II tasks.

Study participants are to be commended for the quality work and cooperative spirit evidenced in this effort. Continued cooperation is the key ingredient for a successful ANCLUC program.

Again, genuine gratitude is extended to each member of the Steering Committee for the guidance provided to ANCLUC technical staff. With the Committee's continued advice and support throughout the final phase of the Study, there is good reason to anticipate that an effective noise control/land use compatibility program can be developed and implemented.

GLOSSARY OF TERMS

ALSF = Approach Lights with Sequence Flashers
CNEL = Community Noise Equivalent Level
DABS = Discrete Address Beacon System
FAA = Federal Aviation Administration
GS = Glide Slope Indicator
HNL = Hourly Noise Level
HIRL = High Intensity Runway Lights
IFR = Instrument Flight Rules
ILS = Instrument Landing System
IM = Inner Marker (east end of runways)
LAX = Los Angeles International Airport
L/MF = Low/Medium Frequency (radio)
LOC = Localizer
MALSR = Medium Approach Light System Runway Alignment Indication Lights
MM = Mid Marker
MAP = Million Annual Passengers
MIRL = Medium Intensity Runway Lights
MLS = Microwave Landing System
OM = Outer Marker (west end of runways)
Operation = Aircraft Takeoff or Landing
RVR = Runway Visual Range
TACAN = Tactical Air Navigation
TCAS = Threat Alert and Collision Avoidance System
TDZ = Touch Down Zone
UHF = Ultra High Frequency (radio)
VASI = Visual Approach Slope Indicator
VFR = Visual Flight Rules
VHF = Very High Frequency (radio)
VOR = VHF Omni-Range (navigation)

LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL/LAND USE COMPATIBILITY STUDY

TASK 2.01

ANALYSIS OF UPDATED AIR TRAFFIC FORECAST

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I. INTRODUCTION

The purpose of this analysis is to develop estimates of aviation demand at Los Angeles International Airport (LAX), on an unconstrained and a constrained basis between 1982 and 1995. Longer range forecasts are considered unreliable and are not included in this analysis. This forecast information will be input into the development and analysis of alternative operational scenarios in Phase Three of the ANCLUC Study.

Task 1.12 provided a comprehensive update of recent forecasts of passenger traffic levels at LAX and is hereby incorporated by reference. These forecasts were prepared by the following organizations:

- Southern California Association of Governments (SCAG)
- Air Transport Association (ATA)
- Federal Aviation Administration (FAA)
- Department of Airports (DOA)

A comparataive analysis of these forecasts and the many variables they utilize is discussed below. The analysis concentrates on air passenger demand and general aviation activity. Forecasts of preliminary helicopter operation will be described in general terms only.

The remaining sections of this paper will describe the Department of Airports forecasting capability, review some of its preliminary results, and offer conclusions on the general trends indicated by these results.

II. ANALYSIS OF FORECASTS

Four forecasts have been analyzed. Each forecast was based on a set of variable assumptions of economic performance and socio/political trends. Future air passenger demand levels correlate to projected economic/socio/political conditions.

A. Passenger Demand Forecasts:

1. SCAG Forecast - 1980-1995

Four forecast scenarios were developed, ranging from a "baseline" case to a "recommended" case. The assumptions upon which these scenarios were based are listed below:

- The cost of air travel will remain competitive with the costs of other travel modes;

- The reasons people travel and the modes they use will remain the same. However, air travel will grow faster than other transportation modes;

- No new technological advances are expected which would greatly alter the jet-powered airliner or other modes of transport; and

- Approximately 80 percent of the regional system's air passengers are origin/destination, 15 percent are connecting and five percent are through. LAX passenger enplanements/deplanements are 77 percent O & D and 23 percent are connecting.

SCAG utilized a two part forecasting technique. Initially, a regionwide forecast of passenger demand was developed using the CalTrans-Air Passenger Forecast Model. This model has three basic data components:

- socio-economic (including population and new employment);

- aviation facility and service-levels; and

- aviation network characteristics.

Secondly, passengers predicted by the CalTrans model were allocated to the various airports in the regionwide system. SCAG fixed the allocation total at 77.1 MAP representing the minimum regional demand.

The forecast model was modified to incorporate existing policy constraints limiting an airport's service-capacity. Limitations set by the maximum duration of ground-travel for each haul-length were also assumed in order to identify each airport's direct service area. (For example, a passenger originating from Orange County would probably prefer to depart from John Wayne Airport rather than LAX, if similar service existed. The length of ground travel would be much less to and from John Wayne Airport.)

Demand for aviation travel is dependent upon such factors as cost, numbers of flights, destinations available and alternative choices for travel.

The assumptions assigned to each scenario were as follows:

a. Baseline

Each existing airport to expand is allowed to meet the market demand generated by its service area with no constraints.

b. New Site

Alternative new sites were added to the existing system of airports; current policy constraints were not changed. (Please refer to Task 1.12 for sites considered).

c. No New Site

Existing airports' growth was limited by the strict application of policy constraints; 12 MAP was set at Palmdale, and no new airport site was included.

d. Recommended System

Existing airports grew within current policy constraints, plus a new airport to be sited to provide air travel facilities as close to the growing Orange County market as possible.

e. Unconstrained System

Any airfield capacity beyond what is presently utilized was assigned to air carrier operations only.

The outcome of these case forecasts, as related to LAX are shown in Table 1.

TABLE 1

Summary of 1995 Forecasts for LAX

Case	MAP
Baseline*	14.9
No New Site	40.0
Recommended**	37.3
Unconstrained	45.5

*The Baseline number represents O & D passengers only the others include connecting passengers. The Baseline because it represents theoretical market share is not appriate for comparison with alternative realistic scenarios.

**The Recommended Case incorporates the New Site Case previously described.

The SCAG forecast methodology appears to be a reasonable approach. However, the difficulties of siting a new airport reduces the utility of the recommended forecast. The previously recommended off-shore site had many potential engineering and environmental problems associated with its development and was dropped from further consideration on September 2, 1982. In addition, the possibility that Palmdale International Airport (PMD) will be serving 12 MAP within 12 years appears to be unrealistic. In the "Recommended" case Palmdale serves 2.6 MAP. Only in the "No New Site" does Palmdale serve 12 MAP. Construction of the required airport facilities at Palmdale has not yet begun.

2. Air Transport Association (ATA) Forecast - 1983-1993

The ATA's approach to forecasting is a "top-down" method. National traffic-levels were disaggregated into hub-shares, then and were adjusted according to projections of population and economic activity. No considerations were given to increased fuel shortages or to changes in travel habits.

Total hub domestic scheduled air carrier enplanements were forecast and then distributed to each airport. This distribution was based on recent experience and projected trends. Aircraft movements were forecast for only the constrained passenger enplanements forecast, since all Los Angeles hub-airports were constrained by passenger enplanements not aircraft movements. Other assumptions were as follows:

- An average load factor per peak month will be 55%;
- high-density seating capacity in wide-bodied aircraft will increase;
- fleet mix will include many narrow-body jets (B-707, DC-8, etc.);
- wide bodied aircraft will not be competitive in commuter markets;
- LAX will remain the major recipient of international traffic;
- maximum capacity at LAX will be as follows;

	1983	1988	1993
LAX	43.0	52.0	56.0

- LAX will continue to be a major connector with other airports having insignificant connecting volumes; and
- the existing system of airports will remain unchanged.

The ATA passenger demand recasts for LAX are provided in Table 2. It is interesting to note that the assumed capacity of LAX was exceeded by the projected demand forecast. The ATA has recently revised their forecast model to reflect current economic conditions. The results of this forecast model are provided in Table 2a.

TABLE 2
ATA - LAX Forecast

1983	1988	1993
45.1	52.0	56.0

TABLE 2a
ATA - LAX Forecast Updated

1981	1985	1990	1995	2000
32.7	39.4	49.2	61.0	74.9

The ATA forecast represents an unconstrained level of service without the 40 MAP limitation at which all demand is satisfied. These forecasted MAP levels appear unrealistically high, since passenger levels totaled only 32 MAP in 1981. The assumed increase in wide bodied aircraft plus the 55 percent load factor may have created higher levels of satisfied demand than can be realistically expected. In reaction to present economic conditions, Airlines are presently delaying delivery of new wide body aircraft Therefore, the fleet-mix assumptions have probably produced highly optimistic forecasts.

3. Federal Aviation Administration - 1981 to 1992

The FAA also used a "top-down" approach to their forecasts. National-level forecasts were disaggregted into hub shares and then adjusted according to projections of state population and income levels, air traffic control capabilities, and market characteristics. The base year was 1979, which represents a recent peak of air carrier activities at LAX of 34.6 MAP. A model was developed for forecasting passenger enplanements which were disaggregated into hub-originating, connecting, and returning passengers. Moreover, separate equations were developed for hubs which were characterized as industrial cities, trade-centers, or recreation areas; and as connecting cities, terminating points, or intermediate cities. The results of the analysis showed that passengers originating at hubs are primarily dependent on income generated in the hub's service area, while the number of connecting and returning passengers depends on income levels at associated destinations. Growth rates for enplanements at each of the hubs were developed based largely on U.S. Department of Commerce forecasts of income generated at these various hubs. Table 3 provides the FAA Passengers Forecasts at LAX.

TABLE 3

FAA Passengers Forecasts for LAX

Year	MAP
1982	39.3
1983	40.2
1984	41.2
1985	42.2
1986	42.8
1987	43.1
1988	43.3
1989	43.6
1990	43.8
1991	44.1
1992	44.3

The FAA forecasts also appear optimistic, when compared to existing passenger levels. The Department of Commerce economic forecasts used in the model may have been overly optimistic, and this confidence was reflected in the projected passenger levels. Reaching 40.2 MAP by 1983 would require an increase of 7.3 MAP in two years. This would represent an 18 percent growth-rate in two years.

4. Department of Airports - 1981-1990

The Department of Airports in conjunction with Data Resources, Inc. (DRI), prepared a multi variable forecasting methodology for LAX.

Two forecast models were developed--one for domestic passengers, the other for international passengers.

a. Domestic Model

Utilizes four variables:

- Gasoline prices;
- unemployment rates of all civilian workers;
- prime rate on short term business loans/ average yield on Moody's AAA corporate bonds; and
- personal consumption expenditures for transportation services--1972 dollars.

b. International Model

Utilizes three variables:

- percentages of Mexican, Canadian and Japanese GNPs;
- the price deflator for petroleum refined products; and
- the U.S. trade-weighted exchange rate.

Air passenger forecasts for LAX are shown in Table 4.

TABLE 4

DOA-Passenger Forecasts for LAX

Year	MAP
1981	32.53
1982	33.16
1983	34.23
1984	36.06
1985	38.99
1986	40.00
1990	40.00

The DOA forecast appears reasonable. The 40 MAP level which represents a policy constraint at LAX, will be reached approximately by 1986. The 1981 forecasted MAP level of 32.53 was very close to the actual 32.9 MAP which occurred in 1981 at LAX. This correlation reinforces the validity of the DOA models.

B. Summary of Passenger Demand Forecasts

In review, the assumptions and methodologies employed by SCAG, ATA, FAA, and DOA in their forecasts all appear valid. The resulting forecasts show a divergence of passenger demand levels which is considered reasonable. The types of data employed and the degree to which it is emphasized were different in each forecasting model. The one assumption which remained constant during the preparation of these forecasts was the operational levels occuring during daytime (6:30 a.m. to 7:00 p.m.) evening (7:00 p.m. to 10:00 p.m.) and night time hours (10:00 p.m. to 6:30 a.m.). The operational levels during these time periods have remained constant since they are established by marketplace pressures which effect airline scheduling. No shifts are foreseen in the percentage splits that now exist. The split is as follows:

Day (7:00 a.m. to 7:00 p.m.) - 70%

Evening (7:00 p.m. to 10:00 p.m.) - 17%

Night (10:00 p.m. to 7:00 a.m.) - 13%

These operational percentage splits provide important input to the computation of CNEL values. The goals of the various forecasts were also varied. Table 5 summarizes the passenger forecasts for LAX.

The SCAG forecasts concentrated on the year 1995, no intermmediate years are available. The ATA, FAA, and DOA forecasts fall between 1981 and 1993. ATA and FAA, each using a "top-down" approach, forecast quite different results. For example, in 1983, the difference between the two forecasts is 4.9 MAP. When compared with the DOA forecast, both the FAA and ATA forecasts appear overly optimistic. The DOA model reflects currently experienced levels of passenger demand with the most accuracy; the 40 MAP policy constraint level is expected to be reached in 1986. The FAA and ATA models are both valuable--each provides a forecast for "unfulfilled" demand after 1986. None of the forecast models made projections to the year 2000. Many of the socio-economic variables are very susceptible to rapid fluctuations which reduce the value and confidence of longer-range forecasts.

The range of divergence among the forecasts analyzed with the exception of the ATA's is not unreasonable, but does however, reduce the utility of these forecasts. The Department of Airports Facilities Planning Bureau, reacting to this problem, has retained Dr. Greig Harvey of the Stanford University Engineering Department to help them develop a more reliable in-house, computer-based short-term forecasting model. This forecasting model is described in the following sections.

TABLE 5

Summary of Passenger Forecasts For LAX

Organization	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
SCAG															
a. Baseline															14.9
b. No New Site															40.0
c. Unconstrained															45.3
d. Recommended															37.3
ATA			45.1					52.0					56.0		
ATA (updated)					39.4					49.2					61.0
FAA		39.3	40.2	41.2	42.2	42.8	43.1	43.3	43.6	43.8	44.1	44.3			
DOA (DRI Data)	32.53	33.16	34.23	36.06	38.99	40.0				40.0					

III. DEVELOPMENT OF A DOA COMPUTER BASED FORECASTING MODEL

A. Theoretical Considerations

Theoretical considerations used in the development of the computer based model are listed below:

1. Air-travel demand analysis has a basis in economic theory, but is strongly influenced by practical considerations such as data availability.

2. Theory and experience tell us that air-travel demand is related to a number of factors such as:

a. Population;

b. The amount and distribution of personal income;

c. Business activity (including number of jobs, profits, gross receipts, and other associated measures of performance);

d. Level-of-service (including frequency of flights, in-flight time, in-flight amenities, and access difficulties); and

e. Price (including the general price level as indicated by the standard coach fare and the range of special fares designed to capture a higher percentage of the potential market).

These variables affect both the amount of air travel (measured as passenger enplanements) and the spatial distribution of air passenger trips. Thus, the unit of air-travel demand must be chosen carefully. For individual city-pairs, the number of air passengers (e.g. MAP) is an adequate measure; but for two or more citypairs taken together, it is desirable to adopt a measure that reflects the different distances involved. The customary measure is revenue passenger miles (RPM). The problem with RPM is that it is even further removed than MAP from the goals of the ANCLUC Study. The rational for using MAP is twofold, (1) the passenger output from the computer and its derivatives are the most relevant measures for DOA's various planning needs, and (2) any other forecasting basis would require extensive data collection, analysis and software development.

As stated earlier, it is misleading to believe that we can specify future conditions, and then forecast the input variables and air passenger demand exactly. A more reasonable approach is to develop scenarios which are based on assumptions about the input variables and the models themselves. To this end, seperate modeling scenarios have been developed for both domestic and international passenager demand. For both modeling scenarios, two or three types of factors have been included to capture the critical determinants of demand. These factors include a measure of personal income, an indication of business activity, and a measure of air-travel cost.

B. Domestic Demand Model

A candidate variable chosen for each of the major factors affecting domestic demand is outlined below:

1. Personal Income

Total U.S. personal income in constant 1972 dollars were used to provide a measure of disposable income available for personal air travel. This includes two effects; population increases which could cause an increase in air travel regardless of what happens to average income and changes in per capita income;

2. Business Activity

To best describe the condition of the economy, the percentage of unemployment was used; and

3. Air Travel Cost

The best measures of travel cost were beyond the scope of this study, and since transportation cost directly correlates with fuel cost, the urban consumer price index for gasoline was selected.

A set of forecasts, for the third quarter of 1981 to the fourth quarter of 1990, was developed using several of DRI's future economic scenarios. The scenarios are intended to provide the range of possible directions the economy could take in the near future. The scenarios are described below:

a. Trend-long

This scenario could be characterized as DRI's "best guess" of the long-term economic future. It anticipates a 30-percent increase in real aggregate disposable income and a stabilization of unemployment in the vicinity of 6.5 percent.

b. Depression

This pessimistic short-term scenario valid only to 1984 (due to the availability of the economic variables) is characterized by a constant aggregate disposable income and high unemployment that peaks at 12.4 percent in the third quarter of 1983.

c. Stateunion

This scenario assumes that the policies and economic prognosis implied in President Reagan's "State of the Union" address to Congress (i.e. Reagoanonmics) are essentially correct. This optimistic short-term scenario, valid only to 1984 (due to the availability of economic variables) indicates a more rapid rise in disposable income and a greater drop in unemployment than the TRENDLONG scenario.

d. Trend-long/Linear

This scenario is a more conservative version of the Trend-long scenario. In order to remove the seasonal fluctuations in people's tendencies to travel (i.e. Christmas, holidays, and summer vacations), the time-series were smoothed to make them move even over a 12-month period. The Trendlong/Linear Model raise the near-term MAP rpojections, but lowers the long-term projections considerably.

Table 6 summarizes the MAP forecasts generated from these four scenarios.

TABLE 6

Domestic MAP Forecasts

	1982	1983	1984	1985	1986	1987	1988	1989	1990
TRENDLONG	27.08	29.93	32.61	34.98	37.20	38.92	40.99	43.19	44.62
DEPRESSION	26.09	23.70	25.34	--	--	--	--	--	--
STATEUNION	27.50	31.21	34.50	--	--	--	--	--	--
TRENDLONG/ LINEAR	29.13	32.06	34.31	36.16	37.70	38.45	39.34	40.18	40.44

C. International Demand Model

The development of a model for international traffic was limited because DRI provides only one scenario. A linear model was developed using two variables described below.

1. A weighted measure of international gross national product (GNP), (45 percent Mexican, 3 percent Japanese, and 25 percent Canadian GNP's). These three nations contribute a large percentage of the international traffic at LAX; and

2. An index of international petroleum prices. Results of this forecast are provided in Table 7.

TABLE 7

Annual International MAP Foreacasts

1982	1983	1984	1985	1986	1987	1988	1989	1990
7.02	7.96	8.85	9.95	11.06	12.15	13.40	14.63	15.88

D. Total MAP Foreacasts

The total MAP forecast for LAX represent the international forecasts combined with each domestic scenario on an annual basis (see Table 8).

TABLE 8

Combined Domestic and International Annual Foreacasts

	1982	1983	1984	1985	1986	1987	1988	1989	1990
TRENDLONG	34.10	37.89	41.46	44.93	48.26	51.07	54.39	57.83	60.50
DEPRESSION	33.12	31.67	34.19	--	--	--	--	--	--
STATEUNION	34.52	39.17	43.34	--	--	--	--	--	--
TRENDLONG/ LINEAR	36.16	40.02	43.15	46.11	48.75	50.60	52.73	54.82	56.33

The computer-based forecasting model which generated this set of annual forecasts is still being refined and these forecasts are considered preliminary in nature. However, they appear to be adequate for the intended purposes of this paper. All indications are that total passenger demand at LAX will increase. The level of improvement in economic conditions will be highly variable factor which effects this rate of increase.

One of the more critical aspects of the forecasts is--they predict increased demand beyond the 40 MAP policy constraint in place at LAX. The forecasts indicated that "unsatisfied" demand will occur in the near future. If the regional air travel system remains unchanged, by 1990 this unsatisfied demand could range from 3.8 MAP to as high as 20 MAP. Table 10 includes all of the pertinent passenger-demand forecasts previously discussed.

TABLE 10

Summary of Passenger Forecasts For LAX

Organization	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
SCAG															
a. Baseline															14.9
b. No New Site															40.0
c. Unconstrained															45.3
d. Recommended															37.3
ATA			45.1					52.0					56.0		
ATA (updated)					39.2					49.2					61.0
FAA		39.3	40.2	41.2	42.2	42.8	43.1	43.3	43.6	43.8	44.1	44.3			
DOA (DRI Data)	32.53	33.16	34.23	36.06	38.99	40.0				40.0					
NEW DOA MODEL	Preliminary Computer Model Forecasts														
a. TRENDLONG		34.10	37.89	41.46	44.93	48.26	51.07	54.39	57.82	60.50					
b. DEPRESSION[1]		33.12	31.67	34.19	–	–	–	–	–	–					
c. STATEUNION[1]		34.52	39.17	43.34	–	–	–	–	–	–					
d. TRENDLONG/ LINEAR		36.16	40.02	43.15	46.11	48.75	50.60	52.73	54.82	56.33					

NOTE: *limited due to availability of only short-range projections of economic conditions.

The computer-based forecasting capability continues to be refined and fine tuned, so that as the socio economic variables fluctuate, forecasts will can be adjusted to reflect these changes. However, long-range economic forecasts are still considered unreliable for planning purposes, until the required economic inputs begin to stablize.

IV. GENERAL AVIATION FORECAST FOR LAX

The forecasting study which dealt directly with future general aviation activity updated in Task 1.12 was prepared by the FAA in 1981. Forecasts of general aviation aircraft operations were based on state parameters including population, disposable personal income, and area. Historical trends were modified in response to changes in the availability of airport facilities and services, presence of reliever airports, and the attitudes toward general aviation activity at the subject airport.

General aviation activity has increased at LAX steadily, since 1977. However, recently as a result of the economic recession and air traffic control restrictions, these levels of activity have declined and according to the FAA forecast will continue to decline annually. The decline expressed in total operations, averages between three to five thousand operations a year between 1981 and 1992, as indicated in Table 11.

TABLE 11

General Aviation Operations Forecast

(Thousands of Operations)

1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
76	59	64	60	56	52	48	44	41	39	36	35

Currently, only fourteen general aviation aircraft are based at the Airesearch Aviation Service Company. These aircraft are all used for business purposes. Airesearch also provides the only itinerant general aviation parking area at LAX.

This facility often holds 15-25 additional aircraft over the number permanently based there.

An effort to open up LAX to additional general aviation activity is being advocated. Other fixed based operations (FBOs) are charging that Airesearch is being allowed to monopolize general aviation activity at LAX. The outcome of this action is not expected for some time. However, the potential for the number of general aviation aircraft based at LAX to increase does exist.

V. HELICOPTER OPERATIONS FORECAST

Helicopter operations at LAX presently occur on a very limited basis. The Coast Guard Air Station has two or three helicopters based at LAX which are used for training and rescue missions. The other type of operations are business related--corporate helicopters transferring executive personnel and clients to and from the Central Terminal Area. Presently, LAX averages approximately 15 operations between 8:00 a.m. and 10:00 p.m., and five operations between 10:00 p.m. and 12:00 a.m. daily.

The Department of Airports is in the process of identifying potential sites for a permanent heliport facility. The FAA and department planners indicate that a facility with a capacity of 15 to 20 operations per peak hour, should be sufficient until the year 2,000. This forecast is predicated on the assumption that there will be no demand for scheduled commercial air-taxi helicopter operations. However, the potential for this assumption to be invalidated in the near future does exist. Presently, two companies are attempting to promote scheduled air taxi helicopter service between many commercial centers throughout Southern California and LAX. One of these proposals has the potential to generate 300 helicopter operations per day. However, both of these proposals are considered very preliminary in nature and would be required to comply with the full array of environmental and safety regulations, including public review.

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LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL/LAND USE COMPATIBILITY STUDY

TASK 2.02

EVALUATE AIRFIELD CAPACITY AND REQUIREMENTS

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I. INTRODUCTION

A. Purpose

This task is an airfield capacity evaluation to identify airfield needs necessary to satisfy projected air traffic demands. The evaluation is based on the existing airfield configuration (1982), updated aviation demand forecasts, current air traffic control procedures, airspace restrictions and prevailing aircraft operational conditions at Los Angeles International Airport (LAX). An investigation was made of operational procedures that may be taken to optimize use of airside area components including airspace, runways, taxiways and terminal aprons.

The product of the evaluation is a list of facility requirements for LAX. Some of these facility requirements are currently under construction and many others are included in the Capitol Improvement Program as budgeted projects. These facilities when fully operational will maximize use of the airside area. This working paper also sets forth estimates of existing and future levels of airfield capacity and delay relative to current and future levels of operational demand.

B. Scope

In recent years, airport/runway capacity has decreased for many reasons including sound abatement techniques causing operational restrictions and increased aircraft separation standards mandated by wing tip wake vortices of heavier wide-bodied aircraft. The Federal Aviation Administration (FAA), along with the Air Transport Association (ATA), Department of Airports (DOA), have been concerned about capacity reduction and increased aircraft delay at LAX.

Air traffic demand is expected to continue to increase gradually through the next decade (See Task 2.01). Consequently, the Los Angeles Task Force Study Group was formed in the mid 1970's to begin an analysis of all aspects of airport capacity, review planned facility improvements and recommend future improvements and strategies. The Task Force Delay Study contains information to assist airport management in decisions regarding the optimum airport use strategy, expenditures for airfield facilities, and research and development. The data included in the Task Force Delay Study provided a detailed information base from which Task 2.02 has been developed.

II. LAX - AIRPORT SYSTEM COMPONENTS

Los Angeles International Airport (LAX) is a transportation system composed of the Los Angeles terminal airspace, the airfield and the apron/gate facilities. The components of the total system include the Los Angeles approach control airspace, approach areas, runways, exits, the apron area and the aircraft gate positions. The purpose of this section is to briefly describe the physical properties of the following components:

- Existing Airspace Structure
- Existing Airfield Facilities
- Existing Apron/Gate Facilities

A. Airspace Structure

1. Regional Airspace

The existing airspace structure consists of two primary subcomponents. The Los Angeles Air Route Traffic Control Center (ARTCC) controls all IFR air traffic arriving and departing the Los Angeles Basin. Traffic for Los Angeles and satellite airports is handled by the ARTCC before control is transferred to Los Angeles Terminal Radar Approach Control (TRACON). Flights over-flying the Los Angeles terminal airspace are routed over Los Angeles Airport for north/south traffic and north of the Los Angeles Airport for east/west traffic. The National Airspace System (NAS) Los Angeles ARTCC low altitude boundaries are illustrated in Figure II-1.

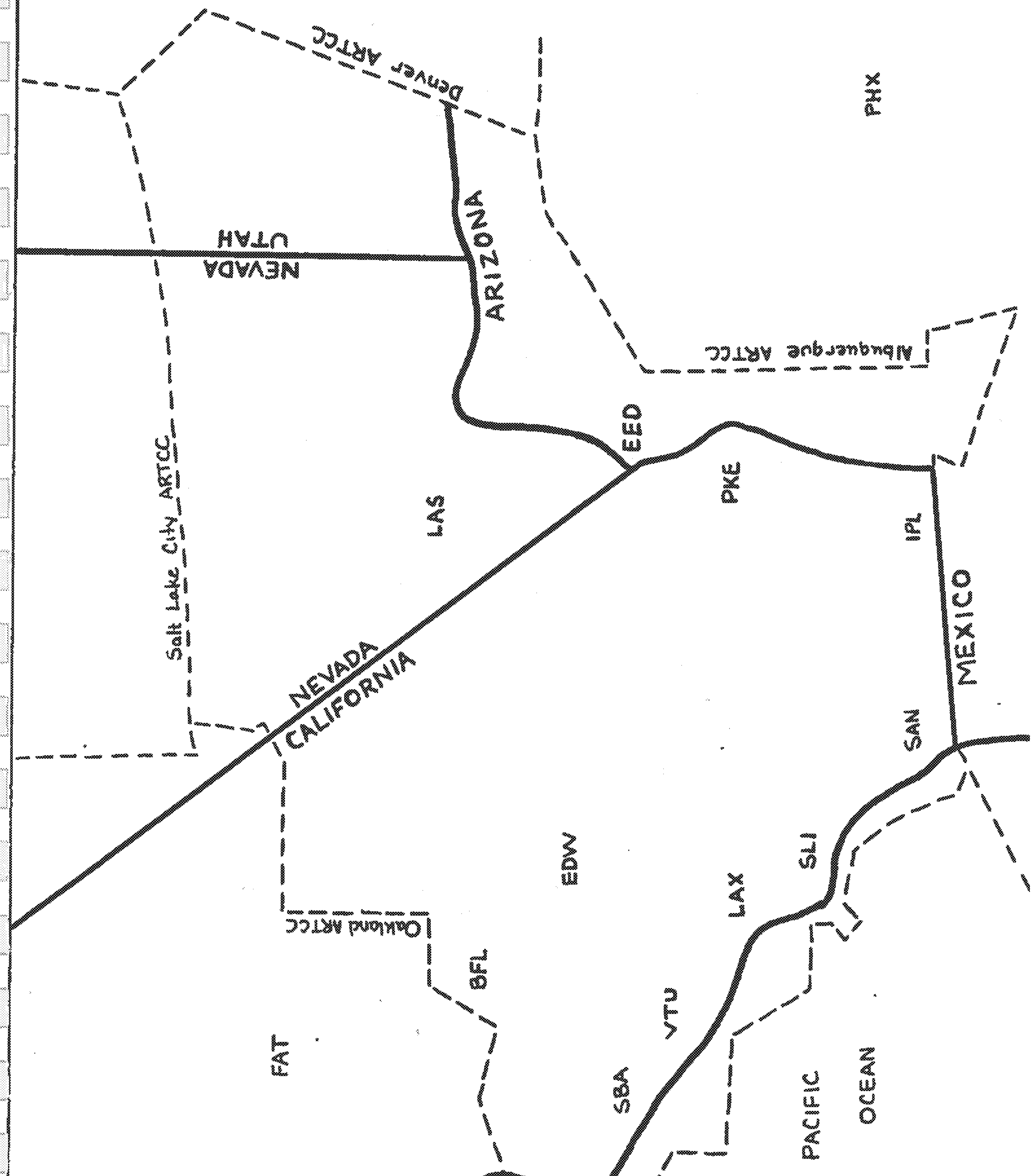
Aircraft operating within the airspace system are regulated by a set rules which are sensitive to the weather conditions being experienced:

- Visual Flight Rules (VFR) are used when there is a ceiling of at least 1000 feet and visibility of at least three miles.

- Instrument Flight Rules (IFR) are used when the ceiling is less 1000 feet and/or visibility is less three miles.

FIGURE II-1

LOS ANGELES ARTCC



2. Terminal Airspace

The sectors through which aircraft arriving Los Angeles are transitioned (in altitude) from the en route portion (about 18,000 feet) to the terminal portion (9,000 feet) of their flight are a primary concern. Associated with each of these sectors is an approach fix (clearance limit) at which control of inbound aircraft is generally tranferred ("handed-off") from Center to Approach Control.

The Approach Control airspace is shown in Figure II-2. Within this airspace, the Los Angeles ARTCC has delegated to Los Angeles Approach Control, authority and responsibility for control of IFR and special VFR* traffic at and below 9,000 feet.

Current Los Angeles arrival and departure radar vector routes within the terminal airspace are shown in Figures II-2 and II-3 for the two primary directions of operation. After handoff by the Los Angeles ARTCC transition sector controller, the arriving flights for Los Angeles are vectored along the parts indicated by the solid line and merged into a single stream before the turn to final approach. For the parallel runway operations shown, turns onto the final approach are separated by 1,000 feet in altitude until established on the respective ILS localizer/final approach course.

Los Angeles arrivals have historically been handled by two approach controllers who split all Los Angeles arrival traffic based on the primary direction of runway operation. Each of the approach controllers vector traffic to a separate runway and are responsible for merging the aircraft from appropriate approach fixes with the spacing requested by the Control Tower. At times, when traffic is heavily imbalanced in favor of one runway, traffic adjustments are made to equalize controller traffic load.

In the same manner, the spacing is adjusted to accommodate departure, as required. Departures are handled by giving the flights a vector heading shortly after takeoff. These headings, in general, are designed to allow the departing flight to proceed to the point of handoff to the en route controller. Los Angeles departure routes are indicated by the dashed lines in Figures II-2 and II-3.

* Special VFR aircraft flying under Visual Flight Rules weather conditions less than basic VFR.

FIGURE II-2

LOS ANGELES TCA

MAJOR ARRIVAL/DEPARTURE ROUTES
WEST TRAFFIC

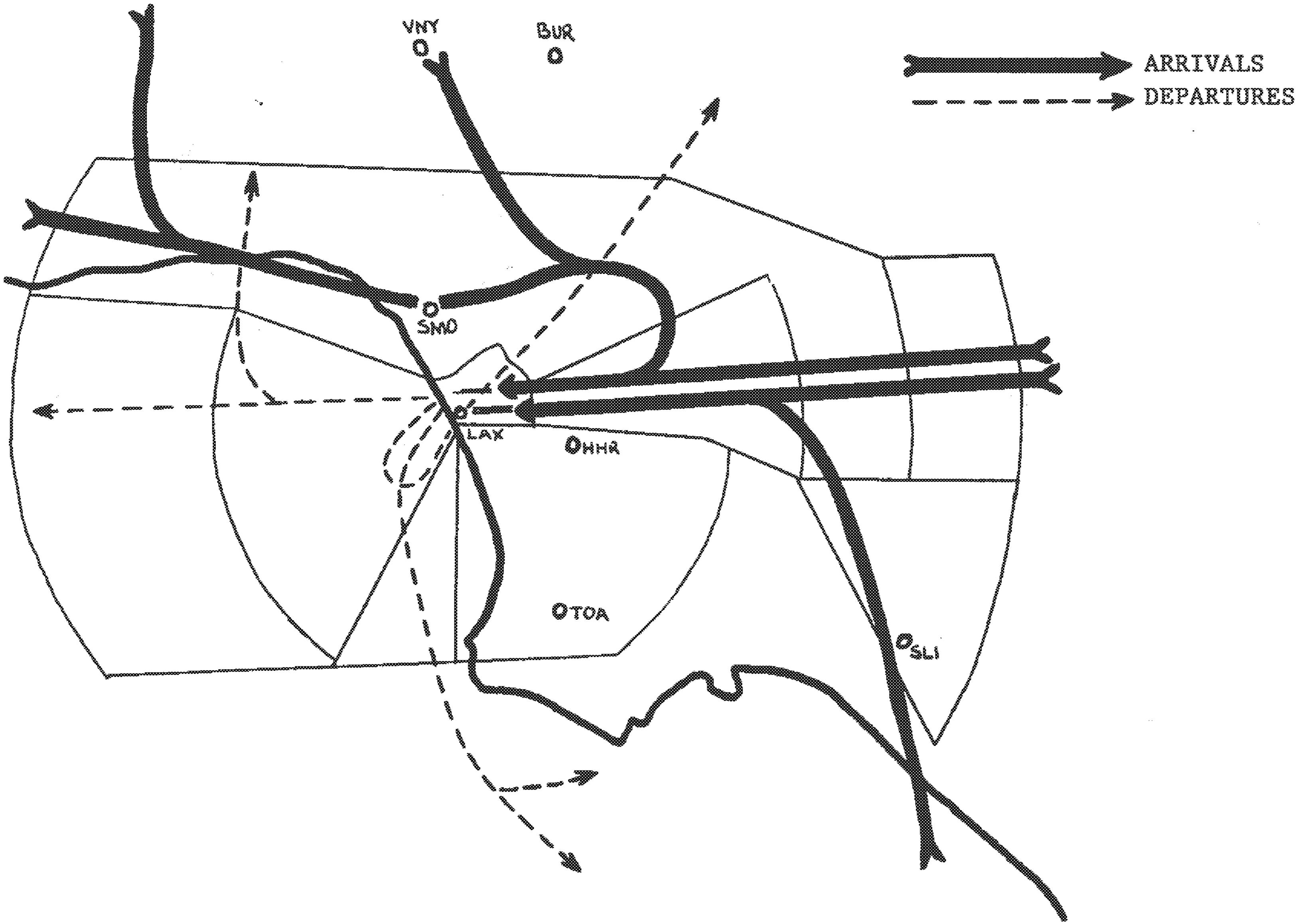
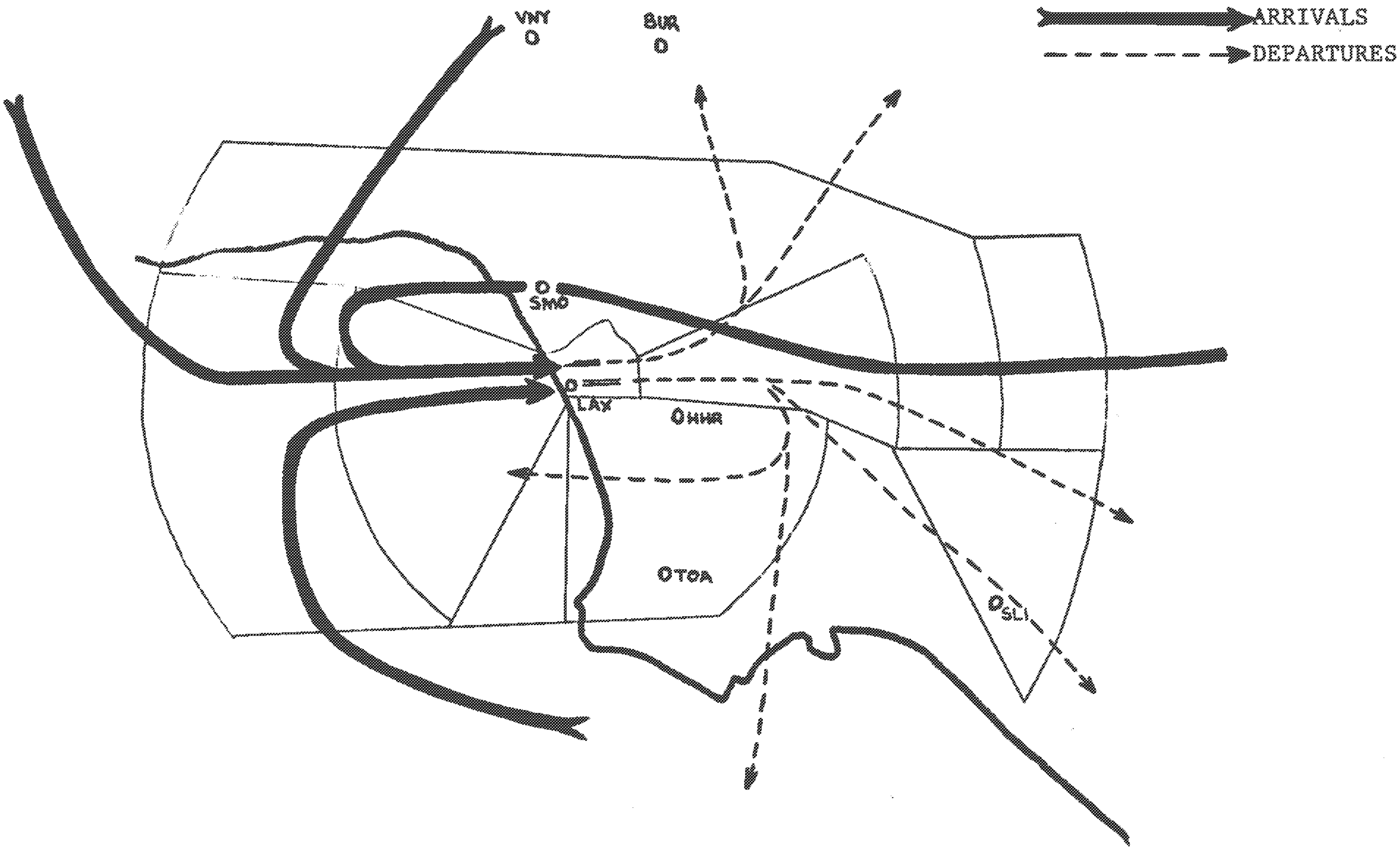


FIGURE II-3

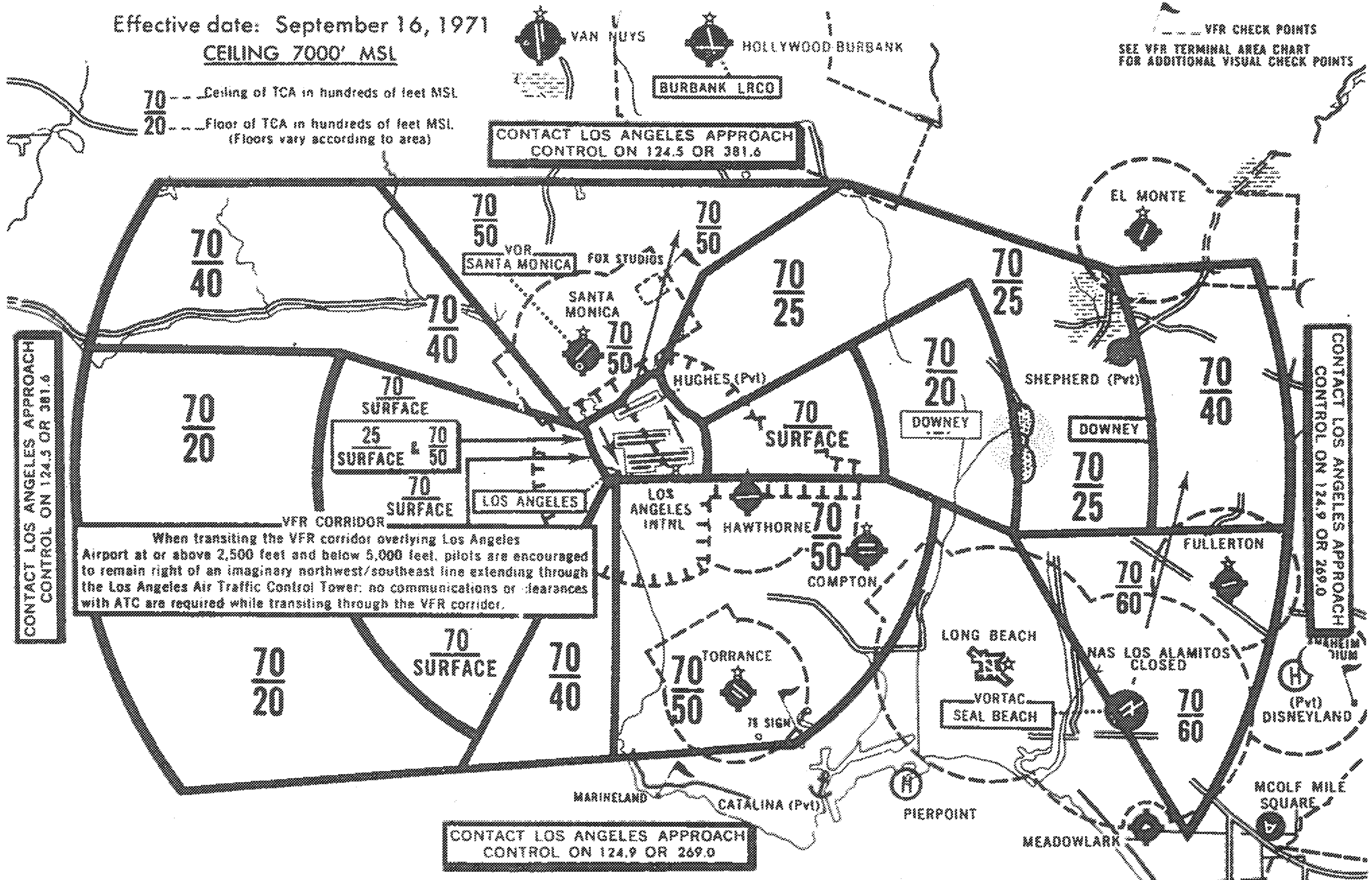
LOS ANGELES TCA

MAJOR ARRIVAL/DEPARTURE ROUTES
EAST TRAFFIC



Because of the high levels of traffic to and from Los Angeles, a Group 1 Terminal Control Area (TCA) overlies LAX. This controlled airspace is shown in Figure II-4. Also depicted in the Exhibit are four general aviation airports located within the Los Angeles terminal area airspace. Of the four airports, presently three have instrument approach capability. The terminal area is dominated by operations at the Los Angeles Terminal. ATC procedures are designed to facilitate the movement of flights into and out of LAX with maximum efficiency and also accommodate traffic serving these satellite airports.

LOS ANGELES TERMINAL CONTROL AREA



This map not to be used for navigational purposes; use instead, the Los Angeles VFR Terminal Area Chart, available at 55c per chart from authorized NOS aeronautical chart agents or from the Distribution Division (C-44), National Ocean Survey, Washington, D.C. 20235.

VFR FLIGHTS

Departing aircraft prior to taxiing are requested to advise Los Angeles clearance delivery of intended route of flight and altitude.

Prepared by the National Ocean Survey
at the direction of the
FEDERAL AVIATION ADMINISTRATION

B. Existing Airfield Facilities

The airfield area includes a system of runways and taxiways as shown in Figure II-5. The airfield consists of two sets of parallel runways running east and west. The south set of runways (25 complex) is restricted for wide-body aircraft which weigh more than 325,000 pounds, until the Sepulveda Tunnel reconstruction is completed. These aircraft must use the north runways (24 complex) for arrival and departure.

At present all runways have full ILS systems. Runway 24R is the only CAT II ILS runway and the only runway with both centerline and touchdown zone lights. Runway 25R - 7L also has centerline lights. A summary of pertinent information on existing runway characteristics, instrumentation and lighting is shown in Table 2-1. The arrival and departure minimums for each runway are presented in Table 2-2. The abbreviations and acronyms used to describe the runway characteristics are defined below:

- GS = glide slope indicator
- LOC = localizer
- OM = outer marker (west end of runways)
- MM = mid marker
- IM = inner marker (east end of runways)
- ALSF = approach lights with sequence flashers
- MALSR = medium approach light system runway alignment indication lights
- RVR = runway visual range
- VASI = visual approach slope indicator
- HIRL = high intensity runway lights
- MIRL = medium intensity runway lights
- TDZ = touch down zone
- ILS = instrument landing system

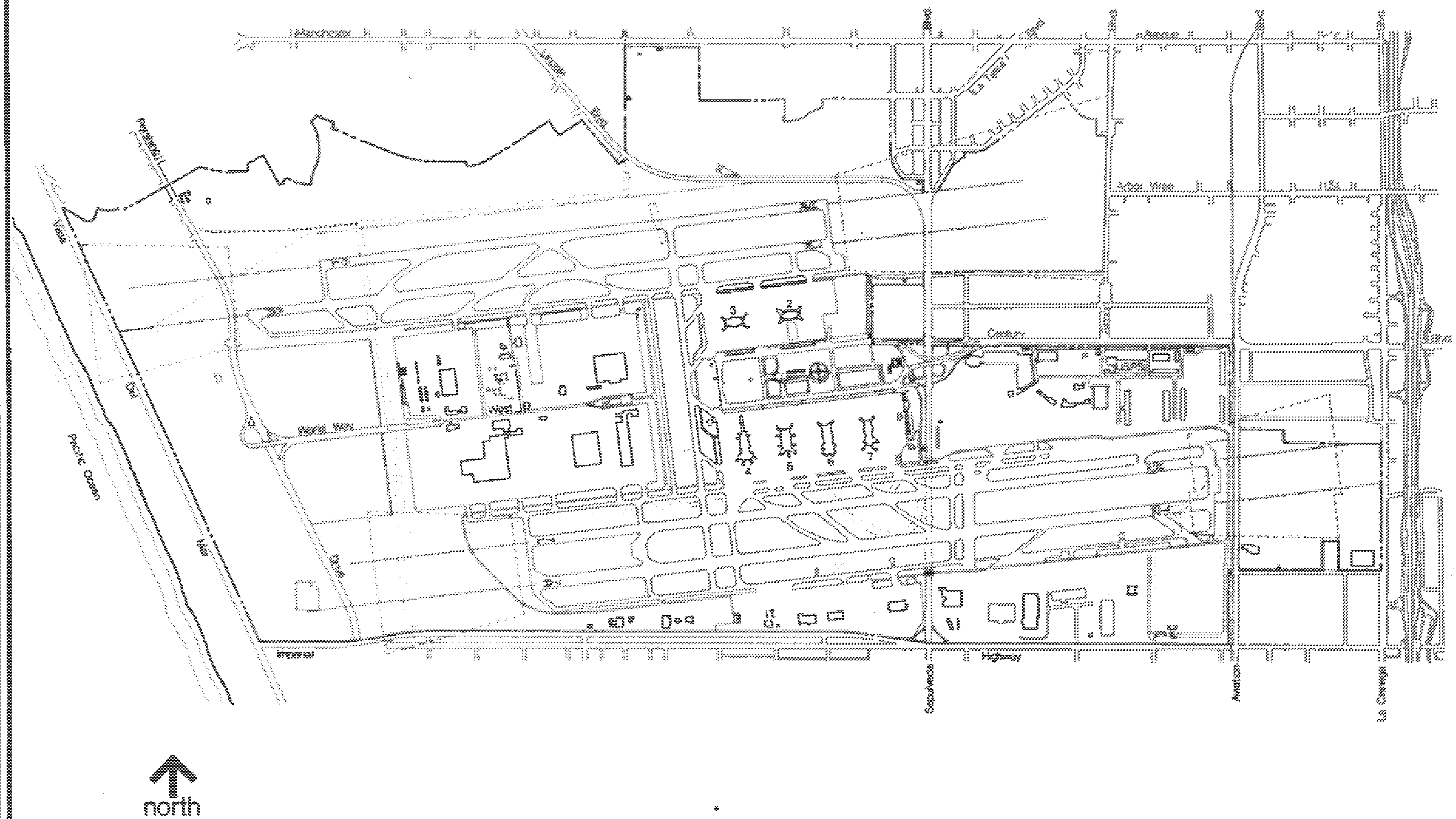


Figure II-5

Los Angeles International Airport

Office of Facilities Planning
CITY OF LOS ANGELES · DEPARTMENT OF AIRPORTS
#1 WORLD WAY · LOS ANGELES, CALIFORNIA 90009
SCALE NONE DRAWN RJA DATE 8-77 CHECKED DMC SHEET 1 OF 5

TABLE II-1

EXISTING AIRFIELD CHARACTERISTICS

RUNWAYS	24R/6L	24L/6R	25R/7L	25L/7R
LENGTH (feet)	8925	10285	12091	12000
WIDTH (feet)	150	150	150	200
ILS Category	II/I	I/I	I/I	I/I*
TERMINAL NAVAIDS				
GS	X X	X X	X X	X X
LOC	X X	X X	X X	X X
OM	X	X	X	X
MM	X X	X X	X X	X X
IM	X	X		*
ALSF/MALSR	X X	X X	X X	X X
RVR	X X	X X	X X	X X
VASI	X	X	X	X
RUNWAY LIGHTS				
HIRL	X X	X X	X X	X X
MIRL				
CENTERLINE	X X		X X	*
TDZ	X			*

* Runway 25L will be ILS CAT II in 1983 with IM, Centerline lights and TDZ lights.

TABLE II-2

ARRIVAL AND DEPARTURE MINIMUMS

RUNWAY	ARRIVAL (MINIMUM)	DEPARTURE (MINIMUM)	REMARKS
24R	200 - 1/2 1800 RVR	700 RVR	Existing Cat II Minimums 1200 RVR to be upgraded CAT III A
24L	200 - 1/2 2400 RVR	1600 RVR	
25R	200 - 1/2 2400 RVR	700 RVR	
25L	200 - 1/2 2400 RVR	1600 RVR	To be upgraded to CAT II, A centerline lights to be installed 1983
6R	300 - 1/2 2400 RVR	1600 RVR	
6L	300 - 1/2 2400 RVR	1600 RVR	
7R	200 - 1/2 2400 RVR	1600 RVR	
7L	200 - 1/2 2400 RVR	700 RVR	

C. Existing Ramp/Gate Facilities

The ramp/gate complex at Los Angeles includes the terminals, aircraft parking positions (i.e., gates), commuter/air taxi and general aviation terminal, air freight ramps and taxiways around the parking areas. (Refer to Figure II-5).

1. Central Terminal Complex

The Los Angeles Central Terminal Complex includes seven terminals containing a total of 84 gates. Except for Terminal Two, the users control the gate assignment and the internal operation of the terminal. Due to the large number of international carriers involved, Terminal Two and the associated three hardstands are controlled by the DOA, City Operations. Though the user makes the gate assignment, ingress and egress of aircraft at the gate is controlled by the FAA Control Tower. This is necessary due to the proximity of the aircraft to the terminals and taxiway.

2. Commuter Terminal

The Commuter Terminal (including General Aviation) is located between the terminal complexes near the West Terminal site. The terminal handles aircraft with a wing span less than 75 feet and a weight of less than 27,000 pounds. Most commuter/air taxi operators and general aviation aircraft (short term parking) use this terminal.

3. Additional Aircraft Parking

a. Long term (overnight) parking for general aviation aircraft is available on the south side of the airport.

b. Some charter flights (jet aircraft) and non-scheduled carriers park at the Imperial Terminal on the south side of the airport.

c. Air freight operations are conducted on several ramp areas located around the east end of the south complex.

III. AIRPORT SYSTEM PERFORMANCE

This section discusses the operational performance of LAX. Performance is measured by the relative capacity of the system components modified by existing constraints and then compared with the amount of delay experienced by an aircraft operation.

Notwithstanding adequate capacity to process current demand, if delays are incurred by aircraft operating within the airfield and final approach airspace system, the overall system may be performing inefficiently. Therefore, the only meaningful measures of airport system performance are the resulting flow rates and delays incurred as current aircraft demand is imposed on existing runway and taxiway system capacity.

A. Airfield Capacity

Airfield capacity is the maximum number of aircraft operations (land or takeoffs) that can be processed in a given time under specific conditions of:

- Airspace Constraints
- Ceiling and Visability Conditions
- Runway/Taxiway Layout and Use
- Aircraft Mix
- Arrival/Departure Percentage

Capacity estimates were obtained using the FAA Capacity Model. Using this analytical approach the full capacity of LAX, if there were no environmental restrictions on the North runway complex is 147 operations per hour for visual approaches and 128 operations per hour under instrument conditions. However, during normal operating conditions Runway 24R - 6L is the last runway utilized under the present preferential runway scheme for both arriving and departing air carrier operations.

1. Runway Capacity

Capacity estimates were developed for VFR and IFR weather conditions with a west flow operation (i.e., Runway 24L, 24R, 25L and 25R).

a. Baseline Operations

Runway capacities were computed assuming current operational restrictions on the use of Runways 24L and 24R were in effect. With these operational restrictions, VFR runway capacity is 114 operations per hour and IFR runway capacity is 114 operations per hour based on a 50 percent arrival/departure split. (See note on Table III-1).

b. Modified Operations

In the capacity phase of work, Task Force Delay Study surveys resulted in the observation that:

- In VFR conditions, Runway 24L is utilized to about one-third of its capability, and Runway 24R is used for not more than six percent of the total airfield operations, and;

- In IFR conditions, Runways 24L and 24R are utilized to about one-half their capacity.

In order to determine current runway capacity with a more balanced utilization of the airfield, the Task Force Delay Study also ran the Capacity Model with no restrictions on Runway 24L. Only the current operational restriction on Runway 24R was maintained. The resulting VFR runway capacity was 147 operations per hour and the IFR runway capacity was 128 operations per hour, based on a 50 percent arrival/departure split. (See note on Table III-1).

TABLE III-1

AIRFIELD CAPACITY

CONFIGURATION*	IFR		VFR	
	Category I (or better)	Controllers 1/ Visual Approach	Basic 2/	VAPS 3/
A: 24L or R, 25L or R (Arrive 2) 4 Rwys D: 24L or R, 25L or R (Depart 2)	114	114	114	114
A: 6L or R, 7L or R (Arrive 2) 4 Rwys D: 6L or R, 7L or R (Arrive 2)	114	114	114	114
A: 1 Rwy Only D: 1 Rwy Only 3 Rwys and Arrive + Depart 1 Rwy	104	104	104	104
1 Arrive + Depart Two 2 Rwys Independent Rwys (Different Complexes)	93	93	93	93
Arrive + Depart Two 2 Rwys Dependent Rwys (same Complex)	57	57	57	57
Arrive + Depart Single Runway 1 Rwy	47	47	47	47
Arrive + Depart Over Ocean (Midwatch Operations due to noise abatement)	32**	32	32	32

1/ Controller's Visual Approach - IFR weather category denoted conditions when controllers can see aircraft and apply visual separation.

2/ Basic VFR - Weather is 1000/3 or better but minima not met for visual approaches (VAPS).

3/ VAPS - Visual Approaches - Weather minima met for visual approaches.

NOTES: *For each LAX configuration (except arriving and departing over-ocean operations), the EPS is the same for all weather categories. This is because LAX operates under strict metering procedures and IFR separation minimums in all categories of weather. Current regulations also require increased separation during VFR weather equal to the IFR separation, thereby equalizing the capacities for all conditions. The FAA indicates that since LAX operations are completely east/west and the separations required by the TCA, the new airspace management program will not effect the metering procedures currently utilized.

**The over-the-ocean procedure capacity of 32 is an approximate average with a range of 20-50 operations per hour. Notwithstanding the previous statement the FAA Tower Chief, given the current set of operating conditions, estimates that 32 operations/hour is about the limit of over-the-ocean operations.

is about the limit of over-the-ocean operations.

2. Terminal Gate Capacity

The Task Force Delay Study, did not specifically quantify the capacity of the existing gates. There are many dynamic variables which fluctuate both daily and seasonally, as well as type of aircraft handled at the gate. The Department of Airports prepared a gate utilization study to identify under-utilized gates. The study contained information which is applicable to this effort. Using the peak traffic year of 1979, gate capacity information was developed. The average gate passenger volume capacity for July 1979 (the peak month) was 41,000 with a range from 32,000 to 47,000. Currently, the airport is accommodating about 33 MAP, which equals approximately 33,000 passengers per gate per month or 393,000 per gate annually.

The Department's Facility Planning group indicates that the total number of gates (109) which will be available after the airport modification program is completed will adequately serve up to 40 million annual passengers (MAP). Gate utilization will become more flexible because more of the new gates will be able to handle both narrow and wide-bodied aircraft.

B. Air Traffic Demand

Actual and forecasted air traffic demands were prepared for the 1978, 1982 and 1987 time periods. Additional 1982 and 1987 aircraft schedules were prepared in total daily increases of five percent and fifteen percent over the projected 1982 1987 operations. Each air traffic demand applied to an experiment required a specified arrival and departure runway distribution and individual gate assignments by airlines.

When the experiment required another weather condition or an improvement in airport design, the aircraft schedule was changed to reflect a proper response to the weather condition or the revised airport operation. After the computer simulation of a particular experiment, the delay and travel time summaries were analyzed to determine whether the results represented logical operating conditions for the airport. If necessary, the demand was modified to produce a reasonable distribution of traffic on the runways by reassigning arrivals from the south complex to the north complex of the airport. This was done by changing the runway assignments in the schedule and/or dynamically reassigning runways during the model run. Changes in the demand, by schedule changes and/or dynamic rerouting, produced lower delay values and better traffic flow over the entire airport.

The actual and projected (1982 and 1987) demand schedules were used to calculate the estimated annual demand and passenger enplanements.

Tables III-2 through III-3 illustrate the projected airfield demand levels used during the Task Force Delay Study.

The 1987 operational demand level is consistent with the level of operation being utilized in the INM Computer runs of various operational scenarios being prepared for the LAX-ANCLUC study. However, a direct correlation between airfield demand level measured in operations and passenger demand measured in MAP does not exist. The passenger demand forecasts discussed in Task 2.01 indicate that demand will increase over the next 20 years. However, the speed of the increase is extremely dependent on many interrelated economic factors. The airport modification program currently underway is expected to provide improved levels of convenience to the air passenger and reduced delay for the airlines up to the 40 MAP limit.

TABLE III-2 AIRFIELD DEMAND LEVELS

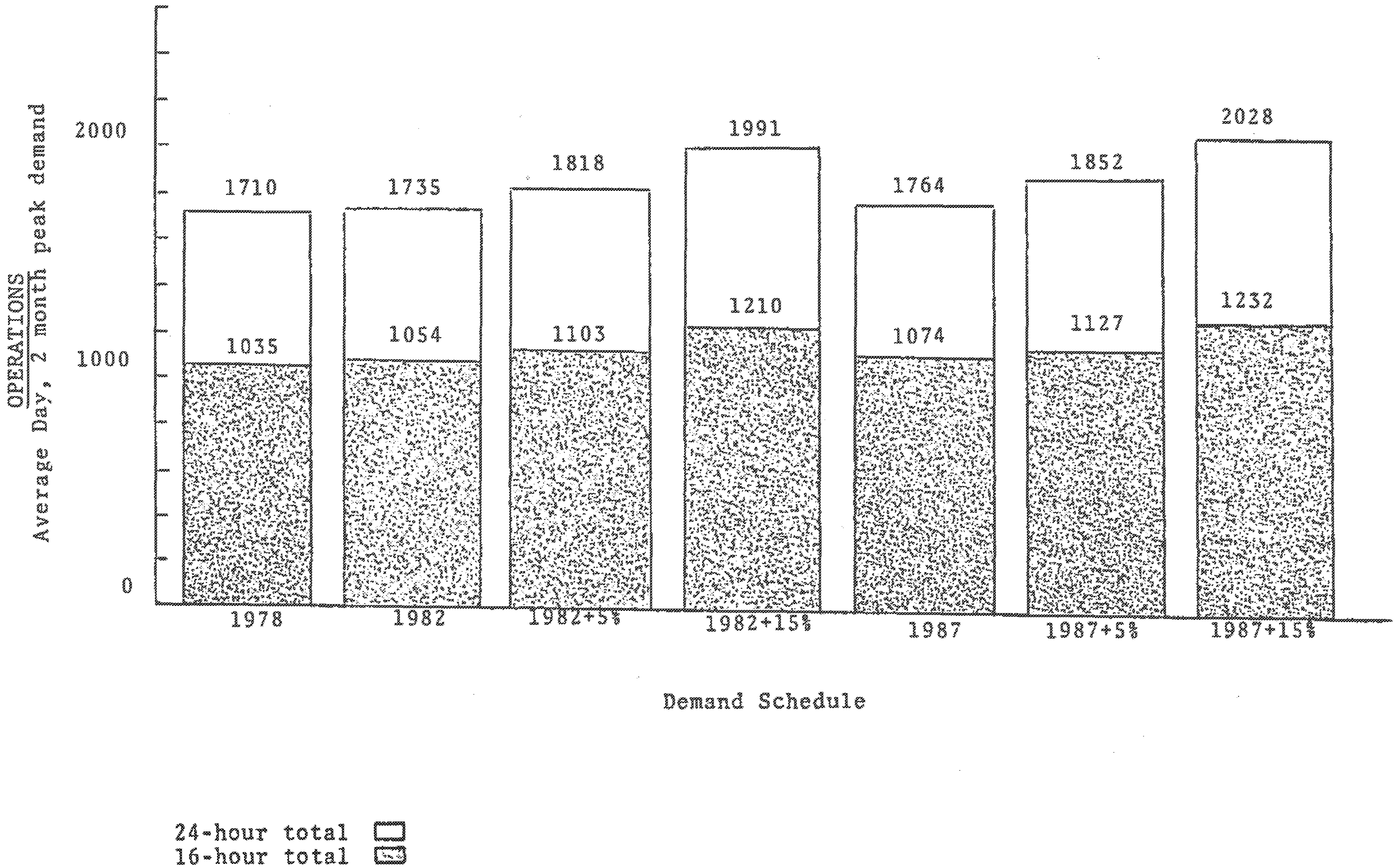


TABLE III-3

AIRCRAFT OPERATIONS

	No. of Operations			Class Distribution*			
	Annual	Avg. Day	Peak Hour	Class 1	Class 2	Class 3	Class 4
78	510,263	1,710	111	21.5%	55.4%	17.9%	5.2%
82	518,157	1,735	114	23.9%	55.0%	15.9%	5.2%
82+5%	544,368	1,818	120	23.9%	55.3%	15.9%	4.9%
82+15%	599,000	1,991	131	23.9%	55.6%	15.9%	4.6%
87	527,315	1,764	115	27.0%	54.0%	13.9%	5.1%
87+5%	553,680	1,852	122	26.9%	54.1%	13.9%	5.1%
87+15%	606,411	2,028	132	27.0%	54.0%	13.9%	5.1%

Class 1 - Heavy - greater than 300,000 pounds.

Class 2 - Large - 12,500 pounds to 300,000 pounds.

Class 3 - Small - twin engine less than 12,500 pounds and Lear jets.

Class 4 - Smaller - single engine less than 12,500 pounds.

C. Airfield Delay Analysis

Airfield delay is the additional travel time, caused by airfield congestion, taken by an aircraft to move from point A to point B. Computing average annual airfield delays involves:

- Airfield physical characteristics
- Air traffic control procedures
- Aircraft operational characteristics
- Airfield demand
- Weather

Average annual delays are expressed in minutes per aircraft operation.

Congestion results whenever the volume of aircraft operations at an airport approaches airfield capacity. Aircraft delays during congested periods are very high; consequently, the average aircraft annual delays are also high.

Aircraft operating delays occur at LAX as a result of the interaction between current demand levels and the existing airfield layout and operating restrictions. The following are the primary causes of delay:

- Restricted use of Runway 24R for landings due to noise abatement and preferential runway use program.

- Aircraft weight restrictions on the south runway complex due to the Sepulveda Boulevard overpass.

- Intra-hourly aircraft volume and arrival/departure ratio peaking.

Experiment 17 of the Task Force Delay Study was conducted to determine the total hours of arrival and departure delay using a 1978 aircraft demand under current ATC System parameters without improvements to the airfield, the results were as follows:

Total Annual Arrival Delay	11,485 hours
Total Annual Departure Delay	26,505 hours
Total Annual Delay	37,990 hours

Using estimated weighted average aircraft ground and air operating costs for 1978 aircraft demand mix the annual cost of aircraft delay was $32 million during normal operating conditions.

The Air Transport Association (ATA) reports that 1982 operating costs have increased by at least 70 percent since 1978 primarily due to rising fuel costs. In addition, since the publication of the Task Force Delay Study the constraints causing delay have changed. Airspace congestion east of Denver, which has increased since the Air Controller strike is now considered the primary cause of delay for arriving flights.

While the cost of each minute of delay has increased since 1978, the actual amount of delay under normal operating conditions has declined. The south runway complex reconstruction could become an interim source of delay. However, another result of the Air Controller strike has been reduced air operations, this fact coupled with the effect of the recessionary economy has reduced air operations further. Therefore, the runway reconstruction will probably not increase delays due to reduced demand.

1. Airfield Constraints

The primary causes of delay described above constrain airfield operations for the following reasons:

a. The inability to use all runways equally for maximum capacity and flow rates creates an unbalanced approach controller workload and runway utilization. Although ATC management has the option to relax the Runway 24R use constraint on Runway 24R to relieve delays, frequently arrival delays have already built up before that action can be taken. ATC must also consider excess taxi distance when clearing arrivals; reducing arrival-landing delay on Runway 24R may create more ground taxi delay than is acceptable for a remote south complex terminal aircraft. The development of additional north and west side terminal gates will help balance runway loads by providing adequate arrival aircraft demand for the north complex to offload the south runways.

b. The Sepulveda Boulevard overpass weight restriction creates extensive peak hour departure delays which are further increased by the restricted use of Runway 24R. Thus, during the morning departure peak, significant heavy jet delays occur on Runway 24R. These delays have been reduced with the reconstruction and reopening of Runway 25R in October 1982. Once Runway 25L is reconstructed in early 1984 no weight restrictions on operations will be necessary.

c. In addition to runway take-off delays on Runway 24R during heavy jet departure peaks, excessive taxi distances are required for many of these aircraft. For example, United Airlines DC-8/DC-10 and B747 departures must taxi a distance of 10,500 feet to the Runway 24R threshold. In addition to excess distance, the volume of these aircraft creates congestion delays to other aircraft due to the airport's limited taxiway capabilities.

d. Significant departure delays were also caused by a cross-over conflict between north and south runway departures. Heavy jets restricted to Runway 24R for takeoffs were delayed by the need to separate them from northbound traffic turning right over the ocean after departure from the south runways. South and eastbound heavy jets departing from the south runways would not be delayed by this cross-over interaction between runways. Reconstruction of the south runway will minimize this problem.

e. Only one runway, Runway 24R, is presently capable of Category II ILS landings at LAX. Both Runways 24R - 6L and 25R - 7L are equipped for 700 RVR takeoff minimums. Therefore, in Category II <u>or</u> lower visibility conditions, all landing operations are restricted to these runways. Past studies of Fog Dispersal feasibility by the FAA have determined that the arrival flow rate to Runway 24R is reduced to 17 landings per hour in Category II conditions.

f. Lack of aircraft holding aprons, for inbound aircraft awaiting gates, and outbound aircraft awaiting clearance, exacerbates delays caused by the runway restrictions outlined above in that outbound gate holds occupy gates assigned to arrivals, thus negating the fuel savings of the gatehold. Holding aprons are needed for outbound aircraft primarily. However, airport geometry is such that no possibility exists for holding aprons in proximity to the Runway 24L/R thresholds on the north complex. On the south complex, cargo area facilities presently occupy or are planned to occupy all available sites for holding aprons to serve the Runway 24L/R thresholds. Planned airport expansion includes a large aircraft parking apron off Taxiway U at the west end of the north complex. While this apron would be useful for inbound/outbound delayed aircraft to/from Runways 24L/R, its use would involve circuitous taxiing on planned Taxiway 75 for departures, in order to avoid delays to arrivals which have landed on Runway 24L or 24R and are eastbound on Taxiway U. This remote aircraft holding apron would not be convenient for use by south runway departures.

g. The north parallel taxiway system must serve both to provide for flow between Terminals Two and Three (and Terminal One in future) and for Runway 24L departure queueing.

h. Inadequate length on Runway 6L-24R tends to restrict heavy jet departures to Runway 24L.

D. Air Traffic Demand and Delay Relationships

This section summarizes the results of the simulation experiments which demonstrated the current and future relationships between air traffic demand and aircraft delay and identified the delay reduction benefits of near-term (1982), and far-term (1987) improvements in airport facilities, ATC equipment and ATC procedures.

The operation of the existing airfield and the potential benefits of the proposed improvements were assessed in terms of airfield capacity, airfield demand, and average aircraft delays. Estimates of average aircraft delays are based on the values-and the interrelationships--of airfield capacity and demand. The estimated average aircraft delay permits assessment of both the operational feasibility of the airfield and the potential economic benefits of the proposed improvements.

Various airfield system improvements, ranging from changes in air traffic control procedures to changes in physical facilities and operations, can increase airfield capacity and thus reduce delays. If a dollar value is attached to each minute of average aircraft delay, the cost of a particular airfield improvement can be weighed against its annual delay savings. For a given forecast increase in demand, a suitable combination of airfield improvements can be implemented in stages so that airfield capacity is increased as needed and average aircraft delays are maintained within acceptable limits.

TABLE III-4

SUMMARY OF ESTIMATED DELAYS FROM THE LAX-TASK FORCE DELAY STUDY

DEMAND [1] SCENARIO	ATC SYSTEM SCENARIO	AIRPORT IMPROVEMENTS	ANNUAL DELAY (HOURS)	AVERAGE DELAY (MIN/OPER)
1978	1978	None	37,991	4.5
1982	1978	None	39,630	4.6
1982+5%	1978	None	56,289	6.2
1982+15%	1978	None	130,382	13.1
1982	1982	None	33,953	3.9
1982	1978	1982	24,113	2.8
1982	1982	1982	21,037	2.4
1987	1978	None	41,334	4.7
1987	1978	1987	22,908	2.6
1987	1987	None	24,354	2.8
1987	1987	1987	13,496	1.5
1987+5%	1982	1987	30,147	3.3
1987+15%	1982	1987	53,858	5.3
[2] 1982+5%	1978	1987	31,192	3.6
[2] 1982+5%	1987	1987	17,970	2.0
[2] 1982+15%	1987	1987	41,624	4.2

NOTES:

[1] Demand Levels are indicated on Table III-2

[2] Projected Values

IV. RECOMMENDED FACILITY IMPROVEMENTS

The Airport Improvement Task Force initiated the task of recommending facility development by determining the areas of aircraft delay and the operating restrictions on the existing airport configuration during the Task Force Delay Study. It was recognized that both tangible reductions in delay and/or improved operating procedures would result from the remedies proposed by the Task Force. In addition, the anticipated increase in the number of aircraft serviced at the airport was of major concern since it was expected that the level of activity would eventually exceed the airport's ability to handle the traffic load without excessive delay. The efforts of the Task Force were directed at reversing this trend by meeting the increase in demand and decreasing the delays encountered while improving the level of service at the airport.

The Task Force members initially identified some near-term improvements which would alleviate the causes of delay at LAX. Calling upon the resources of their organizations to augment their own expertise and after considerable evaluation a set of improvements was formulated which reflected current and anticipated projects.

The proposed improvements were packaged into the near-term improvements most likely to be implemented in the 1982 and 1987 time frames (See table IV-1). Some improvements were grouped for isolated study and provisions were made for the determination of the best sequence for the proposed tunnel construction.

The Task Force recognized that different demand distributions would emerge due to the improvements. Tunnel improvements and terminal expansion would present different demands for runway and gate services than exhibited by present operations. Any improvement in service at the airport is also likely to be matched by an increase in demand by the airlines.

The FAA capacity and delay models were employed by the Task Force during the review of the near-term improvements. One objective of the effort was to estimate the potential benefit of reducing aircraft delay through facility development (airport design improvements).

The placement of Terminal One on the north side of the Airport was recommended after the completion of tunnel construction. This will permit redistribution of traffic between the north and south runway complexes. The change from present conditions will involve the increased use of Runway 24R for departures during VFR weather conditions, thereby reducing delays.

During or immediately after the completion of the tunnel and terminal improvements, consideration was given to bringing the easterly flow configuration to the same level of service as the westerly flow configuration (by improving the taxiway access to Runway 7L and the runway exits from Runways 6R and 7L). Even though utilization of the easterly flow configuration is extremely low, the Task Force felt it was advisable to develop a balanced capability at the airport to accommodate the daily traffic demand during times when weather conditions require easterly operations.

The introduction of a dual taxiway capability at the airport will be a natural extension of the improved terminal complex. In addition, the flexible operation provided by the improved tunnel overpass will be complemented by the dual taxiway. It was found that the dual taxiway will facilitate ground movement of aircraft during closure of a south runway for tunnel construction.

The development of remote parking for aircraft will be implemented in a timely fashion to relieve gate loading conditions during construction of the new terminals. This improvement will also provide the capability to handle future overflow conditions at the airport. Six remote parking pads have been constructed and are currently in use.

A high speed exit off Runway 25L to the south was determined to be beneficial to a small amount of traffic. Construction activity was performed during the construction of the tunnel improvement of Runway 25L to eliminate disruption of traffic at some future date. This improvement will become increasingly useful with the proposed development on the south side of the airport, including the Imperial Cargo Complex now under construction.

The operational experience with tunnel improvements and new terminals may highlight the desirability of providing the departure by-pass to Runway 24R on the north runway complex. The new taxiway access will permit aircraft to take advantage of earlier opportunities to depart. It may reduce the interaction of the southbound departures with aircraft awaiting departure from the south runway complex.

Although airport improvements at LAX offer reductions in delay and improved levels of service, the need to combine them with the reduced separation standards produced by the FAA Engineering and Development Programs (E&D) was accentuated during the Task Force Delay Study. It was noted that immediate benefits could be realized from the E&D improvements but, perhaps more importantly, they offer substantial delay reductions when demand increases to and beyond the projected 1982+5% time frame. Implementation of these programs will permit LAX to operate at an acceptable level of service in the forseeable future, unconstrained by runway limitations.

TABLE IV-1

RECOMMENDED FACILITY IMPROVEMENTS

IMPROVEMENT	RESPONSIBLE AGENCY	CURRENT STATUS
NEAR TERM (5 Years)		
Strengthen Sepulveda Tunnel	LA-DOA	Phase One Complete (25R Reconstruction)
High Speed Taxiway off Runway 25L	LA-DOA	Phase One Complete (25R Reconstruction)
By-Pass taxiways to Runway 24R	LA-DOA	1983-84 Construction
Temporary holding areas	LA-DOA	1983-85 Construction
Parking for 24 aircraft	LA-DOA	Six Pads Constructed (10 complete by 1984)
Terminal Expansion (Terminal One and West Terminal)	LA-DOA	Construction Underway
High Speed taxiway off Runway 7L	LA-DOA	Construction Underway
High Speed taxiway off Runway 6R	LA-DOA	Not Scheduled
By-Pass taxiway to Runway 7R	LA-DOA	Not Scheduled
FAR TERM		
Extend Runway 6L/24R 1360 feet	LA-DOA	1984-85 Construction
Extend taxiway 36V	LA-DOA	Not Scheduled
Construction taxiway 75	LA-DOA	1983-84 Construction
Extend taxiway J	LA-DOA	1983-84 Construction
Construct taxiway 85V	LA-DOA	Not Scheduled
Construct holding area	LA-DOA	Not Scheduled
Install CAT II on Runway 25L	FAA	1983-84 Construction
Wind Shear Detection	FAA	Installed-Not Fully Operational

A. Effect of Improvements on Delay

Several performance measurements were calculated from the experimental computer runs to indicate the changes which occur as improvements are introduced into both the air traffic control and airport design scenarios. These measures include the peak average delays, the annual delay estimates, the total delays and the travel times during a simulated time period. They were calculated under different estimates of air traffic demand and operating conditions.

1. Estimated Effects

The estimated effect of the proposed improvements on delay are summarized below and graphically depicted on Table III-4.

a. Based on the 1987 demand (which assumes a change in aircraft mix) and the 1987 ATC separations, the additional 1987 airport improvements would reduce annual delays dramatically by 45 percent.

b. Based upon the 1987 demand and the 1987 separations, the 1987 airport improvements would reduce annual delays by 45 percent.

c. Based upon the 1987 demand and the 1987 airport improvements, the 1987 separations would reduce annual delays by 41 percent.

d. Based upon the projected 1982 demand and the 1982 ATC separations, the additional 1982 improvements could reduce annual delays by 38 percent.

e. Based upon the projected 1982 demand and the 1982 improvements, the 1982 ATC separations reduce annual delays by 13 percent.

2. Economic Benefits

The estimated economic benefit of the various improvements which reduce delay are described on Table IV-2.

TABLE IV-2

ESTIMATES OF POTENTIAL ANNUAL SAVINGS
FROM IMPROVEMENT PACKAGES (**) OR IMPROVEMENT (*)

IMPROVEMENT OR IMPROVEMENT PACKAGE	POTENTIAL ANNUAL SAVINGS (Hours x Cost Factor = Savings)
**Near-Term Improvements	Arrivals - 5731 x 27.76 x 60 = $9.5 million Departures - 8136 x 15.05 x 60 = $7.5 million
*High Speed Taxiway off Runway 25L	
*Strengthening of the Sepulveda Tunnel	
*Taxiway Access to Threshold of Runway 24R	
*Taxiway Access to Threshold of Runway 24R (Not Additive)	Departures - 1942 x 15.05 x 60 = $1.75 million
**Easterly Traffic Flow Improvements	Departures - 214 x 15.05 x 60 = $193 thousand
*High Speed Exit off Runway 7L	
*High Speed Exit off Runway 6R	
*By-Pass Area on North Side of Runway 7L	
**Terminal Expansion (Facilities and Equipment)	Arrivals - 568 x 27.76 x 60 = $946 thousand Departures - 6742 x 15.05 x 60 = $6.880 million $7.03 million

3. Effect of Individual Improvements

The anticipated effects of the various improvements recommended by the Task Force Delay Study are discussed below:

a. Sepulveda Tunnel Improvements

The potential benefits of strengthening the tunnel under Runways 25R and 25L were estimated by studying the proposed near-term improvement package. Some of the benefits expected after completion of the tunnel construction are:

- At the discretion of the ground controller, some heavy departures will be directed to the south runway complex based on their gate location, direction of flight after departure, etc.

- Delay reduction for departures by increasing ground traffic control flexibility.

- Improvement in nighttime operations through the revision of over-ocean restrictions. Some heavy aircraft departures on the north runway complex cross the south runway arrival route and interrupt the arrival stream. After tunnel construction, these departures may be redirected to the south runways, thus permitting an uninterrupted sequence of arrivals to either the north or south runways during departure operations.

Reconstruction of the Sepulveda Tunnel will require that each of the south complex runways (Runways 25/7) be closed during construction. Reconstruction of Runway 25R was completed in September, 1982.

- Construction began with Runway 25R (keeping 25L open) and will then proceed to Runway 25L (and re-opening Runway 25R). This sequence of construction minimizes delays due to the Sepulveda Tunnel Reconstruction.

- Reductions in both arrival and departure delays has been achieved during tunnel construction by utilizing Runway 24R (arrivals) and Runways 24L (departures) to their capacity. This has required a temporary relaxation of the existing noise abatement restrictions and runway use program.

b. High Speed Taxiway Exit Off Runway 25L

This improvement provided an additional path off Runway 25L at a position which would facilitate the movement of aircraft going to the cargo or general aviation areas located south of Runway 25L. Since the aircraft population of general aviation is presently relatively low and most cargo operations are usually scheduled during off-peak periods, the effect of this improvement was obscured by averaging all the data accumulated during simulation by the Task Force. However, the improvement will have a beneficial effect on reducing controller activity in handling some aircraft on the ground. In addition, any future expansion of facilities or increase in aircraft traffic in the south ramp area would require this exit to minimize the number of aircraft crossing over the two south runways.

c. Taxiway Access to Runway 24R Threshold and Temporary Holding Area in Proximity of Future Taxiway 75

The proposed by-pass of 24L (i.e., taxiway access to Runway 24R for departures) and a temporary holding area for arrivals were considered by the Task Force. The first improvement was intended to provide an uninterrupted departure queue for Runway 24R. This would avoid potential blockage by heavy aircraft waiting for departure on Runway 24L and permit departures to cross Runway 24L with ease. The second improvement was designed to provide a holding area for international and other carriers which did not have a gate available at the time of arrival.

The results of the eight-hour period of operation with and without the improvements (using 1982 aircraft demand) indicated a seven percent reduction in total departure travel time and a ten percent reduction in total departure delay.

d. Dual Taxiway

The dual taxiway improvement applies to the junctions of Taxiways J and K and Taxiways 47 and 49. It is intended to relieve the congestion which occurs in that area for arrivals entering Terminals 4 and 5 from the north complex. The new taxiway system will preserve the present routing flexibility of the ground controller in separating the departure and arrival flow in that critical area after construction of the new West Terminal.

The results of the Task Force Delay Study study indicated that the dual taxiway system would have no effect on taxi delays under existing operating conditions and the 1982 aircraft demand. However, a new dual taxiway reduced the combined taxi delays for arrivals and departures by eight percent during Runway 25R tunnel construction.

Remote Parking Positions For 24 Aircraft

Aircraft demand is expected to increase in the immediate future generating a higher demand for gates, particularly for international carriers who have recently shown a substantial growth rate at LAX. The establishment of a remote parking area for 24 wide-bodied jets in the vicinity of future Taxiway 75 at the west end is needed to meet the projected international air carrier peak and overnight parking demand. This area will be serviced by wide-bodied field buses to the terminals.

Phase one of this project, which began in October 1980, now provides six aircraft positions to relieve the immediate gate demand during the construction of the new terminals (Terminal One and West Terminal).

f. By-Pass on the North Side of Runway 7L and High Speed Exits Off Runway 6R and 7L

The westerly flow of traffic is predominant at the airport, but there are times when over-ocean arrival operations (easterly flow) are required during certain wind conditions and at nighttime, for noise abatement purposes. Improvements to the airport for this configuration are required to insure consistent performance.

Three proposed improvements to the runways are designed to provide an uninterrupted flow of arrivals and departures. The by-pass of Runway 7L will permit departures to queue up for Runway 7R and depart expeditiously during normal traffic flow. The high speed exits will facilitate the movement of arrivals off the runways and onto the taxiway at locations where they can be conveniently directed to their gates.

The by-pass around Runway 7L to 7R will result in the same improvement in performance as the proposed by-pass around Runway 24L to 24R, assuming similar traffic loads. This improvement, combined with the high speed exits, will bring the performance of the easterly traffic flow up to that of the westerly traffic flow.

g. Terminal Expansion (Terminal One and West Terminal)

New terminals have been planned to accommodate the increase in the passenger demand expected in the immediate future. The West Terminal for international flights and Terminal One for domestic flights will add 25 new gates. When joined with the ten remote pads a total of 35 new gates are anticipated by mid-1984. The new locations of the additional and relocated gates and the resulting routing of traffic are expected to have an effect on both the arrival and departure runway distributions and the aircraft travel times. A benefit of the new terminals is an opportunity to balance the aircraft between the north and south runway complexes, based on the desirability of landing and departing an aircraft on a runway closest to its gate.

Task Force Delay Study experiments dealing with terminal expansion was compared to present day gate conditions. Both experiments used redistributed aircraft schedules. The results of the terminal expansion exercise indicated a five percent reduction in airborne arrival traffic time and a nine percent improvement in departure travel time.

B. Estimates of Potential Annual Savings From Improvements

The estimates of potential annual savings from the proposed improvements are shown in Table IV-2. The airport design improvements were treated collectively and/or individually to assess the change in delay and travel time from existing conditions.

The Task Force proposed improvements were designed to alleviate known causes of delay at LAX. Generally, individual improvements were not considered in isolation. The impact of the improvements on the demand distributions of runway and gate assignments have been considered. These dynamic aspects of the exercises added to the value of the results in predicting the characteristics of future airport operations. In general, it was observed that:

1. The improvements generated different demand distributions for runway use, etc. For example, terminal improvements will redistribute traffic from the repositioned gates by reassigning that traffic from the south to the north runway complex.

2. The improvements lead to a more desirable distribution of traffic and reduced delay at the airport.

3. The demand-to-delay relationship was somewhat complex and resulted in shifting arrival and departure delays among runways as various operating conditions were employed.

4. The potential benefits from some improvements were reduced due to other constraints which surfaced after the immediate cause of the delay was relieved. For example, the tunnel improvements, which permit aircraft to depart from the south runway complex, actually produced greater delays for Runways 25R and 25L due to the greater demand for these runways and the change in the heavy aircraft mix. Some departures requesting the south runway complex, based on present day gate positions, must be diverted to the north runways to redistribute the traffic. Only by doing this can the benefits of reduced delays be realized from the tunnel improvements, which permit increased airfield utilization for aircraft.

5. The sequence of tunnel construction, Runway 25R and then Runway 25L, offered some advantage in reducing the total delay after the completion of Runway 25R and during the construction ecessitated a relaxation of the restrictions on the north runway complex. This relaxation permits the facility to maintain the present day level of service at the airport.

The near-term improvements consist of strengthening the Sepulveda Tunnel under Runways 25R and 25L, a high speed exit off Runway 25L to the south, a new taxiway access to the threshold of Runway 24R, and a temporary holding area on future Taxiway 75.

The annual cost savings for the near-term improvement package in terms of delay reduction was estimated to be $16.8 million.

The improvement of the taxiway access to Runway 24R was compared to an scenario without major improvements, using identical operational conditions and 1982 demand. During an eight-hour period of operation, the computer model indicated that there was a reduction of 6.6 hours in departure ground travel time. The annual savings due to this improvement was estimated to be $1.75 million.

The improvement to the easterly traffic flow included a taxiway by-pass around Runway 7L to Runway 7R and high speed exits off Runways 6R and 7L. One estimate of the high speed exit improvements was a reduction in departure taxi delay by an estimated 1.6 hours during an eight-hour period. This result indicated that the location of the new exits was aiding the departure ground traffic flows (arrivals interferred less when using the new exits). The departure by-pass will decrease the departure delay by approximately ten percent (similar to the by-pass to Runway 24R included in the near-term improvements.) The estimated annual savings for these improvements is $193 thousand. This estimate considered the percentage of time the easterly configuration is used during the year, which is approximately 1.5 percent of total annual operations.

Terminal expansion necessitated the redistribution of arrivals which resulted in a reduction in arrival and departure delays. The new terminal locations required greater use of Runway 24R during VFR conditions. The results of the original exercise, which considered the terminals as gate areas, has not detected any difficulty in accommodating the traffic. The annual cost savings of the new terminal complex is estimated to be approximately $7 million.

V. CONCLUSIONS

The proposed and on-going improvements to the airfield facilities required for LAX to operate, offer reductions in delay and improved levels of service. The airfield requirements discussed previously will enable the airport to operate efficiently at up to the 40 MAP level without exceeding the capacity of the airfield system.

The airfield system will probably remain sufficient beyond the turn of Century. Technological advances such as very short take-off and landing (VSTOL) and vertical take-off and landing (VTOL) aircraft should reduce the requirement for long runways and will still be able to utilize the existing gates, although some modifications may be necessary.

The FAA's 20-year plan to modernize the national air traffic control system could bring more efficient use of the airspace and reduce delays further in the next Century, by reducing required aircraft separations and operating minimums.

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LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL/LAND USE COMPATIBILITY STUDY

TASK 2.03

AIRSPACE AND AIR TRAFFIC CONTROL ANALYSIS

TABLE OF CONTENTS

I. INTRODUCTION

A. Purpose

The intent of Task 2.03 is to evaluate the airspace/air traffic control requirements associated with present and future conditions at the Los Angeles International Airport (LAX). The relationship of air traffic control requirements to various existing and potential noise abatement procedures will also be examined.

B. Scope

Much of the basic information associated with the purpose of this task has already been dealt with, in Task 1.01 (LAX Airspace and Air Traffic Control Data). Nevertheless, several features of airport operations, and their ability to lessen aircraft noise, will be considered. Attention will be given to expanded over-the-ocean operations, increased aircraft towing and to variable landing fees.

II. AIRCRAFT OPERATIONS

A. Aircraft Distribution by Runway

Some people in Westchester, Inglewood, Hawthorne, and El Segundo feel that their respective communities receive an undue burden of LAX aircraft noise. The City of Los Angeles Department of Airports (DOA) has considered the effects of balanced aircraft operations between the northern and southern runway complexes. The 1978 LAX Environmental Impact Report analyzed this practice, as well as the preferential runway use sequence presently employed. This system is designed to direct the bulk of operations to those runways located furthest away from residential areas.

B. Aircraft Drift

This issue concerns the extent to which jet aircraft drift and/or premature turns on departures to the west can be controlled to reduce overflights of noise sensitive areas. LAX Tower personnel currently instruct departing aircraft to use the Standard Instrument Departure (SID) which specify "climb via a 250 degree heading or maintain runway heading" to a certain specified altitude which would take the aircraft past the coast prior to any turns. Although premature turns do occasionally occur, simple drifting caused by winds (in about one percent of all departures) is equally the case. That is, the nose-high altitude of the aircraft on takeoff may preclude the pilot from properly determining whether lateral winds are causing a deviation in in the departure course. The Federal Aviation Administration (FAA) Tower crew is not equipped to detect relatively "small" variations in departure flight paths.

The Tower would be concerned with such "variations" only if they presented some potential for an unsafe condition. However, the tower does maintain taped records of all clearances given to aircraft in the vicinity of LAX. These voice records extend back over a 15-day period and identify individual aircraft.

During 1982, the DOA made inquiries into the utilization of narrow beam height sensors for positioning around LAX to detect aircraft drift. If this supplementary aircraft monitoring system were deployed, drift data could be relayed electronically to the Department's Noise Abatement Office. Other methods of detection of drifts and premature turns include videotape surveillance with a fisheye or wide-angle lens, and computer/optical surveillance with a small computer controlling a video array input defice with a similar lens angle of coverage. Information thus acquired could include the position, time and severity of the noise source and would be stored chronologically on tape. Examination of these tapes, which would store relayed data from the previous 100 hours, could take place every workday. Cross-checking this information with Tower clearance tapes would yield the exact identity of severely drifting and/or prematurely turning aircraft. The involved airline(s) would then be notified, together with the Regional FAA Noise Abatement Office. Premature turns may be ordered by the Tower personnel during an emergency situation to enable aircraft to maintain a safe distance from other traffic.

Studies performed by the City of El Segundo indicate that under normal weather conditions, premature turns are likely to occur in less than one percent of operations. However, observations indicate that such operations are likely to be more frequent in crosswind conditions. Because premature turns carry aircraft over areas where they do not normally fly, and are well known by the public to be prohibited from flying, they result in a significant number of complaints.

C. Approach Angle of Descent

Another question often raised is why the descent angle of aircraft on approach cannot be steeper. It is held that steeper angles would perceptively lessen aircraft noise footprints to the east of the airport and that less people would be disturbed. Actually, the amount of noise reduction to be gained from aircraft flying 50 to 400 feet higher over residential areas than the regulation 3-degree descent angle allows would, in most cases, not be noticeable on the ground. More pointedly, many aircraft accidents occur during the approach/landing phase of flight. For this reason, the FAA has prescribed very definite aircraft configurations (power settings, flap settings, etc.) and pilot procedures for every aircraft type to follow during landings. All turbojet aircraft on approach normally fly the same approximate descent profile. However, this requirement is not binding on general aviation light aircraft or commuter propeller driven aircraft executing visual approaches. This profile is commenced as far out as 30 to 40 miles and as high as 10,000 feet, depending on weather, traffic, and other factors. Its most important and unvarying feature is a 3-degree glide slope, which equates to a 318-foot descent rate per mile, or 340 feet per nautical mile. All air carrier aircraft, regardless of type, must be stabilized within their descent profile by at least the time the final approach segment is reached (five to six miles from the runway). Profile parameters will not be affected by new or re-engined aircraft coming into service between 1980 and 1984. Only with the possible introduction of vertical takeoff and landing jet transports, predicted sometime near the year 2000, could the 3-degree glide slope become flexible.

D. Over-the-Ocean Operations

1. Background

In September 1972, a procedure was adopted on a trial basis at LAX to reduce the noise exposure from arriving aircraft, particularly in the Lennox-Inglewood area. The procedure consists of routing aircraft inbound from the north and west for over-the-ocean landings to the east (on Runways 6 or 7). The rate of takeoffs is slowed, although the direction is not affected. Use of the procedure is limited to between midnight to 6:30 a.m. If it is determined that there is a ceiling of 400 AGL or less at the westerly end of the airport, or that the tailwind component exceeds ten knots from the west, or the RVR (Runway Visual Range) is less than 2400 feet, on Runways six or seven, the procedure is suspended.

2. Effects

There are several areas in which the procedure affects the noise environment. Normal routing of flights from the north and west is over the Santa Monica airport, with a right turn in the vicinity of the Coliseum. The elimination of flights using this path results in less exposure to parts of Santa Monica, Culver City, Baldwin Hills and, to a lesser extent, the area south of the Coliseum to Century Boulevard. Areas under the final approach course (Lennox and Inglewood) benefit from an approximate 17 percent reduction in the number of overflights. Areas exposed to sideline noise from of the airport, are subject to some additional landing noise beyond that from takeoffs to the west. The largest component of sideline noise is from the application of reverse thrust from initial touchdown until aircraft speed has dissipated to about 80 knots is utilized to reduce aircraft speed or landing.

Most jet aircraft approach LAX from the east, exposing portions of Lennox and Inglewood to approach noise. To reduce aircraft noise in these residential areas during night hours, "over-the-ocean approaches" are used.

Ocean approaches eliminate noise in areas east of the airport, but introduce noise in other areas.

The noise study associated with the initiation of over-the-ocean operations was meant to determine noise exposure changes in areas now exposed to noise during approaches from the west. Noise measurements were made at thirteen locations, seven nights. Locations were selected to define areas of possible noise impact in El Segundo, Westchester, Marina Del Rey, Venice Culver City and Baldwin Hills. Data showed that El Segundo, Westchester and Marina Del Rey are exposed to the higher noise levels produced by takeoffs. During nighttime approaches are from the west, there was slight increase in noise exposure in areas west of the airport. [A maximum of 3 dB change in hourly noise level (HNL) values was observed at one position]. There is a additional impact from thrust reverser noise. [Less than 0.5 dB change in HNL values was observed]. The maximum change in CNEL values in any of these areas was less than 0.5 dB.

For this same case, there was a reduction in aircraft noise in areas east of the airport. In some areas noise exposure was reduced to background levels, HNL reductions of approximately 20 dB. Reductions in CNEL values approximately 2 dB. The change in CNEL may underestimate the noise reduction benefits occurring in residential areas east of the airport.

3. Impacts

Ocean approaches provide a substantial reduction in nighttime aircraft noise in areas east of LAX. Thrust reverser noise remains about the same to communities north and south of the airport, but there is additional noise in the communities adjacent to the coast to the north and south of the airport.

E. Expanded Over-the-Ocean Operations

The notion of greatly expanded or full-time over-the-ocean operations is not feasible, for economic, operational and political reasons. However, there are theoretical ways of expanding over-the-ocean operations. One is to greatly increase the number of flights within current over-the-ocean operating hours; another is to increase the number of hours during which over-the-ocean operations occur; and a third is to increase both.

1. Increase in the Number of Operations

Over-the-ocean operations currently (1982) occur between midnight and 6:30 a.m. The traffic level factor is crucial because of FAA's runway performance standards and aircraft separation regulations equates to 32 total operations on all runways to per hour, during the over-the-ocean period. Thirty-two operations per hour is not the cutoff number for total hourly oprations during over water procedure. On the other hand, the hourly limit during nonover-the-ocean operations is about 130 to 140, assuming visual flight rules, the present aircraft mix and all four runways operating, without constraints.

The basis for this limitation is largely derived from the federal Standards for Terminal Instrument Procedures (TERPS) and Air Traffic Control Handbook. TERPS provides the framework within which the "rules" for various types of aircraft approaches and landings are specified. Included in this material are procedures for initial, intermediate and final approach, circling and missed approaches, terminal area navigation, and takeoff and landing weather minimums. These criteria are applied to aircraft with different combinations of navigation and communications avionics, such as UHF, VHF and L/MF radios, and VOR, TACAN and ILS navigation/landing systems (See Glossary). Different limitations are also specified for aircraft flying under visual as opposed to instrument flight rules.

More directly related to over-ocean hourly operational restrictions are certain aircraft separation criteria contained within the Air Traffic Control Handbook. The Handbook provides provides for horizontal, vertical and converging aircraft separations by establishing minimum clearances between assigned aircraft positions.

During nighttime over-the-ocean operations, when aircraft arrive from and takeoff to the west, the LAX Tower takes special steps to ensure adequate separation. Any time an arrival is within 15 miles of its landing runway threshold, all departures on the same runway are brought to a halt until clear visual contact has been established between the arriving and departing pilots, or between the arriving pilot and the Tower. Because of the "head-on" nature of operations during over-the-ocean hours, there is little margin for error. The Tower may actually switch to normal (east-west) flight operations if the weather deteriorates enough to preclude safe aircraft separation.

New generation ground control/aircraft electronics, Microwave Landing System (MLS), Threat-Alert and Collision Avoidance System (TCAS) and Discreet Address Beacon System (DABS)] are not expected to reduce the need for added separation during over-the-ocean operations. The potential benefits from new equipment lie in other areas of air traffic control. MLS transmissions, unlike ILS, are not affected by obstacles and may be able to guide aircraft in on curved, variable-altitude courses. (The utilization of MLS at LAX would not result in changes to present noise abatement restrictions on airport access flight paths. TCAS is a sophisticated, though simple, system giving aircraft a vertical and horizontal collision avoidance capability that is independent of ground facilities. DABS is a new system that will provide aircraft with more efficient individual identification, for air-to-air and air-to-ground applications. None of these systems, however, are a substitute for established aircraft separations utilized during nighttime, head-on, and over-the-ocean operations.

Approximately five percent of total LAX aircraft operations occur during midnight to 6:30 a.m., when average hourly flightslot utilizations are well below the over-the-ocean "limit" of 32. Table II-1 illustrates an average level of hourly operations. There are three main ways of manipulating flights in order to achieve an over-the-ocean hourly rate of 32 operations. If one considers every flight slot potentially available between midnight and 6:30 a.m., there are about 210 total slots. Presumably, all that needs to be done is to reschedule flights from the present high utilization hours, between 6:30 a.m. to midnight. This concept however is completely diverse from the current airline demand marketing concept. Additionaly, such an action would create an additional serious noise exposure by maximizing the impact during the most sensitive nighttime hours.

It is highly unlikely that the federal government, affected local governments or private industry would support this type of situation to develop. This approach would inconvenience many millions of air passengers annually and greatly reduce the economic viability of the airport and cause additional noise impacts.

2. Increased Hours

If over-the-ocean operation hours were increased to between 10:00 p.m. and 8:00 a.m. (the next day) an average about 20 operations would be pushed from between 10:00 p.m. to midnight into the midnight to 2:00 a.m. period. About 20 operations would be transferred from between 6:30 a.m. to 8:00 a.m. into the 5:00 a.m. to 6:30 a.m. period.

TABLE II-1

Average Level of Hourly Operations (August 1981)

Hours	Hourly Operations
Noon - 1 p.m.	65
1 p.m. - 2 p.m.	72
2 p.m. - 3 p.m.	58
3 p.m. - 4 p.m.	52
4 p.m. - 5 p.m.	65
5 p.m. - 6 p.m.	64
6 p.m. - 7 p.m.	74
7 p.m. - 8 p.m.	65
8 p.m. - 9 p.m.	58
9 p.m. - 10 p.m.	57
10 p.m. - 11 p.m.	44
11 p.m. - 12 p.m.	41
Midnight - 1 a.m.	23
1 a.m. - 2 a.m.	21
2 a.m. - 3 a.m.	4
3 a.m. - 4 a.m.	3
4 a.m. - 5 a.m.	4
5 a.m. - 6 a.m.	6
6 a.m. - 7 a.m.	10
7 a.m. - 8 a.m.	51
8 a.m. - 9 a.m.	66
9 a.m. - 10 a.m.	69
10 a.m. - 11 a.m.	82
11 a.m. - 12 a.m.	67
Total	1,121

Although less drastic to operational efficiency than a massive increase in the number of night operations, expanded over-the-ocean hours would have both positive and negative effects. Substantial passenger demand and scheduling problems would still remain. This is particularly apparent when the present average flight utilization rates of the hours 6:00 to 7:00 and 7:00 to 8:00 a.m. are considered. The difference between these hours (ten operations versus 51 operations) is substantial, indicating a inflexible passenger demand in terms of modifying these hourly flight utilizations. The same can be said for the midnight to 2:00 a.m. time period. Moreover, for this approach to maintain any political and economic validity at all, it must not be assumed that the "resulting" hourly utilization rates would be maximums. These maximums would equate to the authorized 40 million annual passenger (MAP) level at LAX to help absorb increasing Los Angeles Basin air passenger demand, especially during peak hours.

III. REGIONAL AIRSPACE MANAGEMENT

Many airports share the airspace within the Los Angeles Basin. The LAX Terminal Radar Control Center handles air operations for Santa Monica, Hughes, Hawthorne and Culver City, as well as for LAX. Near-miss incidents rarely occur because all the overlapping airspaces in the vicinity of LAX are under the same positive terminal control. These overlaps do produce some difficulties, though. Departures to the west from Hughes Aircraft Company and LAX occasionally put aircraft on converging courses and this affects the efficiency of air operations within the LAX terminal control area.

Helicopters are assigned specific Tower radio frequencies and are given special separations from fixed-wing aircraft. Fixed-wing aircraft maintain at least 2000 feet of altitude within the Terminal Control Area (until on final approach), while helicopters operate between 1000 and 1500 feet. Helicopters are normally instructed to fly along designated routes, such as freeway corridors. In 1982, helicopters posed no particular operational problems and contributed very little to overall aircraft noise levels at LAX.

IV. CONCLUSION

This task has discussed several potential operational procedures, on top of those presently employed, which may reduce aircraft noise at LAX. A refined aircraft noise-sensory/identification system and expanded over-the-ocean operations are operationsmanagement possibilities worth considering.

The Federal Aviation Administration, in cooperation with the DOA, will continue to explore all new technology, procedures and suggestions to maximize efficient air space utilization.

V. GLOSSARY

CNEL	Community Noise Equivalent Level
DABS	Discrete Address Beacon System
FAA	Federal Aviation Administration
HNL	Hourly Noise Level
ILS	Instrument Landing System
LAX	Los Angeles International Airport
MAP	Million Annual Passengers
MLS	Microwave Landing System
Operation	Aircraft Takeoff or Landing
TACAN	Tactical Air Navigation
TCAS	Threat-Alert and Collision Avoidance System
L/MF	Low/Medium Frequency (radio)
UHF	Ultra High Frequency (radio)
VHF	Very High Frequency (radio)
VOR	VHF Omnirange (Navigation)

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LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL/LAND USE COMPATIBILITY STUDY

TASK 2.04

PRELIMINARY ASSESSMENT OF COMMUNITY PLANNING AREA ENVIRONMENTAL IMPACTS AND ISSUES

TABLE OF CONTENTS

I. INTRODUCTION

A. Purpose

This task has been prepared to define and delineate to the degree possible the environmental impacts associated directly with the operation of Los Angeles International Airport (LAX). Current baseline environmental conditions with the ANCLUC Study Area and projected impact levels at the 40 million annual passenger (MAP) operational limit will be described. The residents within the study area are directly impacted by varying levels of aircraft noise, exhaust emissions and traffic. Therefore, this paper will focus on these direct impacts and be utilized as baseline information in considering the efficacy of alternatives mitigation programs in Phase III.

An important part of this environmental description will be a determination and analysis of noise exposure characteristics. This will include reviews of the current noise monitoring program to ascertain existing levels and locations of exposure and future expectations in regard to FAR Part 36 compliance.

B. Scope

The environmental information included in this paper is based on the review of available data. Documents prepared by individual jurisdictions participating in the ANCLUC Study process were compiled during Phase One and cataloged in Task 1.06/1.08. In additiona, more recent information has been utilized as it became available from the participating jurisdictions.

The noise impact quantification process will include Community Noise Equivalent Level (CNEL) values associated with 40 MAP but will not attempt to project CNEL values for the 1990 to 2000 as suggested in the work program. Long range impact projections of that type are difficult to accurately quantify and the utility of such information is extremely limited due to the number of assumptions which must be made.

The environmental data compiled in this task will provide a preliminary assessment of the noise, air quality and traffic impact levels associated with 40 MAP. The operational alternatives to be considered in Phase III could shift and possibly reduce the noise impact. However, air quality and traffic generation are less dynamic and related almost entirely to total operations. The safety, financial operational and institutional impacts associated with each alternative scenario will be quantified in Phase III.

II. DESCRIPTION OF THE ANCLUC STUDY AREA

A. Formation of Boundaries

The Los Angeles County Department of Regional Planning coordinated the process of developing the boundary with the cities of El Segundo, Hawthorne, Inglewood and Los Angeles. The cities and the County defined the study boundary within their own jurisdiction. The individual products were then synthesized into a composite boundary that recognized each jurisdiction's recommendations.

The study boundary definition relies heavily on the Los Angeles City Department of Airports (DOA) 1st quarter 1976 CNEL contour. The 1976 contour encompasses an area quite a bit larger than the 1980 contour or expected contours of the future.

The study boundary was further refined to correspond with existing census tract boundaries. This will facilitate the use of a computer model to quantify in terms of population and housing units the effect of the various alternatives considered. Figures IV-1 through IV-3 depict the location and size of the ANCLUC Study Area.

B. Description of Boundaries

The ANCLUC Study boundary begins at the Pacific Ocean at the southerly line of Ballona Creek, thence northeasterly along Ballona Creek to the Los Angeles City boundary, southerly and easterly along the common boundary between Los Angeles City and Los Angeles County to Lincoln Boulevard, southeasterly to Campion Walk, northeast to the western boundary of Tract 9430, northeast to Ansel Walk, east to 78th Street, east to Fordham Road, south to 80th Street, easterly to Sepulveda Boulevard, north along Sepulveda Boulevard to 79th Street, east to La Tijera Boulevard, northeasterly to the San Diego Freeway, southeasterly to the common boundary between the cities of Inglewood and Los Angeles, southerly along the common boundary to the Atchison-Topeka/Santa Fe Railroad right-of-way, northeasterly along the railroad right-of-way roughly paralleling with Florence Avenue to Centinela Avenue, east along Florence Avenue to West Boulevard, south to 74th Street, east to Victoria Avenue, south to 79th Street, east to 8th Avenue, north to 76th Street, east to Van Ness Avenue, north to Florence Avenue, east to Vermont Avenue, south to Manchester Avenue, proceeding east on Manchester Avenue (which becomes Firestone Boulevard) to Compton Avenue, north to 84th Street, east to Southern Pacific Company Railroad right-of-way, south to Firestone Boulevard, east to Alameda Street, southerly to 103rd Street, west to Central Avenue, south to 104th Street, west to Figueroa Street, south to 108th Street, west to Vermont Avenue, south

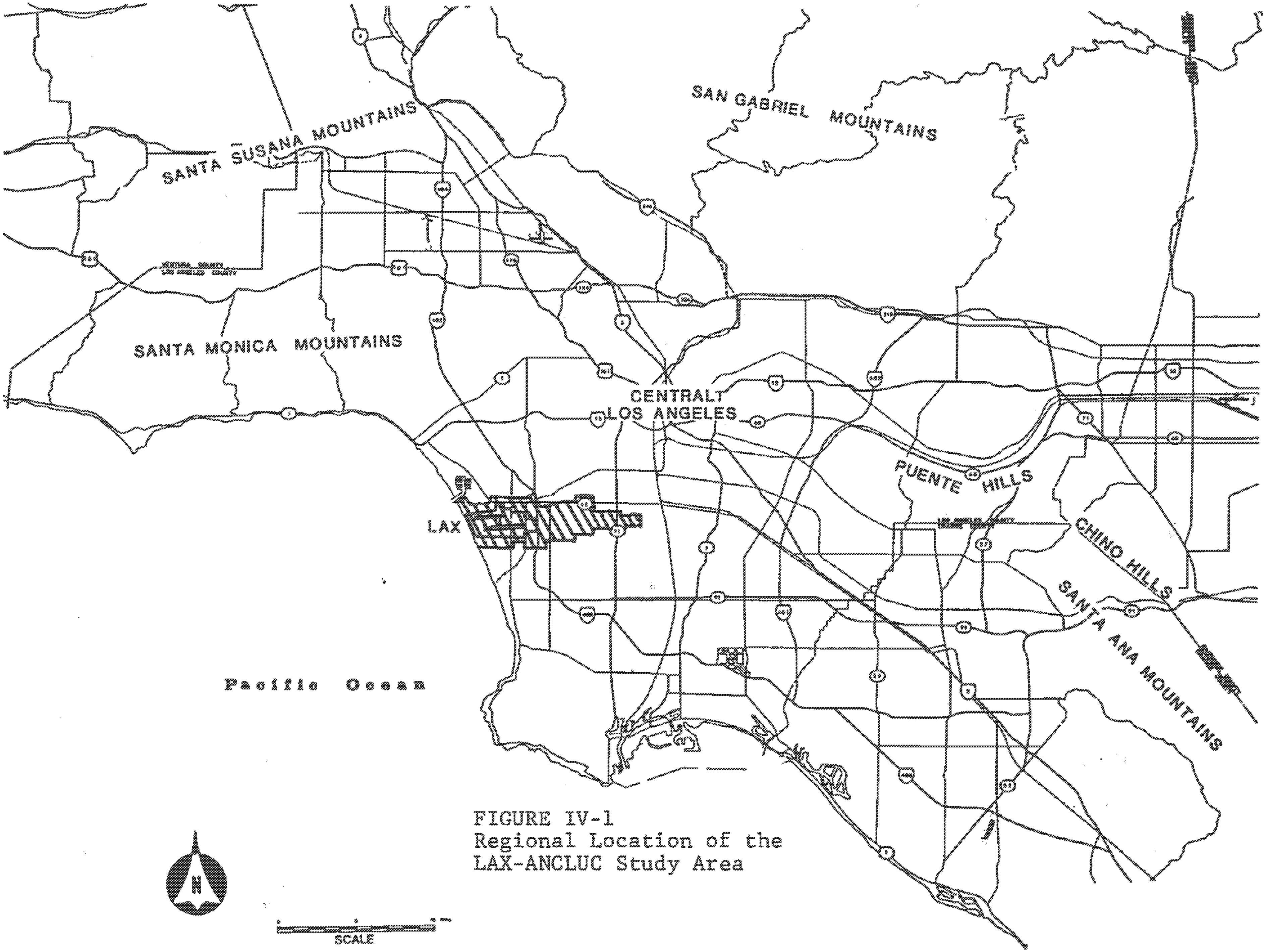


FIGURE IV-1
Regional Location of the
LAX-ANCLUC Study Area

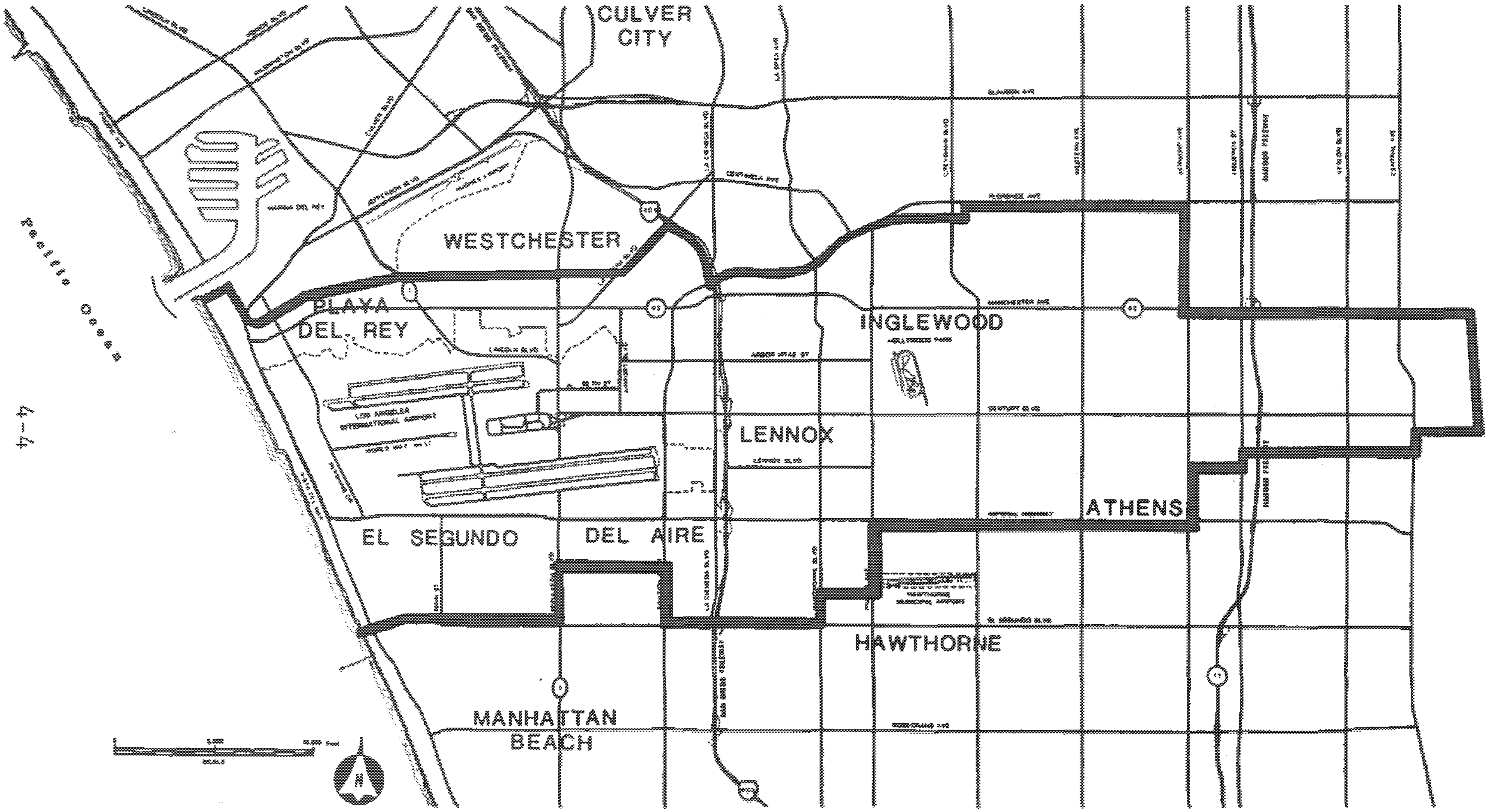


FIGURE IV-2
Sub-Regional Location Map
LAX-ANCLUC Study Area

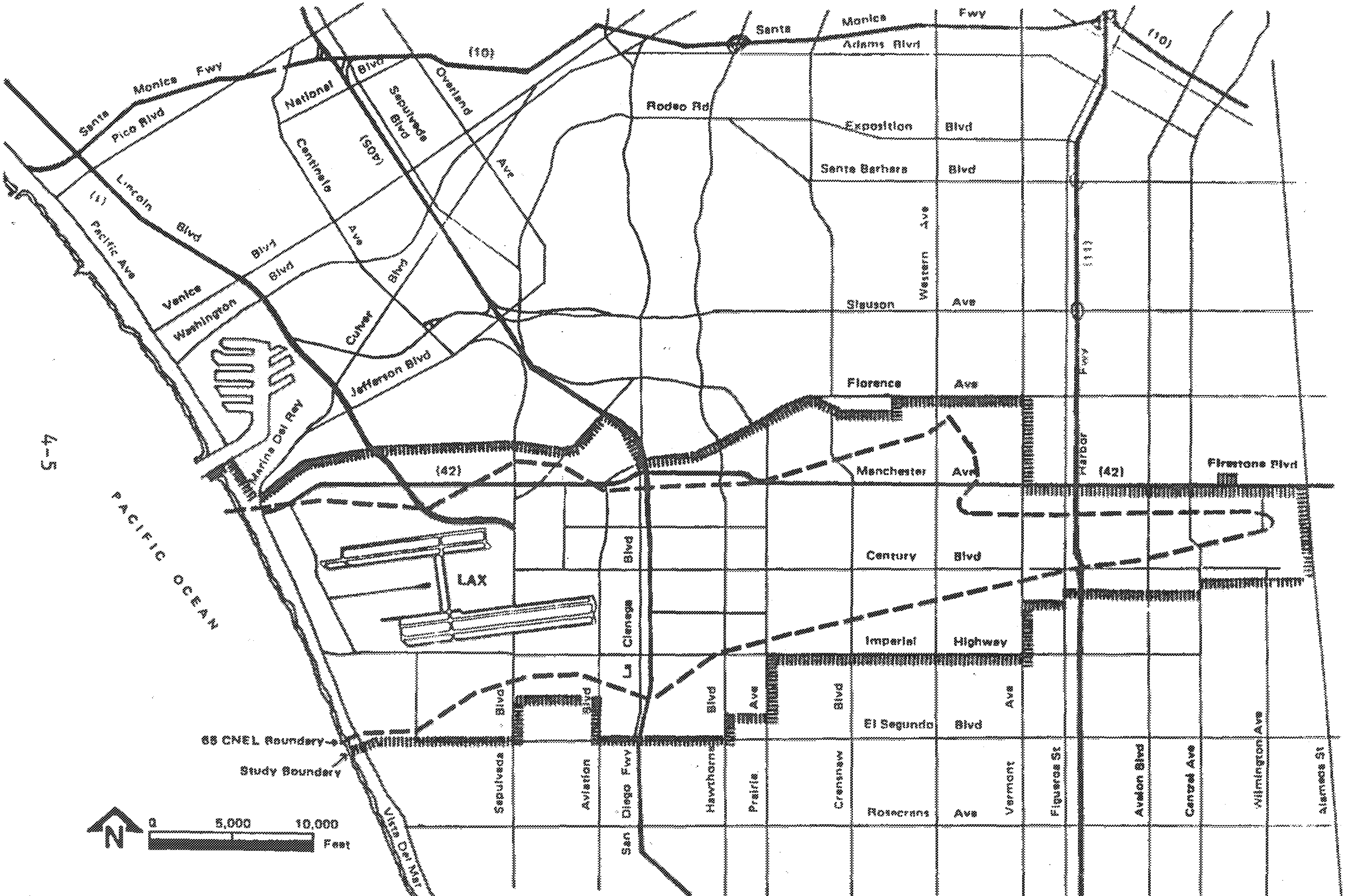


FIGURE IV-3
LAX-ANCLUC Study Boundary

to Imperial Highway, west to Prairie Avenue, south to 120th Street, west to Hawthorne Boulevard, south to Broadway, west to Inglewood Avenue, south to El Segundo Boulevard, west to Aviation Boulevard, north to the easterly prolongation of Mariposa Avenue, west to Sepulveda Boulevard, south to El Segundo Boulevard, west along El Segundo Boulevard to Virginia Street, thence in a southwest direction along a line having an approximate bearing of South 70 degrees, west to the Pacific Ocean.

The total area within this boundary is approximately 23,360 acres with approximately 272,200 people residing within this area.

III. EXISTING AND PROJECTED ENVIRONMENTAL CONDITIONS

A. Airport Noise

1. Nature of Urban Noise

Sound is a physical phenomenon commonly expressed in decibels (dB). Its frequency or pitch is expressed in cycles per second or Hertz (Hz) units. Sound travels through the air in the form of small waves of minute air pressure fluctuations and is perceived by the human auditory system in the frequency range of 20 to 20,000 Hz. Because of the resonant condition in the auditory canal of the human ear, humans are more sensitive to sound frequencies between 1,000 and 5,000 Hz. Thus, a sound at 100 Hz will not appear to be as loud as a sound of equal pressure at 2,000 Hz. Since noise is defined as unwanted sound, the unequal sensitivity of the human ear to frequency, as well as to sound pressure and duration of exposure, must be considered when assessing the impact of urban noise.

Sound waves generated by operating aircraft are affected as they propagate in the atmosphere in two general ways. First, a phenomenon called spherical divergence takes place which results in a decrease in intensity as a sound travels away from its source. Second, atmospheric properties absorb and deflect some of the energy of the sound waves. As a result, sound is attenuated differently at various frequencies. Because of spherical divergence, the intensity of sound from a single source diminishes inversely with the square of the distance from that source. Therefore, for every doubling of distance from its source, noise will decrease by 6 dBA (with dB being an absolute value of noise and A being a correlation factor for the human ear). Relative noise levels, in dBA units are equated with familiar sounds in Table IV-1.

Temperature, wind, humidity and meteorological conditions have identifiable, but not easily quantifiable, effects on sound propagation. Temperature differences from point to point and wind velocity variations both affect the velocity of sound propagation. In both cases, the sound waves are bent from a normal straight-line path. In the case of the wind, the velocity is decreased upwind and reinforced downwind. Wind effects in the form of turbulence in the air mass can be important. The air mass around LAX is in constant flux, which results in divergence and bending in complex and unpredictable ways. In fact, the disturbed air mass produced by jet turbulence during landing will reflect sound waves sufficiently to permit their detection by radar-like acoustic turbulence-detection apparatus.

If sound is propagated in a medium containing a temperature gradient, the sound waves are deflected toward the lower temperature region. Temperature generally decreases with elevation (temperature lapse) and, therefore, sound waves tend to bend upward. Since the ground retains heat in the daytime, the temperature lapse occurs and the ground wave attentuation is greater than at night, when the earth cools, the temperature lapse decreases, and sound travels along the ground more readily. In the Los Angeles region, temperature inversion is quite pronounced, particularly during September and October. In the daytime, the inversion tends to trap the sound wave between the earth and the inversion layer, resulting in a sporadic bounce effect. If the layer is low, there are alternate shadow zones and intensification zones such that some persons farther from the Airport may hear the aircraft better than some individuals in a closer area. Similarly, once aircraft descend below the inversion layer, the sound energy radiated upward will be partially reflected toward earth, producing a reinforced ground impact. Cloud layers have an effect similar to that of an inversion layer.

Humidity affects the absorptive quality of air, its effect increasing with increasing frequency of the sound waves. There is a very sharp absorption at all frequencies near ten percent relative humidity. Since relative humidity is usually above ten percent at LAX, humidity is seldom an important factor in sound propagation at this location.

On occasion meteorological conditions will produce perceptible changes in the noise experienced at LAX. It is possible to predict conditions when there is a high probability of occurrence of the various effects. It is extremely difficult, however, to estimate the exact effects or their magnitude. Therefore, noise effect analysis usually are based on average annual values of parameters.

TABLE IV-1

Sound Levels and Loudness of Illustrative Noises in Indoor and Outdoor Environments
(A-Scale Weighted Sound Levels)

dB(A)	OVER-ALL LEVEL (Sound Pressure Level Approx. 0.0002 Microbar)	COMMUNITY (Outdoor)	HOME OR INDUSTRY (Indoor)	LOUDNESS (Human Judgment of Different Sound Levels)
130	UNCOMFORTABLY	Military Jet Aircraft Take-Off With After-Burner From Aircraft Carrier @ 50 Ft. (130)	Oxygen Torch (121)	120 dB(A) 32 Times As Loud
120	LOUD	Turbo-Fan Aircraft @ Take-Off Power @ 200 Ft. (118)	Riveting Machine (110) Rock-N-Roll Band (108-114)	110 dB(A) 16 Times As Loud
110	VERY	Jet Flyover @ 1000 Ft. (103) Boeing 707, DC-8 @ 6080 Ft. Before Landing (106) Bell J-2A Helicopter @ 100 Ft. (100)		100 dB(A) 8 Times As Loud
100	LOUD	Power Mower (96) Boeing 737, DC-9 @ 6080 Ft. Before Landing (97) Motorcycle @ 25 Ft. (90)	Newspaper Press (97)	90 dB(A) 4 Times As Loud
90		Car Wash @ 20 Ft. (89) Prop. Plane Flyover @ 1000 Ft. (88) Diesel Truck, 40 MPH @ 50 Ft. (84) Diesel Train, 45 MPH @ 100 Ft. (83)	Food Blender (88) Milling Machine (85) Garbage Disposal (80)	80 dB(A) 2 Times As Loud
80	MODERATELY LOUD	High Urban Ambient Sound (80) Passenger Car, 65 MPH @ 25 Ft. (77) Freeway @ 50 Ft. from Pavement Edge, 10 A.M. (76±6)	Living Room Music (76) TV-Audio, Vacuum Cleaner (70)	70 dB(A)
70		Air Conditioning Unit @ 100 Ft. (60)	Cash Register @ 10 Ft. (65-70) Electric Typewriter @ 10 Ft. (64) Dishwasher (Rinse) @ 10 Ft. (60) Conversation (60)	60 dB(A) ½ As Loud
60	QUIET	Large Transformers @ 100 Ft. (50)		50 dB(A) ¼ As Loud
50		Bird Calls (44) Lower Limit, Urban Ambient Sound (40)		40 dB(A) ⅛ As Loud
40	JUST AUDIBLE	[db(A) Scale Interrupted]		
10	THRESHOLD OF HEARING			
0				

Reproduced from Melville C. Branch and R. Dale Beland, Outdoor Noise in the Metropolitan Environment, published by the City of Los Angeles, 1970, p. 2.

2. Characteristics of Urban Noise

a. <u>Aircraft Engines</u>

Aircraft noise depends, in great part, upon the type of engine being operated. Of the four types of jet engines, the turboprop engine presents the least amount of annoyance within the ANCLUC Study area. Fundamental noise generated by turboprop engines comes from the propellers and the turbo-machinery internal to the engines. The propellers produce a low-intensity, humming type noise. The whistle-type whine that can be heard at close range is produced by the axial flow compressors and the turbine stages inside the engine. The turbo-machinery noise usually propagates through the engine inlet and exhaust ducts.

In turbojet engines, the high velocity discharge from the exhaust nozzle is the primary source of high intensity noise. The hot, fast-moving air mass being discharged from the exhaust nozzle joins with the cool and relatively motionless ambient air and creates turbulence which results in a loud blowtorch-type noise. Efficiency and performance characteristics of the turbojet are based primarily on flow volume and velocity of the hot gas discharging from the exhaust nozzle. The noise characteristics are also based on volume flow and velocity of the discharge gas. Past attempts, short of lowering the exhaust velocity, to reduce turbojet noise, resulted in a change in spectral content of the noise with only a minimal reduction in intensity.

The advent of the turbofan engine, brought about a significant reduction in jet exhaust velocity and improved operational performance. The newly added fan stages, however, became a major noise producing component in the turbofan engines. In the multiblade fan stages, the interaction of rotating and stationary blades performed much like a siren. Due to the operational characteristics of turbofan engines, they reproduced discrete frequency tones closely tuned to the audio frequencies to which human ears are most sensitive.

As a result of Federal laws and regulations, newer wide-body type aircraft are quieter and less annoying than their predecessors. The high-bypass ratio, turbofan engines used in these aircraft are specifically designed to generate less noise. The fan stages and exhaust nozzles still are the fundamental noise-generating components the engines, but noise levels have been reduced to levels that are more acceptable than those generated by the earlier turbofan engines.

Many of the older turbofan-equipped aircraft are still in service. To correct these older designs, a modification and retrofit program has been instituted by the Federal Aviation Administration pertaining to all United States registered civil subsonic turbojet aircraft exceeding 75,000 pounds (FAR Part 36).

b. Surface Transportation

The majority of passenger car noise originates from intake, exhaust and tires. Below 35 miles per hour, these components contribute a relatively equal amount to automobile noise. Above this speed, tire noise becomes predominant.

Recent design modifications have significantly lowered overall passenger car noise, and levels are anticipated to decrease by an additional 10 dBA in the next ten years. Recent improvements in the design of motorcycles and sports cars also have produced substantially lower noise levels in recent years.

The greatest amount of highway noise is generated by buses and especially trucks. Due to their engine, body and ancillary equipment designs, they produce large amounts of acoustical energy. Trucks can emit from 85 and 95 dBA (at 50 feet) traveling at 55 miles per hour. Acceleration can add 5 dBA, and an upgrade of three to five percent can result in an additional 2 dBA. As with passenger cars, tires become the principal source of noise at higher speeds. Newer tire tread designs can lower highway noise by up to 20 dBA over conventional tire types. Additionally, new tandem mufflers can reduce noise by almost 20 dBA when used in place of a straight stack (no muffler) system.

c. Other Sources

On the Airport site there are many individual sources of noise, most of which affect only the immediate facility. During the current construction phase, heavy construction equipment will be used extensively at the Airport. These sources of noise generate complaints from the neighborhoods immediately adjacent to the Airport.

Included within the range of equipment in use at the airport and of particular interest are the special motor vehicles used for transporting gasoline and towing aircraft, helicopters used by public safety services, jet run up, emergency warning systems, outdoor loud speakers, oil and gas machinery, electric substations and construction equipment.

3. Existing Noise Environment

The ANCLUC Study boundary includes the 1982, 65 CNEL contour. The regulations concerned with noise impact quantification and the control of airport noise were compiled in Task 1.07, an update of Noise Regulation Policies on Airport Operations and Task 2.06 - Documentation of Federal, State Local and Airport Land Use Commission Requirements.

a. 1979 Basecase and 1982 Noise Impacted Areas

The 1979-65 CNEL noise contour which was used to establish the preliminary study boundary is representative of operating conditions prior to the south runway reconstruction project and the air traffic contoller strike. Both of these factors caused perceptaible shifts in the noise impact. The 1979-65 CNEL basecase noise contour encompassed approximately 40,930 dwelling units and 102,650 residents.

The 1982 noise contours presented on Figure IV-4 are derived from the first six months of the year and projected for the entire years. The 65 CNEL contour includes approximately 36,567 dwelling units and approximately 92,000 residents.

b. FAR Part 36 Compliance

The air carriers operating at LAX report their level of operations on a monthly basis. The airline reports include information of the aircraft used during the operations and identifies if the aircraft is Part 36 compliant or not. The Noise Abatement office recently summarized the current level of compliance to measure the effectiveness of the LAX Noise Regulation. Of the 49 air carrier airlines reporting, 50 percent were operating fleets in 100 percent compliance, with the regulation.

In this case 100 percent compliance implies that the carrier's fleet of aircraft is Stage 2 or better. The overall compliance level of the carriers is currently 78 percent of all aircraft are Stage 2 or better. Currently, Stage 2 aircraft dominate the fleet mix at over 97 percent.

4. Projected 40 MAP Noise Environment

The forecasting information provided in Task 2.01 indicates that the 40 MAP operational limit could be achieved between 1985 and 1990. Therefore, 1987 was chosen as the future base year. The alternative scenarios being considered will be modeled to quantify the change in noise impact generated by both operational and land use adjustments. Use of the 1987 timeframe is also compatible with the requirements of FAR Part 150. A regulation designed to provide funds for Federally approved noise control programs.

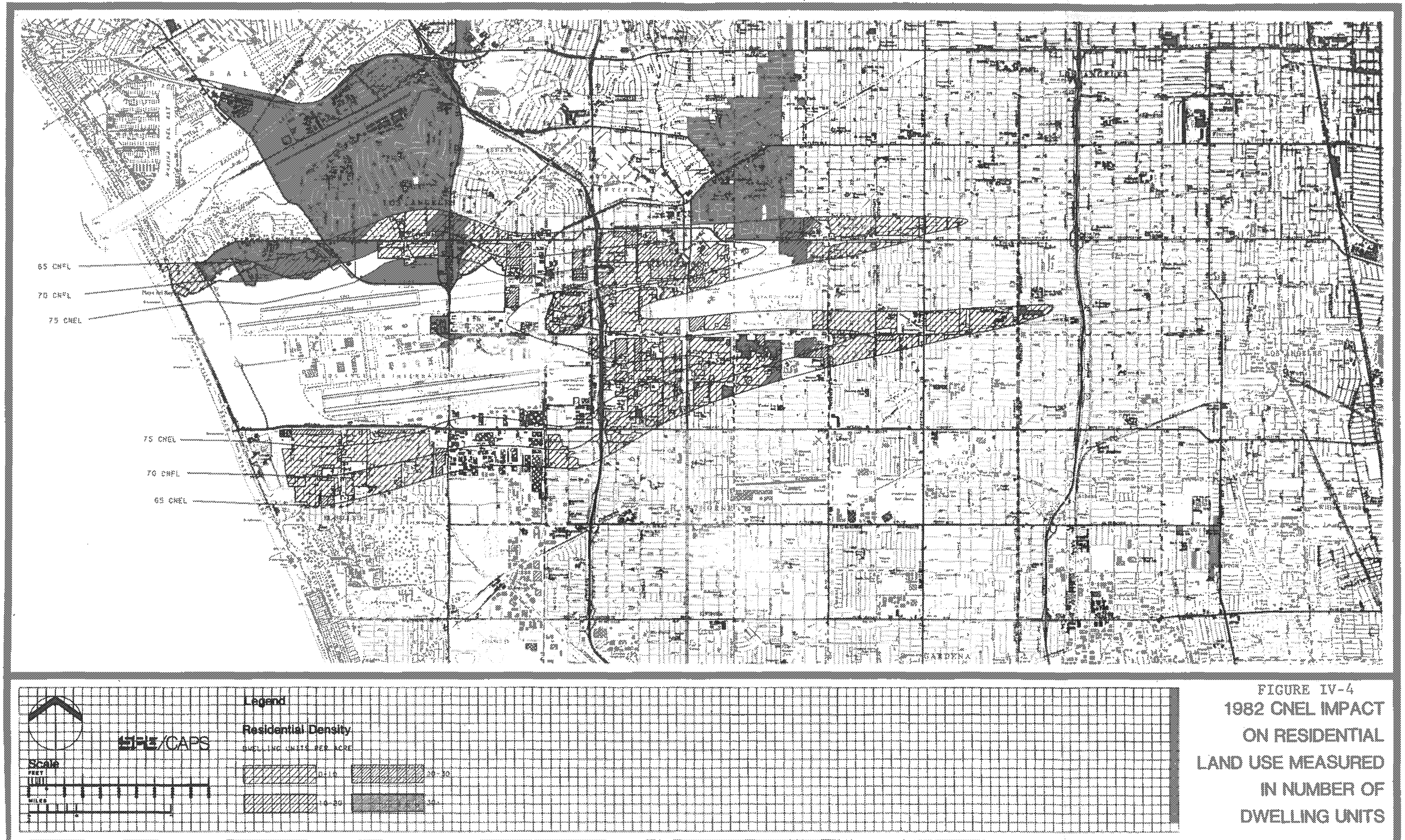


FIGURE IV-4
1982 CNEL IMPACT ON RESIDENTIAL LAND USE MEASURED IN NUMBER OF DWELLING UNITS

The 1987 contours are based on current operational procedures, 100 percent FAR Part 36 compliance with an anticipated fleet mix with 72 percent Stage 2 and 18 percent Stage 3 aircraft and 40 MAP which equals approximately 1200 daily operations.

a. <u>1987 Noise Impacted Area</u>

The projected 1987 noise contours are shown on Figure IV-5. The 65 CNEL contour includes approximately 29,107 dwelling units and approximately 72,000 residents.

5. FAR Part 36 - Fleet Compliance Levels

FAR Part 36 was the first comprehensive Federal regulation prohibiting further increases in aircraft noise. At the same time it required new aircraft types to be quieter than those developed in 1956-1964. The regulation dealt separately with approach and take off noise test conditions, and the specific noise limitations for all newer and older aircraft types. These aircraft were divided into stages based upon their noise emission. Stage 1 aircraft are the earliest turbojets which must be retired or retrofitted by January 1, 1985. Stage 2 aircraft are those certified or retrofitted between January 1, 1967 and November 5, 1975. All aircraft operating in the United States except for those exempted until 1988 must be Stage 2 by January 1, 1985. Applications to certify aircraft produced after November 5, 1975 must meet Stage 3 noise limits. Aircraft in this category include the DC-9-80, B757, B767, and the retrofitted DC-8-73. The average difference between Stage 2 and Stage 3 noise levels is 3-8 dBA. For example the noise emissions between a Stage 3, DC-9-80 and Stage 2, B727-200 serving the Los Angeles-San Francisco market would have an average difference between 5 and 10 dB on takeoff. A description of FAR Part 36 is provided in Task 2.06 of the Phase II Report.

a. <u>Air Carrier Fleet Compliance</u>

According to the Revenue Landing Reports submitted by the tenant airlines, overall fleet compliance with FAR Part 36 has risen dramatically over the last two years. This is a result of the air carriers retiring and replacing older aircraft, current economics which dictate the use of the most fuel efficient aircraft available and the need to comply with LAX Noise Control Regulation which provided a more detailed compliance schedule for the carriers to follow.

Both FAR Part 36 and the LAX Noise Control Regulation use the final fleet compliance date of January 1, 1985. However, specific variances available in the Federal Rule allow compliance of some two engine aircraft to be

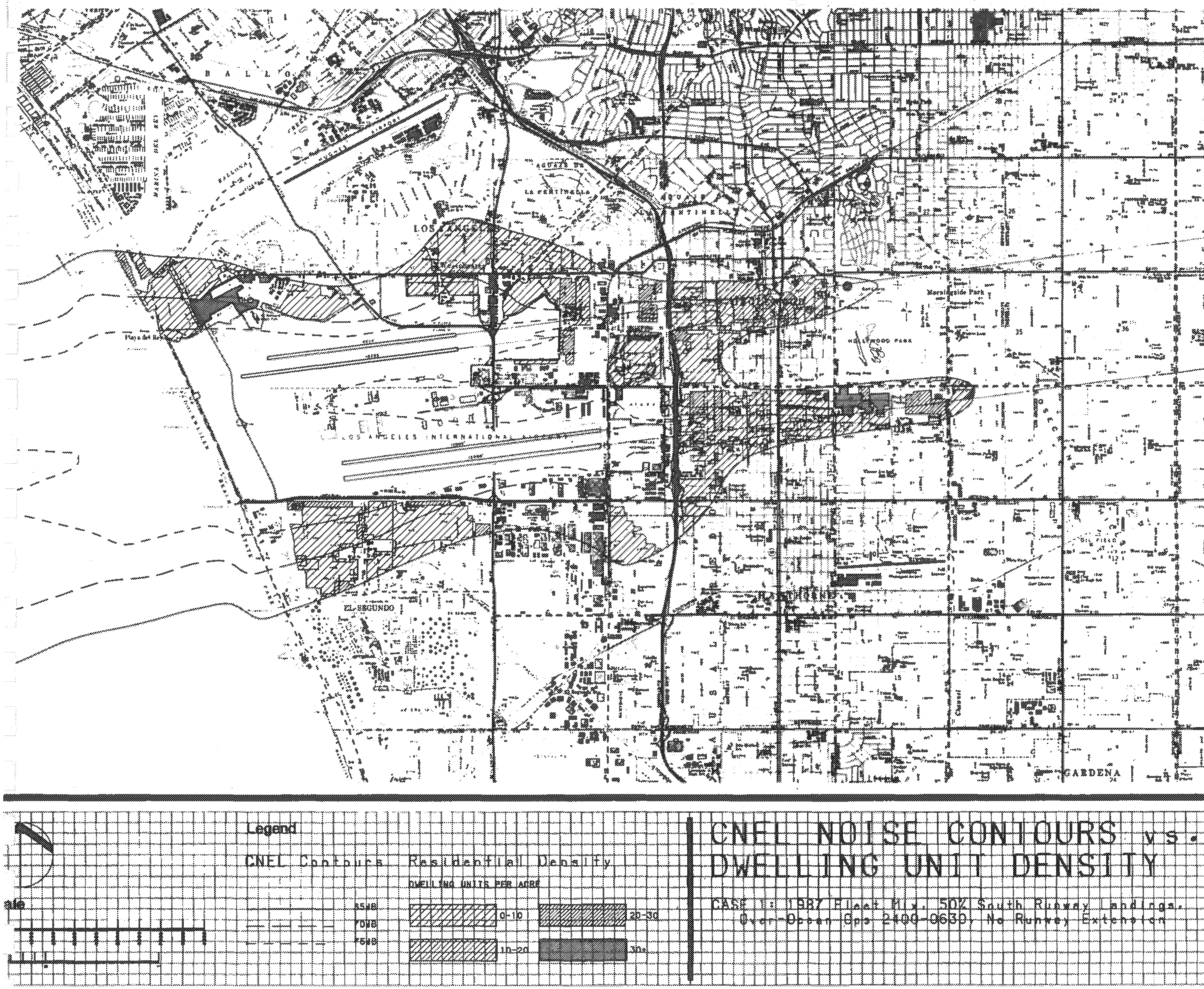


FIGURE IV-5

Projected 1987 Noise Impact Map on Residential Land Use Measured in Number of Dwelling Units delayed until 1988. International operators must comply with Part 36 or the international equivalent by 1985 also. Table IV-2 provides a comparison of FAR Part 36 and total air carrier landings at LAX from July 1980 to March 1982.

The most current month of records available from the Department of Airports Accounting Bureau indicates that fleet compliance has increased since March. This information is included in Table IV-3.

The revenue landing reports indicate that approximately 80 percent of the airlines currently operating at LAX utilize a fleet of aircraft that is at least 50 percent compliant as required by the established schedule. The Noise Abatement Office indicates that of the 49 air carriers reporting, 23 were operating fleets that were 100 percent compliant and that five air carriers operate fleets with zero percent compliance.

The Department of Airports present Noise Regulation requires 100 percent compliance by January 1, 1985. At that time the LAX Noise Control Regulation compliance schedule may supercede the Federal FAR Part 36 as implemented by Part 91-E due to potential exemptions and variance procedures which may be granted to air carriers by the Federal authorities. The Department of Airports does not anticipate taking any similar action and will require full compliance.

Therefore, beyond 1985, the air carrier fleet serving LAX is fully expected to be 100 percent compliant. There is no regulatory impetus for the replacement of Stage 2 aircraft. However, the inventory of aircraft should shift toward Stage 3 aircraft through normal attrition (retirement) and economic factors including competitive pressure and fuel conservation. Therefore, further reduction in the noise impact can be expected as a result of this shift, but the timing and amount of change is dependent on a number of independent variables.

B. Air Quality

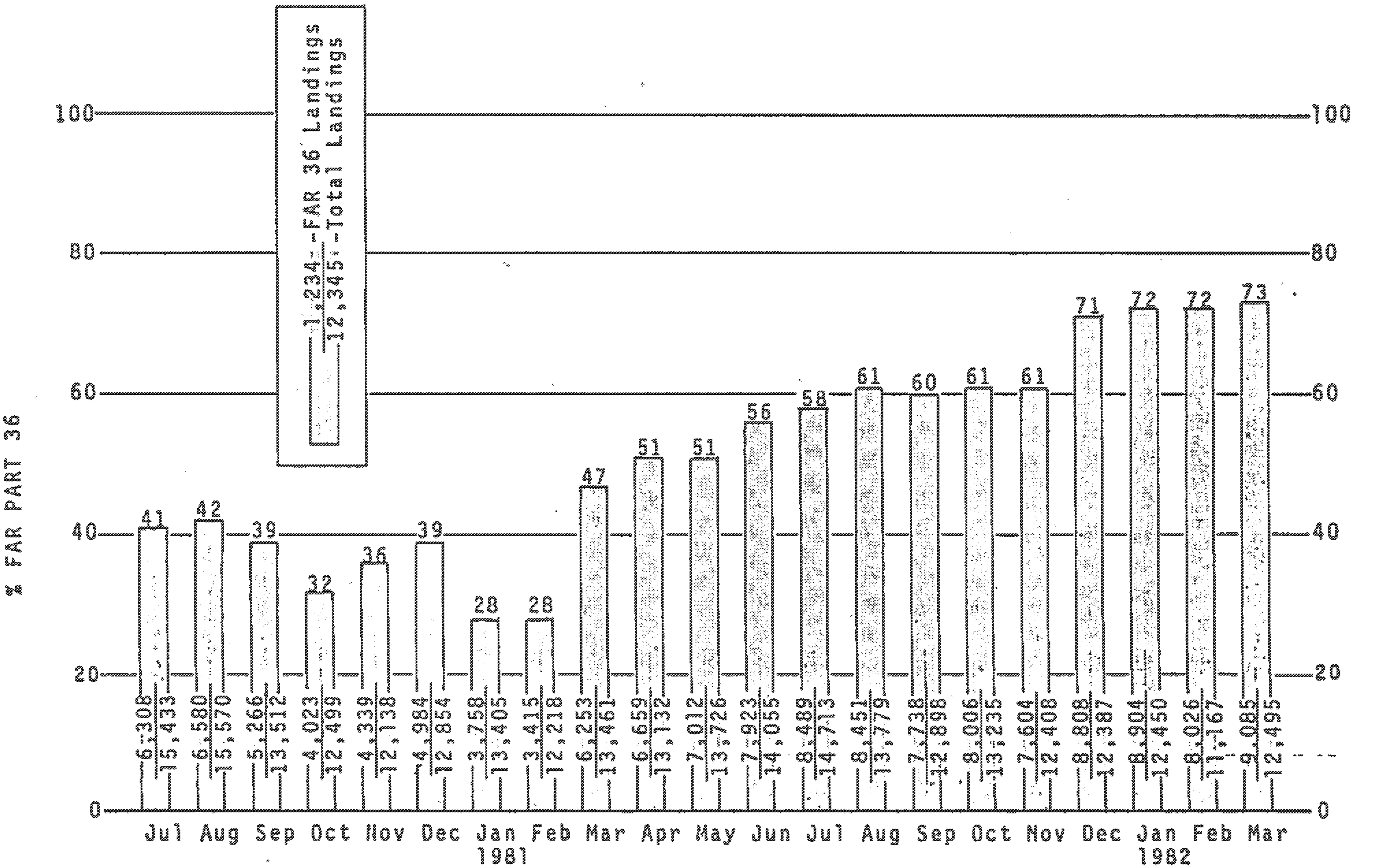
1. Meteorologic Conditions

The South Coast Air Basin (SCAB) is bounded on the west by the Pacific Ocean, on the south by the San Diego County line, and on the north and east by the San Gabriel, San Bernardino San Gorgonio, San Jacinto and Santa Ynez mountains.

Meteorology plays a crucial role in the air pollution potential of the SCAB. During periods of air stagnation, the potential for the formation of high pollutant concentrations in SCAB is greatly increased. Therefore, when assessing air quality trends for a period of years, it is imperative that

TABLE IV-2

COMPARISON OF FAR PART 36 AND TOTAL
AIR CARRIER LANDINGS AT LAX
(Aircraft weighing 75,000 lbs. or more)



Source: Los Angeles Department of Airports Noise Abatement Office

TABLE IV-3

July 1982

FAR Part 36 Air Carrier Fleet Compliance
(Revenue Landings at 75,000 Pounds and Above)

Aircraft Type	Non FAR 36	FAR 36	Total
B-707	358	0	358
B-727	755	4092	4847
B-737	917	538	1455
B-747	0	1407	1407
DC-10	0	1907	1907
DC-8	395	16	411
DC-9	528	1606	2134
L-1011	0	978	978
Total	2,953	10,544	13,497
Percentage	21.88%	78.12%	

Source: Los Angeles Department of Airports, Noise Abatement Office.

meteorological trends be considered before significant conclusions are derived. Such factors as temperature, wind patterns and rainfall can play a substantial role and can, in some cases, mask the true effect of control strategies.

In the SCAB, a large semipermanent, high-pressure cell in the eastern Pacific dominates the meteorology during the summer months. It is responsible for the northwesterly airflow along the California coast and, together with the upwelling of cold water, for low-level temperature inversions (very stable layer) called subsidence inversions. Heating over the interior deserts, especially during the warm half of the year, causes the air there to rise, and the coastal flow is diverted onshore to take its place.

The resulting "sea breeze" is a typical feature of the airflow during the daytime. At night, after the land has cooled below the water temperature, there is a tendency for the "land breeze" to develop - that is, for the flow to be directed offshore. Wind speeds then are usually very low.

The depth of the sea breeze varies, according to the situation, from as little as 200 or 300 feet to as much as 3,000 feet. It is invariably capped by a stable inversion layer. Internally, it is usually neutral or unstable so that dispersion up to the inversion layer is relatively rapid.

Basin, the marine layer is heated so much that the inversion layer may be broken. This is a common phenomenon at the surfaces of the mountain slopes. Studies in recent years, using an instrumented aircraft, have shown that the heating of the mountain slopes breaks the inversion layer close to the mountain, and a "chimney effect" is observed through which the pollutants are vented. One consequence of this venting is that pollutant layers tend to "fold back," giving rise to the formation of strata of pollutants whereby as many as six "layers" of elevated pollutant levels have been observed at increasing altitudes.

In the late summer, the strength of the Pacific high decreases, heating over land decreases, and the strength and depth of the sea breeze tend to be lower. With decreased mixing depth, associated with lowered wind speed, the rate of dispersion and the volume available for dispersion also are decreased and pollutant concentrations tend to be higher.

The situation during the winter is generally markedly different. The Pacific high is either farther south and weaker or it is replaced by a series of cyclonic storm systems. These systems produce stronger winds, precipitation, and an absence of low inversions. Hence, dispersion occurs rapidly through great depths, and pollutant concentrations are very low. Between storms, however, weak onshore flows of very stable air are common and surface-based inversions are formed. These periods are characterized by clear nights during which the earth cools and the subsequent formation of early morning fogs. These fogs then clear by "burning off" from the ground up. During these periods, high levels of primary pollutants (for example, CO and NO_x) can accumulate.

Two other common conditions, which occur during the colder half of the year, produce rapid mixing through great depths and, hence, low pollutant levels. These are (1) the northerly flow produced by a strong "high" pressure air mass moving inland behind a storm front, and (2) the northeasterly Santa Ana flow. The Santa Ana wind is characterized as coming off the high desert which lies to the northeast, and so reversing the normal west-east airflow.

Increasingly, attention is being focused on the transport of pollutants from urban areas to areas tens and even hundreds of miles downwind. Consequently, transport plays a critical role in determining air quality in the South Coast Air Basin, since the sea breezes blow polluted air masses from the western end of the Basin to the eastern areas, thereby compounding the pollutant burden already present in those areas.

2. Air Quality Standards

The Air Quality Act of 1967 and the Clean Air Act Amendments of 1970 require the documentation of air quality criteria for each major pollutant and, based on these criteria, the setting of health-related air quality standards. Such national primary air quality standards are defined as "the levels of air quality necessary, with an adequate margin of safety, to protect the public health."

Unfortunately, there is a paucity of reliable data germane to the health effects of long-term exposure to low levels of pollutants. The EPA has attempted to rectify this situation, partially through its Community Health and Evnironmental Surveillance System (CHESS) program, which related community health to changing environmental quality. For the effects of the majority of pollutants, however, reliance still must be placed on laboratory studies of humans or animals.

National secondary air quality standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Each state must attain the secondary standards within a "reasonable time" after the State Implementation Plan is approved by the EPA. Secondary standards are set at levels to prevent harmful effects on animals, vegetation, weather and visibility and to preserve a certain "quality of life." Current air quality standards are provided on Table IV-4. The status of the Clean Air Act reauthorization process is unclear. Potential revisions and amendments are presently being considered by Congress.

3. Existing Air Quality Conditions

The ANCLUC Study area is located within SCAB with monitoring of pollutants carried out by the South Coast Air Quality Management District (AQMD). The closest AQMD monitoring site to LAX, designated Station 076, is located in Lennox. Sources of air pollution emissions within the study area include aircraft operations at LAX, motor vehicle traffic on area roadways, construction equipment associated with relatively short-term projects in the area and stationary continuous sources.

TABLE IV-4
FEDERAL AND STATE OF CALIFORNIA AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING TIME	FEDERAL Primary	FEDERAL Secondary	CALIFORNIA Primary
Carbon Monoxide	8 hrs	9.0 ppm[a] (10 mg/m^3)	Same as primary standards	...
	1 hr	35.0 ppm (41 mg/m^3)		40.0 ppm (47 mg/m^3)
	12 hrs	...	...	10.0 ppm (12 mg/m^3)
Nonmethane hydrocarbons	6-9 a.m.	0.24 ppm[a] (160 ug/m^3)	Same as primary standards	...
Photochemical oxidants	1 hr	0.08 ppm[a] (160 ug/m^3)	Same as primary standards	0.10 ppm (200 ug/m^3)
Nitrogen dioxide	Annual	0.05 ppm (100 ug/m^3)	Same as primary standards	...
	1 hr	...	...	0.25 ppm (480 ug/m^3)
Particulate	Annual geometric Mean	75 ug/m^3	60 ug/m^3	60 ug/m^3
	24 hrs	260 ug/m	150 ug/m	100 ug/m^3
Sulfur dioxide	Annual arithmetic Mean	0.03 ppm (80 ug/m^3)	0.02 ppm (53 ug/m^3)	...
	24 hrs	0.14 ppm (373 ug/m^3)	0.10 ppm (267 ug/m^3)	0.04 ppm (107 ug/m^3)
	3 hrs	...	0.50 ppm (1334 ug/m^3)	...
	1 hr	...	...	0.05 ppm (1134 ug/m^3)

[a]Not to exceed more than one per year. ppm - parts per million
mg/m^3 - milligrams per cubic meter
ug/m^3 - micrograms per cubic meter

The City of Inglewood, east of LAX in the center of the ANCLUC Study area. The westerly marine breeze blow pollutants eastward and permit generally smog-free days. Carbon monoxide concentrations which exceed both state and federal standard occur periodically. The major sources of air-pollutants, which impact the ANCLUC Study area are; motor vehicle traffic on the San Diego Freeway, operations of Hyperion Wastewater Treatment Facility, the Scattergood Power Generation facility, Standard Oil's El Segundo refinery, and aircraft and motor vehicle operations associated with LAX.

Computations of air pollutant emissions associated with LAX operations (aircraft and non-aircraft sources within the airport boundaries) have been published for the year 1977 and projected for 1985 and 1990 assuming annual LAX traffic of 40 million passengers. The recent trend for total emissions, which are comprised of combined CO, NO_x, SO_2, particulate and hydrocarbon, is downward. There was a continued decrease in emissions from 1977 to 1982, which is projected to continue through the forecast years. This decrease is associated primarily with the control of exhaust emissions from automobiles. Aircraft air pollutant emissions have remain at relatively constant during this period with some reduction in hydrocarbon emissions due to improvements in engine technology and ground control procedures. The present contribution of LAX aircraft and non-aircraft air pollutant emissions is estimated in Table IV-5.

Composite air quality measurements are performed by the AQMD and measured in terms of pollutant concentration levels and number of days each standard is exceeded based on the California Air Quality Standards. The measurements for AQMD Station 076 in Lennox which includes both LAX and non-airport pollution sources, exceed the specified standards periodically. The most recent data compiled for this Station are for 1979 and are provided by the South Coast Air Quality Management District in the Air Quality Handbook, October 1980. The results of the measurement provided in Table IV-6.

a. Airport Emission Sources

The air pollutant emission sources used to quantify emissions at LAX are divided between aircraft emissions and emissions from other Airport associated activities included the following:

- Motor vehicle traffic within the Airports.
- Round-trip passenger mileage to and from the Airport.
- Cargo vehicle deliveries and pickups.
- On-site air conditioning and heating plant.
- On-site fuel storage evaporation.
- On-site solvent evaporation.

TABLE IV-5

Pollutant	Percentage of SCAB Pollutant Emissions Attributable to LAX in 1982[1]
CO	2.0%
NO_x	2.7
Hydrocarbon	2.02
Particulate	1.24
SO_2	0.40

Recent and projected levels of aircraft activity at LAX are provided in Table IV-7. The activity level is expressed in how many land and take-off (LTO) cycles occur per day for each aircraft type.

The introduction of new generation aircraft including the DC-9-80, B767 and B757 will not effect the LTO cycle percentages for each aircraft type. The emissions attributed to current aircraft types are indicated on Table IV-8.

TABLE IV-6

Pollutant	California Air Quality Standards	1979 Air Quality Data for Station 076 (Days Standard Exceeded/Concentration)
CO	10 ppm (12 Hr)[1]	35 days/27 ppm[3]
NO_x	0.25 ppm (1 Hr)	13 days/0.38 ppm
Particulate	60 ug/m^3 (AGM)[2] 100 ug/m^3 (24 Hr)	21 days/206 ug/m^3
SO_2	0.04 ppm (24 Hr) 0.50 ppm (1 Hr)	0 days/0.35 ppm

[1]/Interpolation between 1980 and 1985 projections from FINAL REPORT - PRELIMINARY EMISSIONS INVENTORY, AIR QUALITY FORECAST, 1974-1995, SOUTH COAST - SOUTHEAST DESERT AIR QUALITY MAINTENANCE AREAS, Boundaries and Forecasting Committee, Total Air Quality Maintenance Planning Policy Task Force, May 10, 1976.

TABLE VI-7

Historical and Projected Level of Aircraft Activity

Category	Class	Type	Example	LTO Cycles/Day 1980	1985	1990	1995
Air Carrier	1	Supersonic Transport	Concorde	0	0	0	0
Air Carrier	2	Wide-body Transport	B747, DC-10	267.8	431.5	483.2	522.4
Air Carrier	3	Long-Range Transport	B707, DC-8	52.8	26.7	19.7	13.4
Air Carrier	4	Medium-Range Transport	B727, DC-9	161.1	98.1	34.7	1.2
Air Carrier	5	Turboprops	Lockheed Electra	118.1	146.8	149.1	150.7
General Aviation	6	Business Jet	Lear Jet	25.3	25.3	25.3	25.3
General Aviation	7	Piston Engines	Cessna 150, Piper Cherokee 140	51.5	51.5	51.5	51.5

Unfortunately, operational emission data for the new aircraft types was not available. However, the aircraft manufacturers anticipate an average emission reduction of about 35 percent.

The most recent air emissions survey, conducted at LAX was completed in 1978. Passenger activity in 1978 was approximately 32 MAP as it is today but the fleet mix included a higher percentage of older aircraft. Therefore, it can be assumed that the emission levels associated with 1978 operations are higher than those experienced currently. SCAG has supported this view by stating that the emission levels are overestimated due to the lack of a recent air emission inventory for LAX.

4. Projected Air Quality Conditions

a. Projected Emission Levels

Table IV-10 describes the levels of impact-related to the 40 MAP operational limit. Table IV-11 describes the projected emissions for the entire South Coast Air Basin and those attributable to LAX operations.

TABLE IV-8

Emission Characteristics of Aircraft Engines
(Grams Per Kilogram Fuel)

Engine Type	Aircraft	CO	HC	NO_x	PM	SO_2
JT8D-7 (low smoke turbofan) Per LTO	B727	26	4.8	4.8	5.9	1.1
CF6 Turbofan Per LTO	DC-10	19	4.7	28.5	0.04	0.2
JT9D (idle)	B747	53	1.5	2.5	23.0	a
JT9D (approach)	B747	5	1.0	8.0	8.0	a
JT9D (Climbout)	B747	1.0	1.0	18.0	4.5	a
JT9D (takeoff)	B747	1.0	1.0	26.0	6.0	a

[a]Known to be present but not quantifiable.

b. Air Pollutant Effects

Air pollutants can have a number of adverse impacts on human health, result in degradation of materials and finishes, and are harmful to sensitive plants. The sources and effects of the various contaminants are discussed briefly below:

- Carbon Monoxide (CO) - Carbon monoxide is a colorless, odorless, toxic gas produced by incomplete combustion of carbon-containing substances. Carbon monoxide concentrations are generally higher in the winter when more fuel is burned and meteorological conditions favor the build-up of directly emitted contaminants. In the South Coast Air Basin, gasoline-powered motor vehicles are the largest source of this contaminant.

TABLE IV-9

1978 LAX Daily Air Emissions

Pollutant	Pounds Per Day
CO	138,300
HC	30,700
NO_x	20,500
PM	3,200

TABLE IV-10

Projected Annual Emissions From LAX
(Pounds Per Hour)

POLLUTANT TYPE	AIRCRAFT		NONAIRCRAFT, AIRPORT ASSOCIATED		TOTAL EMISSIONS
	Ground Operations	Flight Operations	Auto Emissions	Other Emissions	
1985					
CO	14,000	828	8,380	4	23,312
NO_x	1,970	4,700	1,590	21	8,481
SO_2	462	291	319	--	1,072
Particulates	502	172	955	4	1,633
Total HC	4,700	126	2,540	277	7,643
1990					
CO	12,800	977	3,550	4	17,331
NO_x	1,810	4,340	1,290	21	7,461
SO_2	474	296	291	--	1,061
Particulates	486	131	872	4	1,493
Total HC	4,010	139	1,400	277	5,826
1995					
CO	12,600	1,270	8,660	4	17,534
NO_x	1,790	4,300	1,130	21	7,241
SO_2	498	311	289	--	1,098
Particulates	490	110	868	4	1,472
Total HC	3,640	173	1,190	277	5,280

TABLE IV-11

Projected 2000 South Coast Air Basin Pollutant Emissions
Attributable to LAX Operations

Pollutant	SCAB Total[1] (Tons per Year)	LAX Total (Tons per Year)	LAX Total (% of SCAB[1])
CO	1,293,000	24,981	1.93
NO_x	352,200	9,421	2.76
SO_2	169,700	1,061	0.63
Particulates	130,800	1,493	1.14
Hydrocarbons	436,000	6,376	1.46
TOTAL	2,381,700	43,332	7.92%

Carbon monoxide does not irritate the respiratory tract but passes through the lungs directly into the blood stream and, by interferring with the transfer of fresh oxygen to the blood, deprives sensitive tissues, primarily the the heart and brain, of oxygen. It is not known to have adverse effects on vegetation, visibility or material objects.

- Oxides of Nitrogen (NO_x) - Two oxides of nitrogen are important in air pollution. These are: nitric oxide (NO), a colorless, odorless gas formed from atmospheric nitrogen and oxygen when combustion takes place under high temperature and/or high pressure; and nitrogen dioxide (NO_2), a reddish-brown irritating gas formed by the combination of nitric oxide with oxygen. Motor vehicles are the primary source in the region, along with combustion in power plants. Some petroleum refining operations, other industrial sources, ships, railroads and aircraft operations are less important sources.

1/ FINAL REPORT - PRELIMINARY EMISSIONS INVENTORY, AIR QUALITY FORECAST, 1974-1995, SOUTH COAST - SOUTHEAST DESERT AIR QUALITY MAINTENANCE AREAS, Boundaries and Forecasting Committee, Total Air Quality Maintenance Planning Policy Task Force, May 10, 1976.

Oxides of nitrogen are direct participants in photochemical smog reactions. The emitted compound, nitric oxide, combines with oxygen in the atmosphere, in the presence of hydrocarbons and sunlight, to form nitrogen dioxide and ozone. Nitrogen dioxide, the most significant of these pollutants, is a reddish-brown gas which can color the atmosphere at concentrations as low as 0.5 ppm on days of ten-mile visibility. It is considered to be a major air pollutant in the region because it is a primary receptor of ultraviolet light which initiates the reactions producing photochemical smog.

- Sulfur Dioxide (SO_2) - Sulfur dioxide is a colorless, pungent irritating gas formed primarily by the combustion of sulfur-containing fossil fuels. In humid atmospheres, some of it may be changed to sulfur trioxide and sulfuric acid mist, with some of the latter eventually reacting with other materials to produce sulfate particulates.

  This contaminant is the natural combustion product of sulfur or sulfur-containing fuels. In the South Coast Air Basin, fuel combustion is the major source while chemical plants, sulfur recovery plants, and metal processing are minor sources. Introduction of low sulfur fuel oil, beginning in 1968, lowered SO_2 emissions. The recent shortages of natural gas have forced a greater use of low sulfur fuel oil, thus possibly adversely affecting air quality.

  At sufficiently high concentrations sulfur dioxide irritates the upper respiratory tract; at lower concentrations, in combination with particulates, it appears able to do still greater harm by injuring lung tissues. Sulfur oxides, in combination with moisture and oxygen, can yellow the leaves of plants, dissolve marble and eat away iron and steel. Sulfur oxides can also limit visibility and cut down the light from the sun.

- Photochemical Oxidant (O_x) - The term "photochemical oxidant" can include several different pollutants, but consists primarily of ozone (more than 90 percent) and a group of chemicals called organic peroxynitrates, which comprise only a small percentage of the total. Photochemical oxidants are created in the atmosphere and are not emitted directly into the air. Reactive hydrocarbons and oxides of nitrogen are the emitted contaminants which participate in the reaction. Ozone is a pungent, colorless toxic gas which is produced by the photochemical process. Photochemical oxidant is a characteristic of Southern California type smog, and reaches its highest concentrations during the summer and early fall when ultraviolet energy from the sun and other conditions are the major source of emission of oxides of nitrogen and reactive hydrocarbons (principal ozone precursors) in the SCAB.

The common effects of oxidants are damage to vegetation and cracking of untreated rubber. Photochemical oxidants in high concentrations can also directly affect the lungs, causing respiratory irritation and possible changes in lung functions.

- Particulates - Atmospheric particulates are made up of finely divided solids or liquids such as soot, dust, aerosols, fumes and mists. About 90 percent by weight of the emitted particules are larger than ten microns, but about 90 percent of the number of particulates are less than five microns in diameter. The aerosols formed in the atmosphere are usually smaller than one micron. In areas close to major sources, particulates are generally higher in the winter, when more fuel is burned, and meteorological and conditions favor the build-up of directly emitted contaminants. However, in areas remote from major sources and subject to photochemical smog, particulates are higher during summer months.

  Particulate matter consists of particles in the atmosphere resulting from many kinds of dust and fume-producing industrial and agricultural operations, construction, from combustion products, including automobile exhaust, and from atmospheric photochemical reactions. Some natural activity such as wind-raised dust and ocean spray also put particulates into the atmosphere.

  In the respiratory tract, very small particles of certain substances may produce injury by themselves, or may act in conjunction with gases to alter their deposition sites and scope of action. Suspended in the air, particulates of aerosol size can both scatter and absorb sunlight, reducing the amount of solar energy reaching the earth, producing haze and reducing visibility. They can also cause a wide-range of damage to materials.

- Hydrocarbons and Other Organic Gases - Any of the vast family of compounds consisting of hydrogen and carbon in various combinations, found especially in fossil fuels, are known as hydrocarbons. Many hydrocarbon compounds are major air pollutants and those which can be classified as olefins or aromatics and highly photochemically reactive. Atmospheric hydrocarbon concentrations in general are higher in winter because the reactive hydrocarbons react more slowly in the winter and can accumulate in the atmosphere to higher concentrations.

The major source of reactive hydrocarbons in the SCAB is now the internal combustion engine of motor vehicles, with minor sources including evaporation of organic solvents and petroleum refining and marketing operations.

Certain specific hydrocarbons, such as ethylene, damage plants by inhibiting growth and causing flowers and leaves to fall. Levels of hydrocarbons currently measured in urban areas are not known to cause adverse effects in humans. However, certain members of this contaminant group are extremely important components in the reactions which produce photochemical oxidant.

C. Transportation

1. Current Roadway System

The roadway network within the LAX ANCLUC Study is typical of most urbanized areas in the Southern California region. It consists of a complex system of improved local and collector streets plus secondary and major highways as well as freeways. This network provides access to the airport, local and regional business centers, beaches, and residential areas. The roadway system is depicted on Figure IV-6.

The San Diego Freeway (I-405) is an 8-lane roadway with high-level service roads in the vicinity of the Airport. This north-south freeway is 1.5 miles east of LAX and has interchanges for Airport-bound traffic at Sepulveda Boulevard, La Tijera Boulevard, Manchester Boulevard, Century Boulevard, Imperial Highway, and El Segundo Boulevard. Further east, the Harbor Freeway (11) bisects the study area in a north-south direction with eight lanes. This freeway is approximately seven miles east of LAX and provides three interchanges which directly serve airport bound traffic. The principle interchange is located At Century Boulevard with some traffic using Manchester Avenue or El Segundo Boulevard.

The arterials within the roadway network which carry airport bound traffic through the study area include Sepulveda Boulevard from Centinela Avenue to El Segundo Boulevard, Lincoln Boulevard from Jefferson Boulevard to Sepulveda Boulevard, Manchester Avenue from Prairie Avenue to Pershing Drive, Pershing Drive from Manchester Avenue to Imperial Highway, Vista del Mar from Manchester Avenue to Imperial Highway, Imperial Highway from Vista del Mar to Aviation Avenue, El Segundo Boulevard from Aviation Boulevard to Main Street, Century Boulevard from Hawthorne Boulevard to Sepulveda Boulevard.

a. <u>Traffic Volumes</u>

Sepulveda Boulevard is a fully improved major highway which provides access to LAX and traverses the study area in a north-south alignment. Between its intersections with Centinela Avenue and Manchester Avenue abutting land uses are principally residential with localized neighborhood commercial centers. South of Manchester Avenue Sepulveda Boulevard is abutted by the Westchester Business District, Los Angeles International Airport and continues in a southerly direction through the growing commercial/industrial center of El Segundo. The traffic volumes on Sepulveda Boulevard vary from 33,000 vehicles per day (vpd) north of Manchester Avenue to 67,400 vpd south of Lincoln Boulevard to 48,900 south of Imperial Highway with about 42,000 vpd at El Segundo Boulevard.

Lincoln Boulevard is a 4 and 6-lane State highway aligned along the northern perimeter of LAX. Lincoln Boulevard provides access to residential areas in Playa del Rey, the western portions of Westchester, Loyola University, the Hughes Airport and the beach communities further north. Adjacent to LAX, Lincoln Boulevard has a daily volume of 31,000 vpd.

Manchester Avenue from Pershing Drive to Sepulveda Boulevard is a fully improved major east-west highway with traffic volumes averaging 16,000 vpd near Pershing to 30,000 vpd near Sepulveda in Westchester's Central Business District. Manchester Avenue from Sepulveda Boulevard to La Cienega Boulevard near the San Diego Freeway averages 30,000 vpd and 37,000 vpd through downtown Inglewood. Land uses along this highway alignment include single family residential, medium density residential, local, commercial, and institutional (government, schools, etc.).

Pershing Drive from Manchester Avenue to Imperial Highway is improved as a secondary highway. Currently this segment of highway experiences volumes of 21,400 vpd. Pershing Drive provides access to World Way West where the airport and airline maintenance areas are maintained. Vista del Mar which parallels Pershing Drive between Manchester Avenue and Imperial Highway has a current volume of 16,000 vpd. Vista del Mar serves as the only continous north-south arterial west of Sepulveda Boulevard.

Imperial Highway is a major east-west highway which provides access to the south side of the airport where air cargo and some passenger facilities are located, commercial office centers and both single and multiple residential uses west of the intersection with Sepulveda. Traffic volumes on Imperial Highway west of Sepulveda are 20,000 vpd while between Sepulveda Boulevard and Aviation Boulevard the volume of traffic is about 52,600 vpd.

El Segundo Boulevard is a major through arterial with four lanes of traffic from Main Street to Sepulveda Boulevard widening to six lanes east of the city limits. El Segundo Boulevard due to offramp of the I-405 provides the main entrance to the City, through the large Hughes Corporate Complex, USAF Space Division officers, Prudential Towers, the Standard Oil Refinery and other large corporate entities before leading into the residential area and downtown civic center. Traffic volumes on El Segundo Boulevard range from about 8,000 vpd at Main Street to 20,000 vpd at the intersection with Sepulveda Boulevard to about 40,000 vpd at Aviation Boulevard. Century Boulevard is the main east-west traffic corridor within the LAX-ANCLUC study area and is the principle ingress and egress route into the Central Terminal Area (CTA). Traffic on Century Boulevard averages around 70,000 vpd at La Cienega west of the San Diego Freeway and 40,000 vpd at Hawthorne Boulevard. Land uses along Century Boulevard include low density residential areas, strip commercial activities and large hotel and commercial office centers near the entrance to the CTA. The aforementioned traffic volumes are summarized on Table IV-12.

b. Key Intersections

The movement of traffic on the existing street system is effected not only by the number of lanes available per direction, but also a function of the intersection capacities and the level of utilization traffic approaching LAX from the north, east, or south impacts many intersections within the study area. This section will concentrate on the major intersections located along these primary ground traffic corridors.

The intersections to be included in the discussion of capacity utilization and service levels are listed below:

- Lincoln Boulevard and Manchester Avenue
- Lincoln Boulevard and Sepulveda Boulevard
- Manchester Avenue and Pershing Drive
- Manchester Avenue and Sepulveda Boulevard
- Manchester Avenue and La Cienega Boulevard
- Manchester Avenue and Hawthorne Boulevard
- Century Boulevard and Sepulveda Boulevard
- Century Boulevard and La Cienega Boulevard
- Century Boulevard and Hawthorne Boulevard

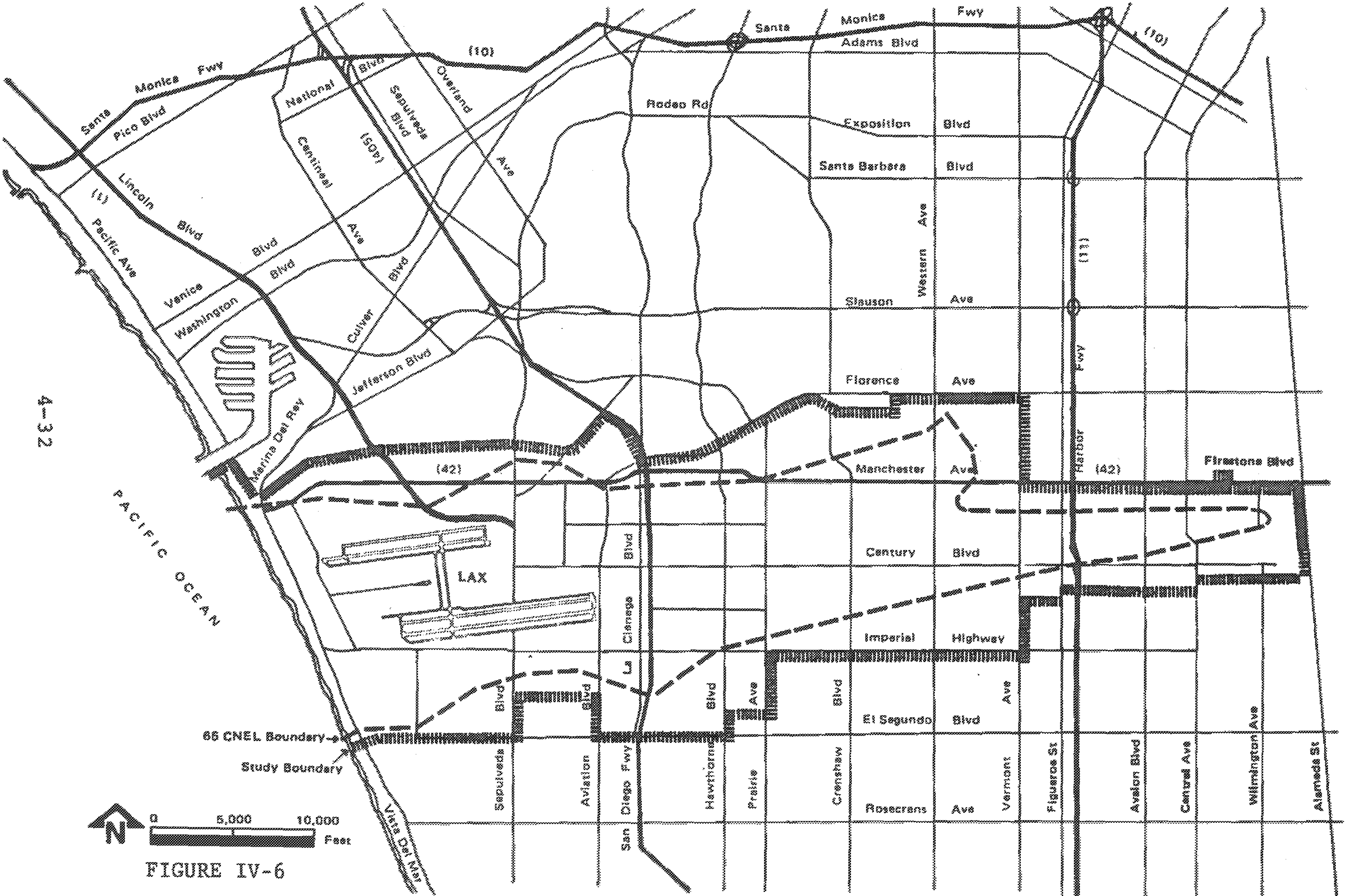


FIGURE IV-6

Existing Surface Transportation Network

° Sepulveda Boulevard and Imperial Highway

° Imperial Highway and La Cienega Boulevard

° El Segundo Boulevard and Sepulveda Boulevard

° El Segundo Boulevard and Aviation Boulevard

TABLE IV-12

Existing Traffic Volumes
(Vehicles Per Day)

Street	Segments(s)	Vehicles Per Day
Sepulveda Bl	Centinela Bl to Manchester Ave	33,000
	Manchester Ave to Imperial Hwy	67,400
	Imperial Hwy to El Segundo Bl	48,900
Lincoln Bl	Manchester Ave to Sepulveda Bl	31,000
Manchester Ave	Pershing Dr to Sepulveda Bl	16,000
	Sepulveda Bl to La Cienega Bl	30,000
	La Cienega Bl to Hawthorne Bl	37,000
Pershing Drive	Manchester Ave to Imperial Hwy	21,400
Vista del Mar	Manchester to Imperial Hwy	16,000
Imperial Hwy	Vista del Mar to Sepulveda Bl	20,000
	Sepulveda to Aviation	52,600
El Segundo Bl	Main Street Intersection	8,000
	Sepulveda Bl Intersection	20,000
	Sepulveda Bl to Aviation Bl	40,000
Century Bl	Sepulveda B to La Cienega Bl	70,000
	La Cienega Bl to Hawthorne Bl	50,000

The method used to evaluate the operational efficiency of each intersection is the Intersection Capacity Utlization (ICU) Model. An intersections service level is a function of its opposing through and turning movements, roadway capacity, and signal phasing. The ICU method allows the analyst to examine an intersection as a functional unit incorporating all of these components of interaction.

The operational efficiency of an intersection is represented numerically on a scale of 0.00 to 1.00 (in some cases values will exceed 1.00). Very good traffic conditions are represented by ICU values of less than 0.70. Increasing levels of tolerable congestion are represented by values ranging from 0.70 to 0.90. An ICU range of 0.81 to 0.90 represents Level of Service (LOS) D - the values normally used for design in metropolitan areas. Level of Service E (ICU = 0.91 - 1.00) represents a capacity situation with long queues at signals and significant delays. Severe congestion causing long delays are indicated by ICU values of 1.00 and larger. Table IV-13 listing these values, will be useful in the interpretation of information which follows.

The ICU values included in Table IV-14 represent the average peak capacity utilization. Review of those values indicates a constructed traffic flow during both morning and evening rush hour traffic. Morning peak traffic flows are less severe than evening peaks according to the level of service indicators. This is a result of a number of factors including flexible working shifts by area employees, more leisure driving in the afternoon hours, and airline scheduleing to mention a few variable factors.

2. Projected 40 MAP Traffic Levels

a. Levels of Service

Traffic impacts associated with the 40 MAP level of activity at LAX were quantified during the preparation of the ground access environmental documents prepared to assess the ongoing airport improvement program. The forecasts included in Task 2.01 indicate that the 40 MAP level could be reached between 1985 and 1995, depending upon general economic conditions. The period chosen for comparison of external roadway conditions was taken as the peak hour of the fifteenth highest demand day of the year when LAX reaches 40 MAP. This period was chosen due to its importance in analysis of the various ground access alternatives considered. The study area roadways were examined independently of backups caused by central terminal area congestion, to facilitate examination of the external roadway system. The ICU method was used to determine overall intersection levels of service. The effect of various ground access alternatives on the ICU values were also identified. Table IV-15 provides the ICU analysis discussed previously. It should be emphasized that the estimated values are higher than would be typically used for planning and design purposes and congestion in general would be less throughout most of the year. However, in order to estimate worst case conditions and not understate impacts at any particular intersection the ground access model combined estimated background peak hour volumes with peak airport volumes.

TABLE IV-13

Relationship Between Level of Service and

Intersection Capacity Utilization (ICU) Value

Level of Service	ICU Value	Description	Operating Characteristics
A	0.00 0.60	Free flow (best)	Low volumes, high speed selectivity, low density. Drivers not imparied by other traffic. At signals no driver waits more than one signal cycle and all turns area easily made.
B	0.61- 0.70	Stable flow	Operating speeds beginning to be restricted by traffic conditions. Suitable for rural design values. At signal, drivers beginning to feel somewhat restricted.
C	0.71-	Stable flow	Volume restricts driver's speed and manuver-ability; suitable for design is smaller urban areas. At signals, drivers may have to occasionally wait more than one cycle to clear.
D	0.81- 0.90	Approaching unstable flow	Temporary restrictions cause drop in volume and speed; comfort and convenience are low but tolerable for short periods. Normally used for design in metropolitan areas. At signals, short peaks may develop queues which which will clear during later cycles. Excessive back-up does not occur.
E	0.91- 1.00	Unstable flow (capacity)	Speeds on Freeways at 30 mph with momentary stoppages. At signals, there may be long queues of vehicles with delays up to several signal cycles. Unsuitable for use in design.
F	greater than 1.00	Forced flow (worst)	Low speeds, many stoppages on freeways, long queues, and high delays; roadway becomes storage area. Back-up from one signal may block adjacent intersections. Volumes carried are unpredictable.

Table IV-14

Existing (1982) Intersection Capcity Utilization
and Levels of Service

	ICU Value		Level of Service	
Intersection	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Lincoln/Manchester	.69	.85	B	D
Lincoln/Sepulveda	.76	.84	C	D
Manchester/Pershing	.33	.42	A	A
Manchester/Sepulveda	.65	.81	B	D
Manchester/La Cienega		-NA-		
Manchester/Hawthorne		-NA-		
Century/Sepulveda	.85	.93	D	E
Century/Aviation	.68	.75	B	C
Century/Hawthorne		-NA-		
Sepulveda/Imperial	.91	1.01+	E+	F
Imperial/La Cienega	.67	.93	B	E
El Segundo/Sepulveda	.81	.80	D+	C-
El Segundo/Aviation	1.01+	.81	F	D+

The primary factors influencing the ICU values are the inclusion or deletion of the I-105 Freeway and the Arbor Vitae/San Diego Freeway interchange. The I-105 or (Century Freeway) is currently under construction. However, the segment from the I-405 to Sepulveda Boulevard is not scheduled for completion until 1993. The proposed Arbor Vitae interchange is currently being studied by Caltrans.

The cost/benefit assessment of constructing the interchange and its ultimate design are controversial local issues still to be resolved. The interchange provides an alternative path to Lot C and the CTA on extended Arbor Vitae. The new interchange could also relieve congestion at the major interchange of Century Boulevard and the I-405.

Sources:

1. Department of Airports Final EIR Volume Four August 1978.
2. Department of Airport Ground Access Final EIR Vol. Two, September 1978.
3. Department of Airports Northside Development Draft EIR, July 1982.
4. City of El Segundo Traffic Circulation Study Phase One Report, May 1982.

Table IV-15

Projected Intersection Capacity Utilization Values
Associated with 40 MAP

Intersection	Null ICU/LOS	AH.1 ICU/LOS	AH.2 ICU/LOS	AH.3 ICU/LOS
Lincoln/Sepulveda	.96/E	1.14/F	1.23/F	1.17/F
Manchester/Sepulveda	.99/E	.78/D	.64/B	1.10/F
Manchester/La Cienega	1.13/F	1.12/F	.82/D	1.19/F
Century/Sepulveda	.96/E	1.00/E	.72/C	1.18/F
Century/Aviation	1.32/F	1.34/F	1.16/F	1.10/F
Sepulveda/Imperial	1.17/F	1.12/F	.85/D	1.11/F
Imperial/La Cienega	1.55/F	1.55/F	.58/A	1.56/F

Null - Approximates existing system with applied TSM and regional bus service.
AH.1 - Approximates impact of second level roadway without the I-105 and Arbor Vitae Interchange.
AH.2 - Approximates impact of second level roadway with the I-105 and Arbor Vitae Interchange.
AH.3 - Approximates impact of preferential bus lane, elevated busway, or people mover alternative.

ICU/LOS - Intersection Capacity Utilization Value/Level of Service Value

The I-105 had the most significant influence on study area levels of service. It would improve conditions for non-airport related vehicles as well providing improved access to the CTA and the peripheral parking lots. Caltrans indicates that the I-105 west of the San Diego Freeway will handle approximately 31 percent of all air passenger trips to LAX. The I-105 will provide a controlled access facility directly to the CTA if it extends to an interchange with Sepulveda Boulevard.

Volumes on the San Diego Freeway are projected to be well over capacity during the peak hour for all the alternatives. Ramp metering, ramp bypass lanes for buses and carpools, preferential freeway lane treatments and other actions may be used to reduce congestion during peak hours.

Several of the study area intersections which are projected be heavily congested are along major access roadways. Mitigations including signalization improvements, turning lanes, channelization, signing (especially for airport related traffic) and other feasible improvements.

b. Airport Traffic Generation

Traffic generated by Airport facilities in 1982 will be approximately 185,000 vehicle trips per day. The potential increases in passenger activity, cargo handling, and employee densities projected for LAX in 1990 under the 40 MAP level and assuming the existence of a functional Palmdale International Airport will generate 237,000 Airport related trips per day, a 28 percent increase over the 1982 level. The daily traffic volume levels generated by the various Airport activity areas for 1982 and 1990 are listed in Table IV-16.

3. Major Study Area Traffic Generators

A number of development projects, both airport and non-airport related, are expected to effect the existing transportation network. These projects will all generate additional traffic. The 1990 traffic levels reported in the LAX Ground Access EIR assumed a cumulative rate of growth in the region of approximately 2 percent annually. The major traffic sources considered include the Century Boulevard Redevelopment Project in Inglewood, Airport Northside Development, El Segundo Commercial/Office Center and immediately north of the study area the Summa Corporation-Playa Vista Development. The projected trip generation for these developments are listed below in Table IV-17.

4. Transportation Planning and Systems Management

The jurisdictions included within the LAX-ANCLUC study area have all indicated concern regarding continued degradation to the existing transportation network. Planners and transportation engineers at both the State and local levels have developed many proposed improvements. CalTrans after many years has begun construction of the Century Freeway (I-105). This freeway will provide direct relief to the heavily congested east-west traffic corridors, but is not scheduled for completion until 1991. El Segundo has contracted for a Transportation System Management (TSM) study to identify potential improvements needed to mitigate worsening levels of service and delays anticipated with the continuing growth of commercial and industrial development in the eastern half of the City. The City of Los Angeles, Department of Airports is planning a number of improvements to mitigate traffic increases expected from the Northside Development.

These improvements include construction of the Northside Arterial (a western extension of Arbor Vitae) the bridging of Sepulveda at 96th Street, and potential participation with CalTrans and Inglewood in the construction of an interchange at the I-405 and Arbor Vitae.

TABLE IV-16

Traffic Generation By Airport Activity Area
at 40 MAP

Area	Average Daily Traffic 1982	1990
Central Terminal	86,300	110,500
VSP Lot	7,300	9,300
East Westchester (Lot C & Car Rentals)	12,500	16,000
Imperial Terminal	5,200	6,600
West End (Aircraft Maintenance, etc.)	31,200	39,900
Cargo City - North	31,000	39,900
Cargo City - South	11,500	14,800
Totals	185,000	237,000

The City of Los Angeles is currently negotiating with Summa Corporation for off-site transportation improvements. These include additional street construction, street widenings and possibly a light rail link of the proposed regional rapid transit system.

The transportation planning activities of the various jurisdictions described above have taken place with limited coordination. In response to this situation a regional TSM task force has been formed to address the traffic situation on a regional basis for the area surrounding LAX. The County and City of Los Angeles have taken the lead in this group. The Task Force has begun work and will develop a proposed improvement program for the entire region. These recommendations should be available in time for consideration by the LAX-ANCLUC study during Phase III.

Source: Los Angeles Department of Airports, Ground Access FEIR, 1978.

TABLE IV-17

Additional Trip Generation

Inglewood Project	Average Daily Trips (ADT)
Century Boulevard Redevelopment	19,700
El Segundo Commercial/Office Center	240,111-419,477*
Summa Corporation-Playa Vista	200,000**
Airport Northside Development	59,900

*This range in ADT was projected using traffic generation factors for the land use categories proposed in the low density and high density development alternatives described in Phase II of the El Segundo TSM study.

**Projected from land use categories included in Marina del Rey Ballona Specific Plan and the Playa Vista Development Plans.

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LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL LAND USE COMPATIBILITY STUDY

TASK 2.05

ESTABLISH COMMUNITY PLANNING CRITERIA AND REFINE COMMUNITY PLANNING AREA BOUNDARIES

TABLE OF CONTENTS

I. INTRODUCTION

Task 2.05 involves a three part effort to 1) document relevant experience of other areawide airport planning efforts, particularly those involving airport environs planning in multijurisdictional situations; 2) to identify planning criteria and standards to be used in subsequent work task and 3) to evaluate and if necessary refine the ANCLUC Study planning area boundaries.

II. REVIEW OF OTHER ANCLUC'S

A. Introduction

The following constitutes a review of planning programs and implementation devices used in other areas of the nation and world that may prove useful in the Los Angeles International Airport compatibility planning effort. This working paper presents an inventory of experiences in achieving airport land use compatibility, especially as it relates to noise impacts. Table I summaries the results of a FAA review of ANCLUC's prepared as of September 1980. The table depicts the numbers of ANCLUC's that considered, recommended and implemented specific alternatives at the time of the evaluation.

Over 50 case examples are discussed which collectively provide a reference to successful applications of airport/environs land use planning and implementation. The experiences contained herein constitute a range of actions, some of which are potentially applicable to LAX and its environs.

The range of actions considered include:

- airport operating procedures
- land development controls
- management/financial policies
- experience of Airport Land Use Commissions (ALUCs)
- building codes

The types of noise reduction actions discussed under airport operating procedures include modifications of aircraft approach and departure procedures; use of a preferential runway system; and limitation of aircraft operations by type, number or time of day. Actions of a land development control nature include ways and means of controlling how land is used or may be developed in areas exposed to excessive airport noise. Such actions include acquisition of property or avigation easements and insulation of noise sensitive residential, office or public uses. Actions involving management/financial policy include the use of noise monitoring systems; the maintenance of citizen information and property assistance programs, and the estabishment of special noise-oriented cost provisions in airport use agreements, lease documents and noise abatement ordinances. The experience of Airport Land Use Commissions identifies methods employed in defining the airport impact planning boundary, reviewing proposed land uses for compatibility with airport operations and implementing the Airport Land Use Plan and its policies. The final section includes a discussion of various uses of building codes and sound insulation standards in achieving airport/environs land use compatibility. Included in this section is a discussion of minimum exterior-interior noise insulation standards for various types of buildings, use of the Uniform Building Code, design of a community noise control ordinance and the use of the noise element of the general plan in helping to address airport-induced noise problems. Appendix A summarizes recommended actions as well as those studied for various ANCLUC's and airports around the world.

TABLE I

NOISE ABATEMENT ALTERNATIVES

Alternatives	Considered	Recommended	Implemented
Airport Related			
Time of day restrictions	18	8	3
Curfew	20	7	2
Airport development	15	10	1
Runup area location	16	8	2
Noise barrier construction	14	6	0
Max. noise limitations	12	3	0
Aircraft Operational			
Preferential runway use	23	20	4
Arrival flight procedures	20	15	1
Departure flight procedures	23	21	4
Climb profile change	18	15	2
Approach profile change	13	9	0
Off Airport Land Use			
Land purchase - fee	19	10	1
Purchase assurance	10	2	0
Noise easements	12	5	0
Zoning	20	14	2
Bldg. code/subdivision reg.	15	9	1
Soundproofing	16	10	1
Truth in sales & lending	15	12	0
Comprehensive planning	15	12	2
Other			
Noise Monitoring	15	10	1

B. Summary

Local agencies and individuals responsible for alleviating a specific airport noise problem typically need to ask and find answers to a series of related questions in order to determine how best to proceed. Among others, these questions may include:

- What form of action is required--corrective? Preventive? Some combination of both?

- Who should be responsible for carrying out a particular noise reduction action? Operational changes at an airport are normally made by the sponsor/ operator, by airlines serving the facility, by the Federal Aviation Administration (FAA), or by all three. Land development control activities are typically effected by local legislative bodies and by local and regional planning organizations. Beneficial management/financial policy actions can obviously be taken by any one or all of the entities mentioned.

- What are the advantages and disadvantages of a possible noise reduction action or set of actions? An objective investigation usually leads one to a host of additional questions, such as: Who will receive the most benefit from the action? The most disbenefit?. . . Will operational capacity or flexibility be reduced?. . . Will it work here, in this setting and at this time?. . . How much and what type of support for or opposition to the proposed action may be expected?. . . How long will it be before improvement actually takes place?. . . Is the action of a permanent or temporary nature?. . . Who has to agree in order to proceed?. . . Is an Environmental Impact Statement required?. . . How much will the action cost? Who should pay? With what resources?

The following summary provides an inventory of the case examples discussed in this working paper which collectively constitute a reference to successful applications of Airport/Environs compatibility planning and implementation.

1. Noise Reduction Actions Taken at Other Airports

a. Actions involving a change in airport operations (AOC)

Action	Airports Involved
- Limitations on the development of new on-airport facilities	Monterey Airport
- Replace existing airport with new facility.	Ke-ahole Airport replaced Kona Airport (Island of Hawaii)
- Shift operations to neighboring airports	FAA Advisory Circular
- Construct new runway	Honolulu International Airport
- Extend existing runway include displaced threshold	Miami International Airport; John Wayne Airport (Orange County, California)
- Establish preferential runway system	Standiford Field (Louisville, Kentucky); Logan International Airport; San Francisco International Airport; Burbank Airport, Heathrow Airport; Gatwick Airport, Zurich Airport; Schipol Airport
- Use computer program to spread noise exposure	John F. Kennedy International Airport
- Modify aircraft approach and departure procedures	Washington National Airport Phoenix Sky Harbor International Airport; Logan International Airport; San Francisco International Airport; Burbank Airport
- Development of new traffic controller procedures and installation of additional navigational aids to provide more positive aircraft direction	Phoenix Sky Harbor International Airport

Action	Airports Involved
- Aircraft retrofit/replacement to meet FAR Part 36	FAA Advisory Circular
- Modify aircraft maintenance practices.	San Francisco International Airport, Sea Tac International Airport (Seattle-Tacoma, Washington), Monterey Airport, Burbank Airport
- Limit aircraft operations including nighttime restrictions, curfews, total operation restrictions.	Kalamazoo Municipal Airport (Michigan), Monterey Airport John Wayne Airport, Burbank Airport, Heathrow Airport, Gatwick Airport, Japan
- Limit operations by certain types of aircraft.	Fresno-Chandler Downtown Airport (Fresno, California), Sea Tac International Airport, John Wayne Airport, Burbank Airport, Germany, Zurich Airport, Schipol Airport
- No air carrier shall inaugurate any operation, or implement any increase in operations, without the written approval of the Commission.	Burbank Airport
- Publication of noise monitoring results which identify airline and aircraft type	Germany
- Establish greenbelt buffer around airport.	Dulles International Airport
- Construct landscaped earth berm noise shield,	Wold-Chamberlain Field (Minneapolis, Minnesota) Burbank Airport

b. Actions of a land development control (LDC) nature

Action	Airports Involved
- Acquire noise-impacted property in fee simple	Sea-Tac International Airport, Logan International Airport, San Jose Vicinity Area Plan, Charles De Gualle Airport, Orly Airport
- Acquire restricted use easements	Miramar Naval Air Station (U.S. Navy, San Diego)
- Acquire avigation easements. Amend zoning, subdivision and building code regulations to require dedication of avigation easements	Tampa International Airport, Sea-Tac International Airport, Monterey Airport, San Jose Vicinity Area Plan
- Establish purchase assurance program	Sea-Tac International Airport
- Cost sharing and limited cost sharing insulation program for noise affected structures	Sea-Tac International Airport
- Insulate impacted residential properties	Los Angeles International Airport, San Francisco International Airport, John Wayne Airport, United Kingdom, Germany
- Insulate school structures	Los Angeles International Airport, Logan International Airport
- Use special zoning procedures	Kansas City International Airport, Sea-Tac International Airport, John Wayne Airport, Charles De Gualle Airport, Orly Airport
- Development control by public agencies	Sea-Tac International Airport, John Wayne Airport

Action	Airport Involved
- Amend general plan and zoning map to preclude new or redeveloped housing units and other noise sensitive land uses within highly noise impacted areas	Monterey Airport, San Francisco Airport, San Jose Vicinity Area Plan, John Wayne Airport
- Neighborhood enhancement program	San Francisco International Airport.
- Designation of a redevelopment plan/specific plan for east Santa Ana Heights, with possibility of including the west side	John Wayne Airport
- Use special taxation procedures	Sacramento Metropolitan
c. Actions based on a management financial policy (MFP)	
- Prepare airport/environs area master plan.	Tucson International Airport
- Install and maintain noise monitoring system.	John Wayne Airport, Sea-Tac International Airport, Charles DeGualle Airport, Orly Airport, Zurich Airport
- Add technical specialists to staff.	Kansas City International Airport
- Establish citizen involvement program, for example, property advisory services, noise abatement committee, information officer.	Sea-Tac International Airport, Phoenix Sky Harbor International Airport, Monterey Airport, John Wayne Airport, Burbank Airport, Torrance Airport
- Noise complaint procedure	San Francisco International Airport, Monterey Airport, John Wayne Airport

Action	Airport Involved
- Update airport operational forecasts and related noise exposure maps	Fresno Air Terminal (Fresno, California)
- Designation of a responsible county agency to conduct a recommended annual review of the status of the ANCLUC plan implementation, and to coordinate any recommended adjustments in the implementation plan and schedule	John Wayne Airport
- Conduct a legal review of the comprehensive ANCLUC plan.	John Wayne Airport
- A passenger head tax is used to generate funds for a noise insulation program.	France, Japan

2. The Airport Compatibility Experience of Airport Land Use Commissions

Action	ALUC involved
- Restrict density uses in crash hazard zones	Alameda County
- Define "emergency catchment areas"	Santa Clara County
- Single event/normalized CNEL consideration	Santa Clara County, United Kingdom, Zurich Airport
- Noise contour/settlement line	Alameda County, John Wayne Airport, Burbank Airport
- Land use/noise compatibility chart	San Diego Comprehensive Planning Organization, Sacramento County, Monterey Airport
- Land use/noise/crash hazard compatibility chart	Orange County, Gillespie Field
- Land use compatibility exceptions	San Meteo County
- Noise reduction at varying distances from aircraft operations	Santa Clara County
- Local agency cooperation	San Diego County

3. Experience in Building Codes (BC) and Sound Insulation Standards

Action	Jurisdiction Involved
- Control of noise transmission	City of San Diego, California
- Sound proofing ordinance	City of Inglewood, California
- Uniform Building Code	City of Seattle
- Insulation Standards	State of California
- Noise Ordinance	State of California
- Noise Element	San Mateo County

C. Discussion of Actions

A search of available literature was made in order to develop a list of actions implemented or proposed at other airports. The original research for this task comes from a working paper prepared for the San Francisco Airport Joint Land Use Study. The report prepared by Williams Platzek and Mocine in July 1978 was updated and expanded to reflect additional airport studies. Where more than one airport is identified after a specific action, the discussion of actions is based on the experience of the first airport listed. The list cannot be considered all inclusive. Only actions implemented elsewhere were included. sider

In each profile, the action taken and key characteristics of its development and implementation are briefly described. Pertinent cost considerations are also included to the extent that such information is both available and appropriate. An implementation follow-up, if possible, discusses the success or failure of the action as well as problems encountered during implementation.

1. Noise Reduction Actions Taken at other Airports

a) Actions involving a change in Airport Operations (AOC)

AOC-1

"Limitations on the Development of New On-Airport Facilities"

Source

Monterey Airport (Contact: Joe Petrowski, Monterey Airport)

Profile of Action

- Limitation of the development of new general aviation and business aircraft facilities was recommended to limit the number of aircraft based at the airport to its current level.
- 195 aircraft based at airport
- Unconstrained forecast: 75% increase by 2000; 18% increase by 1985.

Implementation Follow-Up

- No amendment to Airport Master Plan
- Airport will probably increase capacity 30-40% in next two years by moving fixed base operations to north side.
- Airport action directly contradicts ANCLUC recommendations.

AOC-2

"Replace Existing Airport with New Facility"

Source

State of Hawaii, Department of Transportation, 1966-1970.

Profile of Action

- In the mid-1960s, the State of Hawaii determined that continued operation of the Kona Airport was undesirable from several standpoints, including (1) inadequate site capacity to meet the needs of a rapidly growing tourism region, and (2) traffic patterns that involved overflights of substantial resort facilities in the Town of Kailua-Kona, within 1 mile of the Airport.

- Principal criteria used in planning for the new site included (1) flexibility to stage development of the Airport in response to future changes in activity demand levels, and (2) the effect of aircraft operations--especially noise--on surrounding areas, most notably on nearby beach and historic locations.

Key Cost Considerations

- Since the State already owned virtually all of the 5,000-acre site, relatively low acquisition costs were involved.

- Airport construction costs amounted to some $20 million in 1970.

- At today's inflated prices, and if major site acquisition were to be required, an airport such as Ke-ahole would cost over $50 million.

Implementation Follow-Up

- Ke-ahole Airport was opened to the public in 1970; during 1977, the facility accommodated some 1 million passengers.

AOC-3

"Shift Operations to Neighboring Airports"

Source

FAA Advisory Circular

Profile of Action

- This action is being considered at two FAA owned, operated and maintained facilities - Washington National and Dulles International Airports in Washington D.C. A shift in operations is being considered for construction, air traffic control and noise abatement reasons.*

* The FAA proposed to adopt rules to implement the DOT/FAA policy to guide the future operation and development of Washington National and Dulles International Airports and to improve the quality of the environment in the Washington Metropolitan area. The proposals relate to the number and type of aircraft operations, the hours of operation and scheduling, a limit on the total number of passengers using National Airport, the perimeter for non-stop service, aircraft equipment restrictions, and the hourly allocation of operations among different classes of users at National.

- Some of the problems that could be encountered should this action be selected for implementation at LAX are: persuading air carriers to move from LAX to Palmdale and Ontario Airports (air carriers prefer to locate where the greatest demand is); ensuring that the action does not discriminate against a carrier, (rerouting to other facilities must be equally enforced) passenger and cargo transfer between air carriers; expense involved in shifting operations (manpower, equipment).

- A number of incentives must be developed for encouraging air carriers to shift their operations. Among those could be reduced landing fees at alternative facilities, allowing noisier aircraft at Palmdale, and providing shuttle service between points.

- This action may be especially useful in directing air carriers requesting terminal space in Los Angeles to the Palmdale or Ontario facilities. As economic conditions improve, further utilization of alternative facilities by those carriers with existing terminal space at LAX, should be strongly encouraged.

Key Cost Considerations

- A dollar amount is almost impossible to access at this time. Cost considerations would include the development of the Palmdale facility, hiring additional personnel for operations/ maintenance, and purchase of new equipment, (i.e. trucks, etc...)

Implementation Follow-up

- Proposed Notice of Rulemaking, Federal Register, V46:133 July 13, 1981 to be considered in one year.

AOC-4

"Construct New Runway"

Source

State of Hawaii, Department of Transportation 1970-1977

Profile of Action

- A 1970 master plan study for the Airport programmed construction of a new 12,000-foot east-west runway in Keehi Lagoon approximately 6,700 feet seaward.

- A new runway with its over-water approaches was needed because jet aircraft operations were responsible for a severe and growing noise exposure problem in a densely built-up area east of the Airport.

- Although the new "Reef Runway" was deemed necessary for noise abatement reasons, environmental groups initiated legal action to halt the project on the basis that (1) placement of the runway in Keehi Lagoon would result in ecological damage, and (2) all possible options had not been considered or documented in the Environmental Impact Statement prepared in support of this federally aided undertaking.

- After a considerable legal battle, the U.S. Ninth Circuit Court of Appeals in San Francisco ruled in favor of the project in 1973.

Key Cost Considerations

- Reef Runway design, engineering, and construction costs amounted to some $80 million. Of this amount, the federal share approximated $45 million.

- Preparation of necessary environmental documents and legal fees required close to an additional $1 million.

Implementation Follow-Up

- New Runway 8R-26L became operational on October 14, 1977.

AOC-5

"Extend Existing Runway"

Source

Metropolitan Dade County (Florida), Aviation Department

Profile of Action

- According to the 1975 Airport Layout Plan for Miami International Airport, an existing runway will be extended in order to reduce aircraft noise exposure within residential neighborhoods located adjacent to or near the Airport.

- Runway 9R-27L is to be extended at its west end by 3,650 feet. This will increase its overall length from 9,350 to 13,000 feet.

- The takeoff point is to be moved 3,650 feet to the west.
- The arrival threshold is to be displaced by 2,200 feet to the east of the takeoff point.

Key Cost Considerations

- The estimated total cost of the runway extension and associated work is approximately $13 million

Implementation Follow-Up

- Plans for the runway extension are scheduled to be implemented in 1981.

AOC-6

"Establish Preferential Runway System"

Source

Standiford Field, Lousiville, Kentucky, 1974

Profile of Action

- In 1974, as a result of growing concern about aircraft noise in the community, the Louisville-Jefferson County Air Board and the FAA jointly established a preferential runway system.

Key Cost Considerations

- A slight reduction in airfield capacity may occur when preferential runway patterns are used; for example, in certain weather conditions, higher airfield capacities could be realized if the preferential runway system were not in effect.

Implementation Follow-Up

- Air Board representatives report a major improvement in relations with the principal community activist group since the preferential runway system has been in effect; complaints from surrounding homeowners have declined dramatically.

AOC-7

"Use Computer Program to Modify Noise Exposure"

Source

Port Authority of New York and New Jersey, Aviation Development Council of New York, and FAA, 1971.

Profile of Action

- A computer program was used to develop a preferential runway system at John F. Kennedy International Airport that would minimize dwell within existing residential neighborhoods adjacent to or near the Airport--dwell being defined as the length of time over which overflights of a given community sector are essentially continuous.

- Some neighborhoods near the Airport were impacted by frequent noise exposure while others were rarely affected. Residents who were frequently bothered by aircraft-generated noise complained that such exposure was unfair and unreasonable.

- The Port Authority of New York and New Jersey, the Aviation Development Council of New York, and the FAA jointly investigated the situation and developed a Dynamic Preferential Runway System (DPRS) to determine a more acceptable runway use pattern from a noise abatement standpoint.

- As inputs, the computer program, as designed and installed by Tracor Sciences & Systems of Austin, Texas, considers air traffic demand, weather forecasts, time of day, and increased public sensitivity on weekends and holidays. As outputs, the program produces a series of preferred runway uses.

- The program is designed so that no single residential area is exposed to overflights for more than 6 hours at a time.

Key Costs Considerations

- Capital costs required to implement the system were less than $250,000.

- Current operating costs are on the order of $30,000 per year.

AOC-8

"Modify Aircraft Approach and Departure Procedures"

Source

Washington National & Dulles International Airports (Washington, D.C.)

Profile of Action

- By modifying aircraft approach and departure procedures it will provide metropolitan Washington area with safe and efficient airport facilities as well as to reduce the aircraft noise and congestion associated with their use.

- The number of instrument flight operations (takeoffs and landings) would be reduced from 40 to 37 per hours over a fifteen hour period. The reduction would eliminate 45 potential operations during the 15 hour period by the air carriers.

- No air carrier aircraft may fly nonstop between Washington National Airport and any airport that is more than 1,000 statute miles away from Washington National Airport.

- Any air carrier aircraft not currently operating at Washington National Airport would not be allowed to use the airport:

  - Until it has been determined by the Airport Administrator that the operation of the aircraft meets appropriate safety concerns and that the proposed operation is compatible with the airport's gate, baggage and handling, and roadway facilities.

- Air carrier's aircrafts will not be permitted to land or takeoff between the hours of 10:00 p.m. and 7:00 a.m. unless the aircraft can meet a noise level of 72dB or less.

Key Cost Considerations

- Airport revenue generated from landing and takeoff fees will be reduced as a result of the decrease in the number of slots for the major carriers.

Implemental Follow-Up

- The final Environmental Impact Statement (EIS) for the proposed plan is being prepared.

- The final step will be the submission of the final EIS and proposed plan to the FAA for review and approval.

AOC-9

"Modifying Air Traffic Controller Procedures and the Installation of Additional Navigational Aids"

Source

Phoenix Sky Harbor International Airport.

Profile of Action

- By modifying air traffic patterns out of the airport with the aid of radio signal beacons, noise levels can be reduced to a noise level more acceptable to a larger portion of the community.

- Aircraft takeoffs will fly eastward along a riverbed for approximately five miles before initiating any new course changes.

- While flying along the riverbed, aircraft will have the option to use radio signal beacons for directional assistance.

Key Cost Implementation

Cost figures for implementing new air traffic controller procedures and the installation of additional navigational equipment is not available.

Implementation Follow-Up

- The modification to the air traffic controller procedures have been in effect for over five years and have proven to be effective in reducing aircraft takeoff noise.

- Phone complaints have decreased by approximately 80% to 90% since the new procedures have taken effect.

- Aircraft takeoff noise levels and phone complaints do increase when there is a low cloud ceiling over the takeoff flight path.

AOC-11

"Modify Aircraft Maintenance Practices"

Sources

City and County of San Francisco Airports Commission

Profile of Action

- In response to an increasing awareness of the impact of aircraft noise on surrounding residential communities, in the mid 1960s special areas were designated at the Airport for aircraft maintenance runups during nighttime hours.

- These designated runup areas were existing pavement areas and were situated so that prevailing wind conditions permitted "pointing the aircraft tail" over the San Francisco Bay.

- In 1975, a regulation was promulgated as part of the Airport Operations Manual that established further control of runways between the hours of 10 p.m. and 6 a.m. Under this regulation, nighttime maintenance runups are not permitted unless the aircraft is scheduled for an "early morning departure" (i.e., between 6 and 10 a.m.) the following day.

- The procedure requires the airline to contact the Airport operations supervisor for permission to conduct a nighttime runup in a designated area. The following morning Airport staff verifies that the requirement to make the runup was valid.

- Since implementation of the 1975 regulation, according to Airport staff, nighttime runups have been reduced to an average of 3 or 4 per night, from a previous estimate of 7 to 10 per night.

Key Cost Considerations

- Pavement areas designated for nighttime runups have suffered accelerated surface deterioration.

AOC-12

"Limit Aircraft Operations by Means of Nighttime Restrictions"

Source

City of Kalamazoo, Michigan, 1977

Profile of Action

- In making the ADAP grant offer, FAA included Special Condition 29 which required the City of Kalamazoo, in consultation with all users and those affected, to institute appropraite restrictions on night jet operations as well as a preferntial runway use pattern of jet arrivals on Runway 35 and departures on Runway 17 (i.e., reverse flow operations on the same runway).

- In conformance with this special condition, the City of Kalamazoo worked jointly with FAA Great Lakes Region personnel to obtain FAA concurrence on the Airport administrative rule which effectively prohibits all turbojet operations between the hours of 11 p.m. and 6:30 a.m.--both air carrier and general aviation.

Key Cost Consideration

- The precedent-setting nature of the FAA stipulation may have substantial cost implications far beyond the particular situation in Kalamazoo.

Implementation Follow-Up

- The restrictions are apparently tailored to the current schedule of the airline that serves the Airport (North Central); however, general aviation jet aircraft operators could be inconvenienced.

- Airport management reports that operators of general aviation jet aircraft based at the Airport have expressed some concern over the new rule. Because the prohibition does not relate to noise emission characteristics of aircraft, certain relatively quiet jet equipment (e.g., Cessna Citation) is included in the prohibited period.

- Since the runway opened in late 1977, there has been compliance with the Airport rule (which is enforceable by a maximum fine of $500 per day and/or 90 days in prison).

AOC-13

"Limit Operations by Certain Types of Aircraft"

Source

City of Fresno (California), Department of Transportation

Profile of Action

- The City of Fresno has limited the use of business jet aircraft at Fresno-Chandler Downtown Airport (a general aviation airport) in order to (1) minimize aircraft noise exposure within existing high-density residential neighborhoods adjacent to the Airport and (2) enhance and maintain the longevity of the Airport.

- The rule prohibiting business jet aircraft at Fresno-Chandler without prior clearance was established when these aircraft were first introduced into the general aviation aircraft fleet.

- The prohibition has been enforced both by Airport management and by positive action decisions in the planning and development of the Airport.

- General aviation jet aircraft are accommodated at nearby Fresno Air Terminal, an airport also serving the community's air carrier and Air National Guard needs.

Key Cost Considerations

- Because of available alternatives, the cost to the Airport sponsor was negligible. Inconvenience to jet aircraft operators was minimal because of the proximity of Fresno Air Terminal (within 7-1/2 miles of downtown Fresno) which provides a full range of services for such aircraft.

- The benefit is the ability to retain and operate a major general aviation facility that can accommodate 75% of all existing types of general aviation aircraft, as well as 95% of general aviation piston aircraft under 12,500 pounds.

AOC-14

"Restrict New Operations or Increases in Operations by an Air Carrier, Subject to the Written Approval of the Commission."

Source

Burbank Airport Authority

Profile of Action

- The above rule, known as rule #7, provides that new operations or increase in operations (takeoffs and landings other than emergency procedures, or takeoffs and landings resulting from the use of the airport as a weather alternative), may not be granted without the written approval of the Commission upon a determination that the proposed operations or increase will not result in or contribute to an increase in the noise impact area of the Airport from all aircraft operations based on the annual CNEL of 70 for the period ending June 30, 1978.

- The Commission may approve an application in whole, or part, for a period, not to exceed one year.

- Any carrier violating the provision may at the discretion of the Commission, in addition to any other remedies, be subject to civil penalties of $1,000 for each operation not approved by the Commission.

Key Cost Considerations

- Computer (noise monitoring equipment) and noise consultant firm to determine contour.

Implementation/Follow-up

Rule effective January 1, 1981. Flights are checked by computer and matched up. Violators are informed and have 15 days in which to respond. The operations committee determines if a fine shall be imposed.

AOC-15

"Publication of Noise Monitoring Results Which Identify Airline and Aircraft Type"

Source

Germany (Noise Abatement in Foreigh Countries, Pages 122-131)

Profile of Action

(Leq) is determined by a formula which measures maximum sound level of noise and duration of noise for each passing aircraft. Results are published to the airlines, the airport authority, the federal licensing authority, the airport commission, and other interested parties. Information is provided on:

1) Average noise level for each type of aircraft.

2) Comparison of the fleet noise level of each type of aircraft is made by each airline company.

3) Noise levels for various meteorological conditions are computed.

4) Noise which exceeds the standard allowed for a given type of aircraft by 4dB or more is identifiedd by time, date, carrier, flight number, amount of noise, and weather. Explanations are required.

Implementation/Follow-Up

- The system was found to be useful as protection for the pilot and the airline company against faulty complaints.

- Noisy pilots have been removed from the route.

- Results are used in connection with requests for exceptions to the curfew (quiet flights are permitted exceptions).

Source

Switzerland (Noise Abatement in Foreign Countries, Pages 98-100)

Profile of Action

- An average noise level and a noise limit is computed for each type of aircraft. Noise monitors record on tape the noise of each aircraft which exceeds a preset level and the results are matched to each flight number. Every excess over the limit is called to the attention of the airline immediately. Excesses of 5dB or more require a written explanation from the company.

- Documents are circulated each month to all airlines showing the monitoring results. A less detailed report is circulated to the public.

Implementation/Follow-Up

- The system has both critics and supporters. One pilot who habitually exceeded the limit was removed.

AOC-16

"Establish Greenbelt Buffer round Airport"

Source

Federal Aviation Administration

Profile of Action

- A 1,000-foot wide timber greenbelt was created as a buffer zone entirely around Dulles International Airport in order to screen Airport activity, including ground noise, from adjacent Virginia communities and rural countryside. Existing wooded areas were incorporated into the greenbelt, and a supplementary reforestation program was carried out.

- Thus, at the outset of Airport development, the greenbelt became an integral part of the land use plan (as well as landscaping plan) for this 1,000-acre Airport.

- The greenbelt surrounds the active Airport area; however, certain unobtrusive buildings and installations required to provide utilities and other Airport services are located within this area.

Key Cost Cosiderations

- The total area on the Airport devoted to greenbelt uses is some 3,000 acres. On the basis of current land values, the greenbelt would now cost some $30 million.

AOC 17

"Construct Landscaped Earth Berm Noise Shield"

Source

Airports Commission, Minneapolis, Minnesolta, 1973

Profile of Action

- After numerous complaints from Richfield residents about noise and "visual pollution" produced by the ground maneuvering of aircraft taking off or landing, the Airports Commission decided in 1973 to investigate the feasibility of establishing an earth berm noise shield and buffer on Airport property.

- As finally constructed, the project consists of a series of 15- to 18-foot high earth berms that are 75 feet wide and from 125 to 150 feet long. The discontinuous series design was selected to avoid a monotonous "barrier" look. Trees as well as shrubs were planted and are maintained on the residential (Richfield) side of the berms.

Key Cost Considerations

- Including preconstruction studies, the Wold-Chamberlain earth berm noise and visual shield involved total costs of some $280,000.

Implementation/Follow-up

- The project has been very well received by all interests, especially from a visual standpoint. Commission staff members estimate that complaints from residents and officials of Richfield have declined by 95% since the landscaped earth berm was installed along a 3/4-mile stretch of the Airport's western boundary.

b. Action of a land development control (LDC)

LDC-1

"Acquire Noise-Impacted Property in Fee simple"

Source

Port of Seattle, 1975

Profile of Action

- Between 1973 and 1975, the Port of Seattle and King County, Washington, jointly developed a composite master plan for Sea-Tac International Airport and surrounding communities. A year-long noise measurement effort was conducted as part of the project.

- The adjusted NEF grid cell values were then used to make a preliminary determination as to which areas ought to be considered for outright acquisition because of excessive noise.

- As described in the adopted Sea-Tac Communities Plan, the resultant acquisition program included some 480 acres of land and over 1,000 single family housing units.

- The program was initiated in 1974--prior to completion of the final master plan--as a firm indication that the Port of Seattle was willing to carry out recommendations stemming from the joint planning process at the earliest possible moment.

- Following acquisition by the Port, existing housing units are sold on a bid basis in lots of 10 to 12 structures and return all properties to a natural condition.

Key Cost Considerations

- Approximate average costs experienced by the Port per residential tranaction since acquisition began in 1975 have been as follows:

  House and lot = $35,000 (lot only = $5,000)
  Salvage value of house = $3,000
  Relocation benefits = $8,000
  Administrative costs = $1,500
  Net cost per property = $44,500 - $3,000 = $41,500

- The $35,000 average purchase price for housing units acquired to date is 410,000 greater than was estimated during the planning process, because of a general increase in areas housing costs.

- Approximately $14.5 million has been, or will be, expended to acquire the first 410 parcels. The federal share of this amount is 49.4 million.

- Upon its completion in the early 1980s, this particular program will have involved total costs of some $30 million.

Implementation Follow-Up

- To date, some 340 residential properties have been obtained by the Port as part of this program; 70 are currently being acquired; and another 290 parcels are being processed (the acquisitions have been authorized but are awaiting funding).

LDC-2

"Acquire Restricted Use Easements"

Source

U.S. Navy, 1977-1980

Profile of Action

- As suggested by an Air Installation Compatible Use Zoning Study carried out in the mid-1970s, the Navy Department received authorization from the U.S. Congress to purchase restricted use easements within prescribed safety areas and compatible use zones near the Miramar Naval Air Station.

- The easements involve 37 parcels and about 600 acres of land located within high-accident-potential zones and high-noise zones (70-75 Ldn or above).

- As specified by the Navy Department, the grant of easement runs with the land and requires the grantor to comply with the following conditions: (1) no use of the premises for use of any kind except in compliance with provisions set forth in a "Land Use Criteria" exhibit attached to and made part of the easement deed; (3) no man-made or natural obstruction to be permitted above a prescribed height limit; (4) gross coverage of the site used for buildings and required parking cannot exceed 25% of the surface area of the premises; and (5) no use of the property for the production, concentration, or storage of petrochemicals or nuclear materials. Existing dwellings, uses, and improvements (if any) are exempted from provisions (1) and (2) above.

- Before undertaking this program, the U.S. Department of Defense required the Navy Department of document that all possible planning and zoning options by local government jurisdictions had been totally exhausted.

Key Cost Considerations

- Although acquisition of the easements will substantially reduce the potential use of affected lands, the properties can be used for many productive purposes and will remain on the local tax rolls.

- According to professional appraisals, the restricted use agreements can cost from 40% to 80% of a given property's market value. The higher percentages typically relate to lands zoned R-1-5 (single-family 5,000 square foot minimum lot) which are subject to intense development pressures.

- As a matter of policy, if a particular easement is slated to cost more than 60%-65% of market value, the Navy intends to purchase all of the property in fee simple.

- The sum of $12.1 million was authorized in the U.S. Budget for Fiscal Year 1976 for purchase of the easements. This appropriation covered all property interest acquisition costs, contingencies, and overhead items (such as appraisal fees), and project planning costs, including preparation of the necessary Environment Impact Statement.

LDC-3

"Acquire Avigation Easement"

Source

Hillsborough County (Florida) Aviation Authority, 1969-1972

Profile of Action

- Avigation easements were acquired to resolve a series of inverse condemnation suits against the authority in connection with the operation of Tampa International Airport.

Key Cost Considerations

- A listing of costs incurred by the Aviation authority with respect to the four described legal actions is both instructive and interesting. For instance:

  -- The twelve owners who agreed to a negotiated settlement in 1969 received a total of $25,315 in return for avigation easements granted to the Authority. This represents an average of $2,110 per easement, or between 14% and 18% of the taking year (1963) property values.

  -- The seven plaintiffs in the 1971 case settled by negotiation for a total sum of $9,400, or $1,342 per easement; some $25,500 was paid for the fourth set of easements in 1972--an average of 41,500 per transaction (about 10% - 13% of property value).

  -- Appraisal, legal, and other costs for the 1971 and 1972 settlements required an additional $5,750.

  -- Fees accumulated by the Authority's legal counsel over the entire period (1964-1972) amounted to approximately $20,000.

- In total, the Authority paid $121,765 for avigation easements on 39 parcels of property, or an average of $3,122 per easement (between 20% and 26% of the 1963 property values).

LDC-4

"Establish Purchase Assurance Program"

Source

SEA-TAC International Airport (Port of Seattle, King County)

Profile of Action

- A "sustained" exposure level is one that is expected to fall below ANE 40 at some point during the airport's implementation period.

- Areas exposed to "Sustained" noise levels of ANE 40 or above should be eligible for programs that guarantee public purchase of noise-impact private properties, if affected property owner so desires.

- Procedure for Purchase Assurance Program:

  - Property owner joins program by listing home with airport.

  - Then, within ninety days, the property owner must make reasonable efforts to try to sell the property on the open market.

  - If after ninety days the property is not sold, the airport will have an appraisal report done for the property.

  - If the asking price by the property owner is within five percent of the appraised value, the airport will go ahead and acquire the property.

  - If the asking price was higher than five percent of the appraised value, the property owner would have to make reasonable effort to sell the property at the appraised value.

  - If within ninety days the property has not been sold, the airport would have to acquire the property at the appraised value.

  - Upon acquiring the property, the airport would noise insulate the home and then resell the property.

- Relocation benefits are not associated with this program.

Key Cost Considerations

- Approximately five million dollars has been earmarked for the program.

Implementation Follow-Up

- The program will not begin until the outright acquisition of noise-affected properties in the areas permanently subjected to ANE 40 or greater is completed. The purchase assurance program will be in operation within the next three years.
- Because of an unstable housing market and high interest rates, the program has received a very mild reception from property owners in the noise-affected areas.

LDC-5

"Cost Sharing and Limited Cost Sharing Insulation Programs for Noise Affected Structures"

Source

SEA-TAC International Airport (Port of Seattle, King County)

Profile of Action

- A program of cost-sharing noise insulation and acquisition of easements would apply to those areas exposed to sustained noise levels of ANE 35 or above but below a sustained ANE 40.
- A more limited program of cost sharing insulation assistance and limited term easements would apply to those areas subjected to sustained noise levels of ANE 35 of above but below a permanent ANE 35.
- Volunteer Program
- A standard thermal insulation package was included with the noise insulation package.
- The airport would cover seventy-five percent or up to $5,000 of the cost of noise insulating a residential home and in turn receive an air right easement over the property.

Key Cost Considerations

- In 1976, the total cost of the cost sharing and limited cost sharing program was estimated at $50 million and involved approximately 8000 homes.

Implementation Follow-Up

- A test program was conducted on two homes and the results proved that the noise level could be reduced by as much as seven dB by noise insulating homes.

- As a result of the test program, it was determined that homes could be adequately noise insulated at about one dollar per square foot.

- Twenty-five percent of the property owners in those areas eligible for the program were interested in participating.

- The noise insulating program will go into full swing in 1984.

<u>LDC-6</u>

"Insulate Impacted Residential Properties"

<u>Source</u>

City of Los Angeles, Department of Airports, 1969

<u>Profile of Action</u>

- Twenty different homes around Los Angeles International Airport were systematically soundproofed and then tested for the amount of noise reduction realized as a result of such attenuation efforts.

- Six homes received a level of treatment designated as "Stage 1" which consisted of the installation of (a) forced air ventilation and (b) weatherstripping and nonhardening caulking around doors and windows. The typical incremental reduction in noise levels inside these residences amounted to approximately 6 dBA.

- In addition to Stage 1 treatment, eleven homes were further modified by the installation of solid core doors, double-glazed windows, and ceiling tile or gypsum board. The incremental reduction inside these "Stage 2" residences proved to be about 8 dBA.

- Three other homes received "Stage 3" treatment which produced an incremental noise reduction of some 15 dBA. Modifications in addition to those of Stages 1 and 2 consisted of (a) ventilator attenuators and glass fibre lining of crawl space ducts, (b) plywood or moisture-proofed gypsum board on the underside of floor joists, (c) fibrous material between open joists of ventilated attic and open wall joists, and (d) gypsum board at bottom of roof rafters.

<u>Key Cost Considerations</u>

- As shown in the following tabulation, the cost for various noise level reductions since 1969 have nearly doubled.*

Noise level reduction	Costs per square foot 1969	1975a	1979a
5 dBA	$1.64	$ 2.60	$ 3.03
10 dBA	4.68	7.42	8.65
15 dBA	8.50	13.47	15.71

* Based on an average inflationary increase of 8% per year.

- If an "average" house in the United States is assumed to be 1,500 square feet in size, then typical noise insulation costs based on the Los Angeles pilot project would currently amount to $4,545 for a 5 dBA reduction, $12,975 for a 10 dBA reduction, and $23,565 for a 15 dBA reduction.

LDC-7

"Insulate School Structures"

Source

City of Los Angeles, 1976

Profile of Action

- A series of lawsuits, initiated in 1969 and 1970 by the Centinela Valley, El Segundo, Inglewood, Lennox, and Los Angeles school districts, were filed against the City (owner and operator of the Los Angeles International Airport.

- After several years of litigation, the City of Los Angeles agreed to pay some $21.4 million to the various school districts. This amount, prorated among the districts, was to cover acceptable noise attentuation programs by the districts, as well as legal fees and other costs incurred by the plaintiffs.

- In return, the five districts agreed to provide avigation easements to the city in connection with 64 different schools. While these easements do not permit use of supersonic aircraft over the properties in question, they do provide the City with the flexibility to balance runway use patterns, as appropriate to operational and other needs. Also, conditions in the easements permit the Airport to grow and expand operations as necessary to accommodate up to 40 million total scheduled passengers per year.

Key Cost Considerations

- In addition to the aforementioned $21.4 million, the City paid over $50,000 for consultant noise studies.

- Legal services required by the City were provided by in-house attorneys; it is estimated that these services would have cost about $100,000 in fees if outside counsel had been retained to handle the cases.

LDC-8

"Use Special Zoning Procedures"

Source

City of Kansas City (Missouri), 1970

Profile of Action

- Because of the anticipated impact of Kansas City International Airport (KCIA) on the largely undeveloped countryside of Platte County, the City Development Department and Metropolitan Planning Commission cosponsored a special study which was completed in 1970.

- The KCIA Impact Area Development Plan culminated in (1) the development of a master plan for the Airport Environs Area, and (2) the formation of a 100 square mile special zoning district known and referred to as the "Kansas City International Airport Area Development District" (or KCID).

- As established by a city ordinance, the KCID combined zoning and subdivision procedures into a single "Development Guidance System" similar to the planned unit development (PUD) zoning process now in common use throughout the United States.

- The adopted Guidance System is bassed on 15 underlying goals and policies. Of these, the following three are particularly important:

  - Land development must be in accordance with the district-wide master plan.
  - Each land use must be compatible with the area in which it is located, as measured by applicable standards of urban design and performance.
  - Land development approval must be closely coordinated with the provision of required public services and facilities.

- Seven land use control zone categories were also defined as part of the KCID: (1) industrial uses; (2) Airport-related commercial uses; (3) high-density residential uses (up to 35 dwelling units per gross acre); (4) retail commercial uses; (5) medium-density residential (up to 10 dwelling units per gross acre); (6) agricultural and low-density residential (40-acre minimum lot size); and (7) agricultural and conservation uses. Under certain stated conditions, Zones 2,3,4, and 5 may be combined into an integrated development project such as a PUD.

Key Cost Considerations

- Staff and consultant costs associated with the origination of a special district for KCIA amounted to less than $100,000.

- In general, a local city or county planning department has the staff capability to develop special airport-oriented zoning provisions as part of its normal responsibilities (i.e., at no estra cost).

Implementation Follow-Up

- Experience with the special district approach are generally very good. New land use developments have located where and as designated by the KCID Area Plan, and noise attenuation requirements for prescribed types of new construction have been enforced.

- Note should be made, however, of the fact that too much industrial activity was anticipated by the 1970 KCID Plan. Little of the envisioned industrial/office type development has materialized to date.

LDC-9

"Development Control by Public Agencies"

Source

John Wayne Airport, Orange County

Profile of Action

- Establishment of an overlay zone using the most current 65 CNEL contour as a boundary. This overlay zone would serve as a guide for residential development. The overlay zone would shift as the 65 CNEL contour shifts. The overlay zone conditions would be strengthened by revising of land use and noise elements.

- An estimated 10 years would be required to reach the optimum 65 CNEL contour, at which time the overlay zone would become a permanent district.

Key Cost Considerations

- Preparation of the overlay zone can be accomplished as a regular part of the work program. No additional funding would be required.

Implementation/Follow-Up

- Specific plan still under preparation. The proposed use of an overlay zone has been critized by developers as well as residents who dislike the restrictions on the types of uses which may take place and many view it as a moratorium.

LDC-10

"Amend general plan and zoning map to preclude new or redeveloped housing units and other noise sensitive land uses within highly noise impacted areas."

Source

Monterey Airport (Contact: Bill Fell, Butch Cope; Monterey Planning Department)

Profile of Action

- Adopt the following land use compatibility standards and planning criteria:

Noise Exposure Area	Planning Guidelines
Above 75 CNEL	All land to be placed within airport ownership or control
70 - 75 CNEL	Permit no new residential or other noise sensitive land uses
Above 60 CNEL	Require acoustical studies, sound insulation and avigation easements as necessary for new construction including detached single-family dwellings.

- Amend City General Plan and Zoning Map to preclude new housing above 70 CNEL.

- Amend City Noise Element to incorporate ANCLUC findings and recommendations.

- Amend subdivision ordinances to require acoustical studies and noise insulation as necessary.

Implementation Follow-Up

- No residential zoning or land uses are located within 70 CNEL contour. No need for change in zoning. General Plan not amended to specifically prohibit residential uses above 70 CNEL.

- Noise Element written prior to ANCLUC. Not amended to include ANCLUC findings. City wants airport to implement changes first.

- New development reviewed to determine necessity for acoustical analysis and insulation.

- City attorneys are opposed to airport proposal that City impose a requirement for avigation easements.

LDC-11

"Neighborhood Enhancement Program"

Source

San Francisco International Airport

Profile of Action

- The purpose of the proposed program was to improve the neighborhoods which were expected to remain within the 65 CNEL contour as compensation to residents for residual noise impacts. The action would be conducted concurrently with with the insulation/easement program. Neighborhood plans were proposed to be formulated with local participation. Possible improvement programs included:

  - Shielding program such as noise barrier, earth berm, landscaping to serve as buffer for noise, air pollution, and visual screening.
  - Housing rehabilitation to improve the quality of life in the neighborhood.
  - Airport-related job training program.
  - Provision of community facilities.
  - Community relocation and open space program.
  - Circulation improvements.

Key Cost Considerations

- Staff time as well as costs for programs.

- Independent funds, such as head tax, needed for implementation.

Impelmentation/Follow-Up

- No action taken as of yet.

LCD-12

"Designation of Redevelopment Plan/Specific Plan for East Santa Ana Heights"

Source

John Wayne Airport (Orange County)

Profile of Action

- Establishment of an Overlay Zone corresponding the 65 db CNEL contour. In order to have land uses suitable to the area's environmental resources and land use constraints it is recommended in the Study to convert some areas to low-intensity non-residential uses in order to be compatible with adjacent commercial open-space.

- Aware of the need for a transitional buffer area between existing commercial-developed areas and single-family residential areas, the plan proposed professional/administrative offices and low-intensity commercial development as transitional types of land uses.

- The land use plan proposes development of multiple-family housing in the areas where the outer most line of the 65 db CNEL contour recedes outward.

- The remainder of the Plan advocated maintenance of existing land uses to be modified with appropriate acoustical insulation, and providing for the opportunity for general and overall enhancement of the area through the recommended establishment of a Redevelopment Plan to implement and manage an ultimate community improvement plan along the guidelines of the Land Use Plan.

Key Cost Considerations

- Cost estimates for the new Specific Plan are not available.

Implementation/Follow-Up

- he Orange County Board of Supervisors did not believe the establishment of a Redevelopment Plan was a suitable approach in dealing with the airport noise problem.

- The Board of Supervisors did not take any action on the Specific Plan proposed by ANCLUC but instead directed staff to prepare the Specific Plan.

- There has been strong community opposition to the proposed Specific Plan and Redevelopment Plan. Certain groups in the affected areas wanted those residents living in the area to be permitted to continue to do so, and to limit any further development.

- Other community groups wanted development restrictions lifted from the area so that they could realize the economic potential on the properties they purchased.

- The residential advisory group for the affected area was not very representative of the community; and as a result, internal conflicts occurred and held up the formulation of community input by two months.

LDC-13

"Use Special Taxation Procedures"

Source

Sacramento County, California, 1961

Profile of Action

- In anticipation of the development of the Airport, the County Planning Commission completed a specific plan for the Environs Area in 1961. This plan recommended the establishment of an exclusive agricultural zoning district with a 20-acre minimum lot size, and reflected early noise contour information, a "crash hazard index", and soil suitability within the Airport locale.

- The combination of exclusive agricultural zoning and use of the Williamson Act has permitted Sacramento County to protect the Airport from incompatible development within the Environs Area.

Key Cost Considerations

- ^part from the normal expenses of a public planning and zoning operation, no special costs were involved in the development and maintenance of the exclusive agricultural zone around the Airport.

- Although the establishment of agricultural preserves in the Airport vicinity does reduce possible property tax revenues that the County might obtain if other uses were to be encouraged and permitted, the amounts involved are, on balance, relatively small and inconsequential. The reduced tax yields represent a fair trade-off for the continued protection of an important aviation facility and the conservation of dwindling agricultural lands.

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c. Actions based on a management financial policy (MFP)

MFP-1

"Prepare Airport/Environs Area Master Plan"

Source

Tucson (Arizona) Airport Authority, 1973-1975.

Profile of Action

- Overflights of the urbanized area to the northwest have long been responsible for adverse impacts on noise-sensitive land uses located in this part of the community.

- From careful studies of existing and forecast noise conditions, as well as air traffic control requirements and other factors, a revised airfield configuration scheme was worked out that will virtually eliminate the adverse noise impacts referred to above.

Key Cost Considerations

- evelopment of the 1994 Tucson International Airport Master Plan by an airport planning consultant on behalf of the Authority required some $200,000. Of this sum, the FAA provided about $130,000 under provisions of the Airport and Airway Development Act of 1970.

MFP-2

"Install and Maintain Noise Monitoring System"

Source

John Wayne Airport, Orange County, 1971

Profile of Action

- The monitoring system at Orange County Airport was originally established to furnish Airport management with factual information to be used in response to nearby homeowners who claimed to know how much noise was being made by the Airport and in what manner.

- Consisting of just five monitoring stations and a "triggering" point in the control tower, the early system was extensively used in testing how Air West and Air California aircraft equipment could best be operated (from a noise standpoint) into and out of this urban airport.

- A new and more comprehensive noise monitoring system was placed into effect at the Airport in 1977. The new system has two teletype positions and a possible 30 station network. It is tied into a visual display housed in the Airport Noise Abatement Office. It also has the capability to handle an aircraft departure fee process automatically if such a process is ever initiated by Airport management for purposes of noise control.

- A three-person staff composed of one noise abatement specialist and two technicians is employed (among other duties) to operate and maintain the new noise monitoring system.

Key Cost Considerations

- The original noise monitoring system at John Wayne Airport required some $105,000 to become operational.

- Installation costs for the new system have thus far amounted to about $300,000, out of a total budget of $375,000.

- Approximately $100,000 is needed at the present time to cover annual maintenance and operation costs; this sum includes all necessary staff salaries and fringe benefits. (Note: Annual maintenance cost of the system is expected to range from 10% to 15% of initial hardward costs.)

- The State of California, Department of Transportation, has provided $63,000 in support of the new system.

MFP-3

"Add Technical Specialists to Staff"

Source

City of kansas City (Missouri)

Profile of Action

- The City of Kansas City initiated an extensive effort in 1977 to develop a composite plan for the Airport and a 200-square mile area surrounding this important installation.

- To foster a coordinative understanding of how the Airport does and will affect the community (and vice versa), the Aviation Department enlisted the aid and support of seven other departments of city government in this undertaking. A number of special consultants have also been retained to assist in the overall project.

- A full-time study team has been assembled to prepare a staged plan (to 1985, 1990, 1995, and 2000) for the Airport and Environs Area.

- It is anticipated that most (if not all) of these technical specialists will be permanently retained by the City upon completion of the FAA - assisted planning project.

Key Cost Considerations

- Total annual compensation, including fringe benefits, of the four specialists described above, is just over $87,000 at the present time.

- Space and overhead costs for these specialists amounts to $1,000 per month.

- Slightly under $100,000 per year is thus required to maintain these special in-house skills by the City.

MFP-4

"Establish Citizen Involvement Program"

Source

Port of Seattle, 1975.

Profile of Action

- A massive community involvement program was carried out as part of SEA-TAC International Airport ANCLUC effort. Aided by part-time citizen volunteeers, Port and County staff personnel conducted the program from a local office opened in the community near the Airport.
- Records maintained by the Community Involvement Office indicate that approximately 300 citizens actively participated in all phases of the planning effort. Moreover, some 3,000 persons had direct contact with the project via newsletters, information bulletins, questionnaires, committee and task force meetings, seminars, and visits to the local office.

- Thousands of additional residents of the Airport Environs Area were also made aware of the undertaking by such means as:

  -- Letters from King County to all 36,000 property owners within the area inviting participation in the project.

  -- Special video tape and television programs.

  -- A special brochure prepared and distributed by the King County League of Women Voters.

  -- An 8-page newspaper supplement about the plan and project distributed through four local newspapers with a total circulation of some 70,000.

  -- A continuing adult education program developed in coordination with a local school district.

Key Cost Considerations

- Participants in the SEA-TAC Study consider the Community Involvement Program outlined above to be one of the most important factors in the development of an Airport and Communities Plan that was generally acceptable to all parties of interest.

- Although specific cost data were not maintained, it is estimated this program required an expenditure of staff and consultant time (plus overhead) valued at about $150,000 per year.

MFP-5

"Noise Complaint Procedure"

Source

John Wayne Airport (Orange County)

Profile of Action

- The noise complaint procedure was developed to deal with the day-to-day activity of collecting noise complaints in a uniform manner and the efficient storage and retrieval of the data for later use.

- By utilizing a standardized questionnaire with a simple set of directions, the noise complaint process could be handled in a timely fashion.

- The information from the questionnaire is supplemented with additional background information (weather and noise monitoring data) and is entered into the computer to form a noise complaint data base.

Key Cost Considerations

- The noise complaint procedure costs on an average of $10,000 per year to keep in operation.

Impelmentation/Follow-Up

- The noise complaint procedure is more effective in monitoring flight carriers and their complaince to airport flight procedures than in aiding in future airport planning.

- The data resulting from the complaint procedure appears to be of little importance to those airports in areas already significantly built-up.

- The airport's complaint procedure generally takes in complaints and will only respond back to those complaints requesting information.

- The number of complaints have remained about the same since the establishment of the noise complaint procedure.

MFP-6

"Update Airport Operational Forecasts and Related Noise Exposure Maps"

Source

City of Fresno (California), Department of Transportation, 1976-1977

Profile of Action

- An important facet of the Environs Area Planning Study was to define current aircraft noise exposure patterns (accomplished by means of actual noise monitoring) and to forecast the extent to which aircraft noise patterns might be expected to change during the 20-year planning period.

- Previous forecasts of aviation activity had been prepared for the 1973 Master Plan. However, subsequent changes in passenger enplanements and air carrier flight schedules serving Fresno (primarily resulting from the 1973 "fuel crisis") indicated the need to update these earlier forecasts to reflect current conditions. The forecasts were revised in 1977.

Key Cost Considerations

- Consultant costs incurred in the updating and revision of aviation activity forecasts for Fresno Air Terminal amounted to $4,400.

MFP-7

"Negotiate Noise-Abatement Guidelines as Part of an Airline/ Airport Use Agreement"

Source

City of San Jose (California), 1975

Profile of Action

- The purpose was to establish a contractual commitment by the air carriers to (1) observe all rules and regulations promulgated by the City of San Jose regarding their use and occupancy of prescribed portions of the Airport (including limitations on the hours of operation), and (2) provide a revenue-financing base for a capital improvements program that may include land acquisition and possibly other noise alleviation projects.

- Members of the Airport management staff, with consultant assistance, reviewed various attempts made in the United States to reduce aircraft-generated noise exposure by administrative action through the establishment of special laws, ordinances, or resolutions.

- From this review--as well as numerous consultations by the staff with other City officials and representatives of the air carriers--it was determined that the City, as Airport Sponsor, would retain the right under a long-term Airline/Airport Use Agreement to enact rules and regulations governing the use and occupancy of facilities at the Airport. Included was the right to establish regulations governing the hours of Airport operation.

- Following a lengthy period of negotiations between the air carriers and the City, an appropriate Airline/Airport Use Agreement was reached that would also permit the sale of Airport revenue bonds to finance capital programs, including the purchase of noise-impacted property and other measures designed to make the Airport more compatible with the community.

Key Cost Considerations

- The preparation and negotiation of an Airline/Airport Use Agreement is typically handled as part of the normal administrative responsibility of a airport management staff. No special costs are involved unless outside consultant assistance is required.

MFP-8

"Designation of a Responsible County Agency to Conduct a Recommended Annual Review of the Status of the ANCLUC Plan Implementation, and Coordinate Recommended Adjustments in the Implementation Plan and Schedule."

Source: John Wayne Airport, Orange County

Profile of Action

- County Administratiave Office was assigned responsibility to perform annual evaluation and budgetary analysis.

- Evaluate CNEL reduction levels, noise control programs effectiveness and land use compatibility program elements as they relate to the goals of the ANCLUC Study.

Key Cost Considerations

- Existing staff would be utilized, therefore, no additional cost would be incurred.

Implementation/Follow-Up

- Environmental Management Agency is being considered, as the agency responsible for ANCLUC plan implementation, however, no final decision has been made by the board. Much of the information and background reports necessary for implementation are still under preparation. The board adopted the general action, however, staff must prepare the actual substance. A legal review is being prepared.

MFP-9

"A Passenger Head Tax is Used to Generate Funds for a Noise Insulation Program"

Source

France (Noise Abatement in Foreign Countries, Pages 80-83)

Profile of Action

- Since 1973, a one franc head tax for domestic passengers and three franc tax for international passengers has been used for a noise insulation program and, occasionally, for acquisition or relocation purposes.

- To prevent individuals from taking advantage by building and seeking payment, compensation is limited to property constructed or acquired before 1970.

- Financial aid cannot exceed 66% of the price of the work done.

- Money stays with the individual airport area where it was generated.

Implementation/Follow-Up

- A plan is in process to charge for noise based on the weight of the aircraft and the deviation from the maximum permissible noise.

2. Airport Compatibility Experience of Airport Land Use Commission Experience

ALUC-1

"Restricted Density Uses in Crash Hazard Zones."

Source

Alameda County Airport Land Use Policy Plan (ALUPP)

Profile of Action

- In addition to defining standard safety zone dimensions, the Alameda County ALUPP lists incompatible uses within those zones. It further defines the uses not allowed in the safety zones by distinguishing between that area within 1/4 mile from the end of the runway and beyond 1/4 mile from the end of the runway.

- Within 1/4 mile, incompatible uses are defined as: Permanent structures or objects projecting above the level of the primary surface of the runway and any use which on a regular basis would result in a density (excluding streets) which would exceed 25 persons per acre at a time.

- Beyond 1/4 mile from the end of the runway: Uses should be excluded if they would result on a regular basis in a concentration of population exceeding 25 persons per acre over a 24 hour period or more than 50 persons per acre for more than 2 hours. In particular, new shopping centers, restaurants, schools, hospitals, arenas should not be permitted. Density calculations shall exclude streets.

ALUC-2

"Emergency Catchment Areas"

Source

Santa Clara County Land Use Plan

Profile of Action

- The Santa Clara County ALUC has defined emergency catchment areas in response to safety considerations for various types of runways and the aircraft that take off from them.

- The minimum total length of an emergency catchment area, beyond the end of a take-off runway, varies with the type of aircraft (e.g., single- and two-engine general aviation aircraft, jet propelled aircraft, and those weighing over 12,500 lbs.).

- In addition, the width of the catchment area varies with the type of runway (e.g., single or dual).

ALUC-3

"Single Event and Normalized CNEL Consideration"

Source

Santa Clara County

Profile of Action

- Although single event measurements in and of themselves do not determine the noise values, the Santa Clara Plan features a policy which determines that single event noise levels (on a dBA scale) can be one factor in approving appropriate new land uses within the planning boundary.

- The Santa Clara Plan provides for adjustments to the measured community noise equivalent levels by the use of noise sensitivity factors, as indicated on Table 2. Essentially, this normalized" CNEL provides for community awareness to noise by raising or lowering the acceptable noise impact level.

Implementation/Follow-Up

- Although the normalized CNEL may be a consideration in the delineation of boundaries of noise sensitive areas, according to the Santa Clara Plan, it has not been applied in any of the Santa Clara County airport environs areas thus far.

ALUC-4

"Noise Contour/Settlement Line"

Source

Alameda County ALUPP

TABLE 2

ADJUSTMENTS TO THE
MEASURED COMMUNITY NOISE EQUIVALENT LEVEL (CNEL)
TO OBTAIN NORMALIZED CNEL

Type of Correction	Description	Amount of Correction to be Added to Measur[ed] CNEL in dB
Seasonal Correction	Summer (or year-round operation).	0
	Winter only (or windows always closed).	- 5
Correction for Outdoor Residual Noise Level	Quiet suburban or rural community (remote from large cities and from industrial activity and trucking).	+10
	Quiet suburban or rural community (not located near industrial activity).	+ 5
	Urban residential community (not immediately adjacent to heavily traveled roads and industrial areas).	0
	Noisy urban residential community (near relatively busy roads or industrial areas).	- 5
	Very noisy urban residential community.	-10
Correction for Previous Exposure and Community Attitudes	No prior experience with the intruding noise.	+ 5
	Community has had some previous exposure to intruding noise but little effort is being made to control the noise. This correction may also be applied in a situation where the community has not been exposed to the noise previously, but the people are aware that bona fide efforts are being made to control the noise.	0
	Community has had considerable previous exposure to the intruding noise and the noise maker's relations with the community are good.	- 5
	Community aware that operation causing noise is very necessary and it will not continue indefinitely. This correction can be applied for an operation of limited duration and under emergency circumstances.	-10
Pure Tone or Impulse	No pure tone or impulsive character.	0
	Pure tone or impulsive character present.	+ 5

SOURCE: California Office of Noise Control, "Guidelines for the Preparation and Content of Noise Elements of the General Plan", February 1976. (Used in Santa Clara County, "Land Use Plan.")

Profile of Action

- An agreement was reached between the Port of Oakland, the City of Alameda and Harbor Bay Isle Associates which effectively allows new residential development on Bay Farm Island contrary to the land use compatibility guidelines established by the California Office of Noise Control.

- The agreement establishes a settlement line of demarcation on Bay Farm Island in lieu of a 65 CNEL contour. The State guidelines stipulate that construction of most new residential uses within the 65 CNEL is usually unacceptable whereas the settlement agreement allows the construction of new residential development on Bay Farm Island between the settlement line and the 70 CNEL line under certain conditions.

- These conditions stipulate that the property is subject to a noise easement and insulation standards, as defined in the ALUPP, for 70 CNEL. New development within 500 feet of the settlement line, however, must meet insulation standards, as established in the plan, based on an assumed exterior 65 CNEL.

ALUC-5

"Land Use/Noise Compatibility"

Source

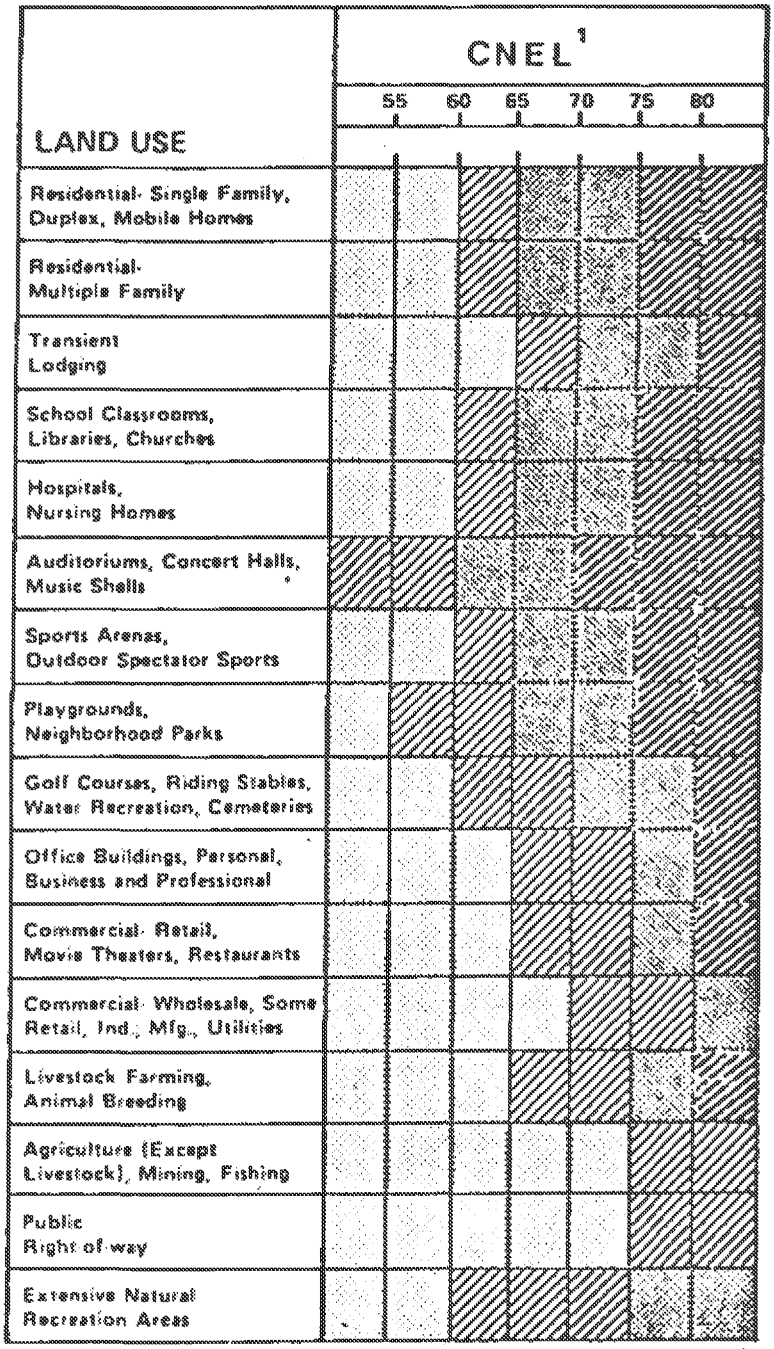
San Diego Comprehensive Planning Organization (CPO)

Profile of Action

- In an attempt to simplify the Airport Land Use Commission's (ALUC's) decision-making process, ALUC's usually adopt a Land Use Compatibility Chart to guide their decisions. Most ALUC's adopt either the Noise/Land Use Compatibility Chart (see Table 3 and 4), or design individual charts resembling the chart.

TABLE 3

LAND USE SUITABILITY IN NOISE IMPACT AREAS



INTERPRETATION

CLEARLY ACCEPTABLE
The noise exposure is such that the activities associated with the land use may be carried out with essentially no interference from aircraft noise. (Residential areas: both indoor and outdoor noise environments are pleasant.)

NORMALLY ACCEPTABLE
The noise exposure is great enough to be of some concern, but common building construction will make the indoor environment acceptable, even for sleeping quarters.

NORMALLY UNACCEPTABLE
The noise exposure is significantly more severe so that unusual and costly building construction is necessary to insure adequate performance of activities. (Residential areas: barriers must be erected between the site and prominent noise sources to make the outdoor environment tolerable.)

CLEARLY UNACCEPTABLE
The noise exposure is so severe that construction costs to make the indoor environment acceptable for performance of activities would be prohibitive. (Residential areas: the outdoor environment would be intolerable for normal residential use.)

[1] Community Noise Equivalent Level

SOURCE: HUD, "Aircraft Noise Impact; Planning Guidelines for Local Agencies", by Wilsey & Ham and Bolt, Beranek and Newman, 1972.
(Used in San Diego CPO, "Comprehensive Land Use Plan Palomar Airport,")

- The format of the Compatibility Charts is such that new land uses proposed within various CNEL contour lines are categorized as either "normally acceptable", "conditionally acceptable", "normally unacceptable" or "clearly unacceptable".

- The San Diego CPO has designed a land use guidance chart which indicates whether general land use categories within given CNEL levels are satisfactory, whether the use should be avoided or whether noise insulation should be investigated.

- The chart, while giving land use guidance as it relates to noise impact zones, helps to reduce the extent of interpretation required by the foregoing general land use compatibility charts.

ALUC-6

"Land Use/Noise/Crash Hazard Compatibility"

Source

Orange County Airport Environs Land Use Plan

Profile of Action

- The Orange County Plan goes one step further in assigning compatibility ratings which take into account both noise impact and crash hazard zones.

- Noise impacts are categorized as high (greater than 65 CNEL) or moderate (60-65 CNEL). Crash Hazards are categorized independently for each airport according to the Aircraft Installation Compatible Use Zone methodology and are rated extreme, considerable or limited.

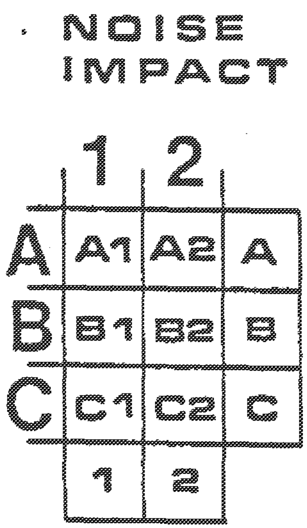
- The noise and crash hazard categories are then shown on a map and each individual or combined category is used to determine compatible uses within the planning boundary.

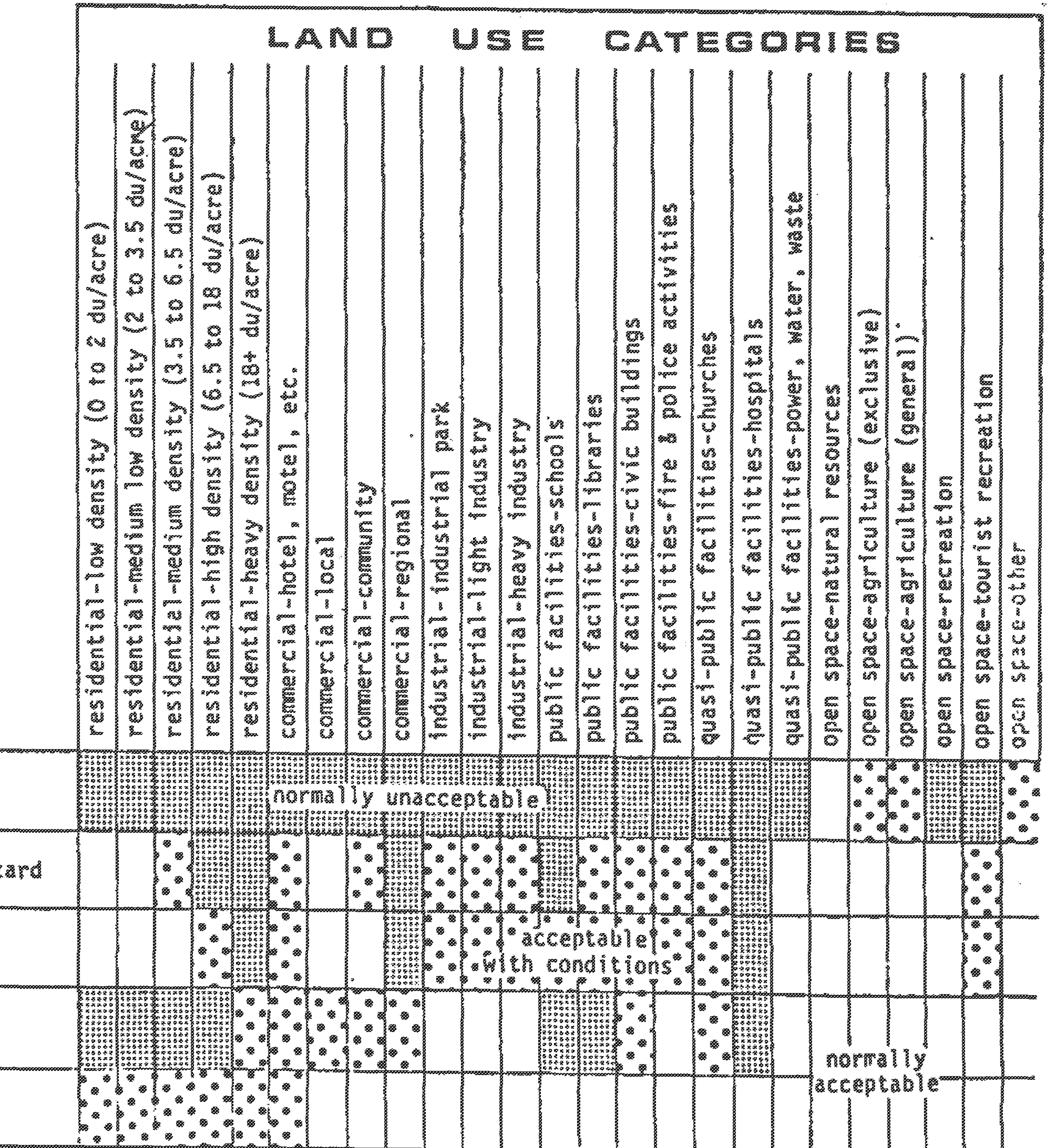
- The Orange County Plan evaluates the acceptability of 25 different land uses within a single compatibility chart (see Table 4).

TABLE 4

LAND USE GUIDELINES

5-54





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ALUC-7

"Exceptions to Land Use Compatibility Standards"

Source

San Mateo County ALUP

Profile of Action

- Exceptions are designed to allow uses in certain instances which would not otherwise be acceptable provided that applicable safety, height and noise insulation standards are met.

- These exceptions include:

  - Borderline cases - where the property is bisected by a CNEL noise contour or approach zone boundary.

  - Minor Additions - e.g., bedroom, family room, etc., where additions to existing non-conforming uses do not exceed the assessed value of the structure based on the Tax Assessor's most recent assessment.

  - *Replacement - of non-conforming uses destroyed by fire or natural disaster is permitted if the portion destroyed is valued at less than 50 percent of the market value of the improvements on the parcel as determined by the Assessor.

  - *Extensive Prior Investment - where the development plan review procedure by the local jurisdiction was in the process before the ALUC Plan was adopted and a substantial investment by the applicant has been determined. Such exemptions must always be determined by the District Attorney.

  - *Infill of Developed Areas - "Infill" is the development of vacant parcels in areas that are already substantially developed with uses not ordinarily permitted by the Plan, e.g., residential use in the 70+ CNEL of San Francisco International Airport. Infill is permitted within subdivided areas which are 80 percent developed. The proposed development must be 1) a permitted use under existing zoning, and 2) consistent with the prevailing use of the area..."

---

* Do not apply to property within approach zone.

- A special exception may be made if it is found that strict application of the ALUP standards would "deprive unreasonably the subject property of a use which will...conflict with the plan. Also, any exception shall "substantially meet the intent and purpose of the adopted plan and any necessary conditions shall be required to accomplish this purpose.

ALUC-8

"Noise Reduction Afforded Land Uses at Various Distances from Aircraft Operations"

Source

Santa Clara County Land Use Plan

Profile of Action

- The Santa Clara County ALUC has adopted standards (Tables 5 and 6) which require specific dBA noise level reductions for building exteriors at various distances from aricraft take-off operations.

- These tables provide review standards applicable to both general land use compatibility and specific noise levels acceptable for a range of activities commonly occuring within those general land uses.

- In order to aid implementation of these standards, the plan also provides sound insulation guidance in the form of general construction methods to achieve the exterior noise reduction required in the tables, as adopted in ALUC policy.

ALUC-9

"Local Agency Cooperation"

Source

Palomar Airport Comprehensive Land Use Plan, San Diego

Profile of Action

- Although the area surrounding Palomar Airport is largely undeveloped, and preventative action by the ALUC is theoretically easier, the cooperation of the City of Carlsbad in complying with the Palomar Plan has been essential to the success of the Plan.

- One technique used to aid implementation strategies is a set of priorities based on potential for land use conflict, cost, effectiveness and use of land (e.g., developed or undeveloped).
- Given numerous constraints to carrying out a comprehensive list of recommendations relating to airport use compatibility, use of locally sensitive priorities seem appropriate in many cases.

TABLE 5

REQUIRED BUILDING EXTERIOR NOISE REDUCTION FOR VARIOUS LAND USES (OCCUPANCIES) AT VARIOUS NOMINAL DISTANCES FROM AIRCRAFT TAKE-OFF OPERATIONS **

Land Use (Occupancy)	REQUIRED BUILDING EXTERIOR NOISE REDUCTION - dBA Slant Distance from Aircraft in feet*								
Zone Boundaries	175 350	350 700	700 1400	1400 2800	2800 3500	3500 5000	5000 7000	7000 9000	9000 14000
Nominal Distance	250	500	1000	2000	3000	4000	6000	8000	10,000
A. RESIDENTIAL SINGLE & TWO FAMILY DWELLINGS									
1. Living Areas									
a. Daytime	53	47	41	34	28	-	-	-	-
b. Nighttime	58	52	46	39	33	28	-	-	-
2. Sleeping Areas	73	67	61	54	48	43	35	28	-
B. RESIDENTIAL MULTIPLE FAMILY APTS. NEAR MAJOR TRAFFIC ARTERIES	SAME AS A								
C. EDUCATIONAL FACILITIES, ETC.									
1. Concert Hall	88	82	76	69	63	58	50	43	35
2. Legitimate Theater	83	77	71	64	58	53	45	38	30
3. School Auditorium	78	72	66	59	53	48	40	33	-
4. School Classroom	58	52	46	39	33	28	-	-	-
5. School Laboratory	53	47	41	34	28	-	-	-	-
6. Church Sanctuary	68	62	56	49	43	38	30	-	-
7. Library	48	42	36	29	-	-	-	-	-
D. RECREATIONAL FACILITIES									
1. Motion Picture Theater	68	62	56	49	43	38	30	-	-
2. Sports Arena	38	32	-	-	-	-	-	-	-
3. Bowling Alley	38	32	-	-	-	-	-	-	-
E. COMMERCIAL, MISCELLANEOUS									
1. Hotel, Motel Sleep.	73	67	61	54	48	43	35	28	-
2. Hospital Sleeping	73	67	61	54	48	43	35	28	-
3. Exec. Office, Conf.	58	52	46	39	33	28	-	-	-
4. Staff Offices	53	47	41	34	28	-	-	-	-
5. Sales, Secretarial	48	42	36	29	-	-	-	-	-
6. Restaurants	48	42	36	29	-	-	-	-	-
7. Markets, Retail Stores	48	42	36	29	-	-	-	-	-

(continued)

TABLE 5 (Cont.)

F. LIGHT INDUSTRIAL									
1. Office Areas			SEE E - 3, 4, 5						
2. Laboratories	53	47	41	34	28	-	-	-	-
3. Machine Shops	38	32	-	-	-	-			
4. Assembly, Const.	38	32	-	-	-	-	-	-	-
G. HEAVY INDUSTRIAL									
1. Office Areas			SEE E - 3, 4, 5						
2. Machine Shop	38	32	-	-	-	-	-	-	-
3. Assembly, Const.	38	32	-	-	-	-	-	-	-

- Indicates required building exterior noise reduction in 25 dBA or less. Therefore, normal construction will suffice. With windows closed, forced ventilation or air conditioning may be required.

* For cases where the land parcel is located near a zone boundary, a specific calculation may be required to establish the exact noise reduction required.

**For purposes of this table, the noise produced by three-engine turbofan aircraft has been used(see Figures 1 and 2). If other types of aircraft are used, then the change in required noise reduction is equal to the change in noise exposure for the new type of aircraft.

SOURCE: Santa Clara County, "Land Use Plan."

TABLE 6

REQUIRED BUILDING EXTERIOR NOISE REDUCTION FOR VARIOUS LAND USES (OCCUPANCIES) AT VARIOUS NOMINAL DISTANCES FROM AIRCRAFT LANDING OPERATIONS **

REQUIRED NOISE REDUCTION – dBA
Slant Distance from Aircraft in feet*

Land Use Occupancy									
Zone Boundary	175 350	350 700	700 1400	1400 2800	2800 3500	3500 5000	5000 7000	7000 9000	9000 14,000
Nominal Distance	250	500	1000	2000	3000	4000	6000	8000	10,000
A. RESIDENTIAL SINGLE AND TWO FAMILY DWELLINGS									
1. Living Areas									
a. Daytime	43	36	28	–	–	–	–	–	–
b. Nighttime	48	41	33	–	–	–	–	–	–
2. Sleeping Areas	63	56	48	38	32	27	–	–	–
B. RESIDENTIAL									
Multiple Family Apts.			SAME AS A						
Near Major Traffic Arteries			" " "						
C. EDUCATIONAL FACILITIES									
1. Concert Hall	78	71	63	53	47	42	35	29	–
2. Legitimate Theater	73	66	58	48	42	37	30	–	–
3. School Auditorium	68	61	53	43	37	32	–	–	–
4. School Classroom	48	41	33	–	–	–	–	–	–
5. School Laboratory	43	36	28	–	–	–	–	–	–
6. Church Sanctuary	58	51	43	33	–	–	–	–	–
7. Library	38	31	–	–	–	–	–	–	–
D. RECREATIONAL FACILITIES									
1. Motion Picture Theater	58	51	43	33	27	–	–	–	–
2. Sports Arena	28	–	–	–	–	–	–	–	–
3. Bowling Alley	28	–	–	–	–	–	–	–	–
E. COMMERCIAL, MISC.									
1. Hotel, Motel Sleep.	63	56	48	38	32	27	–	–	–
2. Hospital Sleeping	63	56	48	38	32	27	–	–	–
3. Exec. Off., Conf.	48	41	33	–	–	–	–	–	–
4. Staff Offices	43	36	28	–	–	–	–	–	–
5. Sales, Secretarial	38	31	–	–	–	–	–	–	–
6. Restaurants	38	31	–	–	–	–	–	–	–
7. Markets, Retail Stores	38	31	–	–	–	–	–	–	–

(continued)

TABLE 6 (Cont.)

F. LIGHT INDUSTRIAL									
1. Office Areas	SAME AS E - 3, 4, 5								
2. Laboratories	43	36	28	-	-	-	-	-	-
3. Machine Shops	28	-	-	-	-	-	-	-	-
4. Assembly, Const.	28	-	-	-	-	-	-	-	-
G. HEAVY INDUSTRIAL									
1. Office Areas	SAME AS E - 3, 4, 5								
2. Machine Shops	28	-	-	-	-	-	-	-	-
3. Assembly, Const.	28	-	-	-	-	-	-	-	-

\- Indicates required building exterior noise reduction in 25 dBA or less. Therefore, normal construction will suffice. With windows closed, forced ventilation or air conditioning may be required.

* For cases where the land parcel is located near a zone boundary, a specific calculation may be required to establish the exact noise reduction required.

** For purposes of this table, the noise produced by three-engine turbofan aircraft has been used (see Figures 1 and 2). If other types of aircraft are used, then the change in required noise reduction is equal to the change in noise exposure for the new type of aircraft.

SOURCE: Santa Clara County, "Land Use Plan."

3. <u>Experience in Building Codes (BC) and Sound Insulation Standards</u>

<u>BC-1</u>

"Noise Transmission Control"

<u>Source</u>

City of San Diego

<u>Profile of Action</u>

- The building laws of the City of San Diego include regulations for the control of noise transmission in multiple family residences. These regulations apply to the design of additions and conversions as well as new construction.

- Plans for multi-family residences are routinely checked by the Noise Abatement and Control Office of the Building Inspection Department during the plan check procedure. These plans must comply with the following before a building permit will be issued.

  - Common (party) walls and floor/ceiling assemblies in <u>all</u> multifamily dwellings must comply with the California Noise Insulation Standards (CAC, Title 25): party walls must achieve a Sound Transmission Class (STC) rating of at least 50 decibels; floor/ceiling assemblies must also meet an Impact Insulation Class (llC) rating of at least 50 decibels.

  - Exterior walls of multifamily dwellings <u>in areas exposed to noise levels greater than 60 decibels (dB), Community Noise Equivalent Level (CNEL)</u>, must be constructed in such a way that sound entering the building from outside is reduced to 45 decibels, the building from outside is reduced to 45 decibels, CNEL. High noise areas are commonly found around Lindbergh Field, Miramar Naval Air Station, freeways and major city streets carrying traffic loads greater than 7,500 average daily vehicle trips.

<u>BC-2</u>

"Sound Proofing Ordinance"

<u>Source</u>

City of Inglewood

Profile of Action

- Wall and floor-ceiling assemblies separating dwelling units must meet a Sound Transmission Class (STC) of 50 (45, if field tested), and an Impact Insulation Class (IIC) of 50 (45, if field tested).

- Entrance doors from interior corridors must have an STC rating of not less than 30.

- Any walls and floor-ceiling designs that have been laboratory tested for a STC and/or IIC rating of 50 could be used to establish an acceptable design.

- The interior noise levels in any room within a dwelling unit can not exceed 45 db.

- In residential areas with a CNEL greater than 60 db, acoustical analysis must be conducted and evidence shown that the dwelling unit has complied with the states' minimum noise insulation standard of 45 dr.

Key Cost Considerations

- Noise insulation could cost as much as $3.50 per square foot depending on energy conservation standards, building orientation and design.

Implementation/Follow-Up

Due to a lack of follow-up testing, it is not possible to determine whether the State of California Standards for noise insulation are adequate.

OTHER TECHNIQUES

Uniform building Code, City of Seattle--applicable to Sea-Tac noise impact imitigation. Seattle, Washington uses the Uniform Building Code, Chapter 35, for control of sound between multi-family dwelling units only.

Insulation Standards, California Administrative Code, Title 25, Chapter 1, Subchapter 1, Article 4. Noise Insulation Standards. This code establishes insulation standards and a maximum interior noise level of 45 CNEL for any new hotel, motel, apartment house and dwelling other than detached single-family dwelling.

Noise Ordinance, State of California, department of Health, Office of Noise Control, "Model Community Noise Control Ordinance", April, 1977. The model ordinance suggests that communities adopt interior noise standards as part of their noise control ordinance. Nighttime noise limits would be 35 dBA and daytime noise limits would be 45 dBA to be consistent with CAC Title 25 limit of 45 CNEL for any habitable room or any multi-family dwelling.

Noise Element, San Mateo County, California, "Draft Noise Element of the General Plan," May 1978. Appendix A, Proposed Noise Insulation Standards for unincorporated San Mateo County.

> "The purpose of this section is to establish uniform minimum noise insulation performance standards to protect persons within new multi-family dwellings--hotels, motels, apartment houses, etc. and single-family dwellings from the effects of excessive noise, including but not limited to, hearing loss or impariment and presistent interference with speech and sleep."

> "These regulations apply to all applications for building permits and are effective after adoption by the San Mateo County Board of Supervisors."

REFERENCES

1. Alameda County, Airport Land Use Commission, Airport Land Use Policy Plan, 1977.

2. California Administrative Code, Title 25, Chapter 1, Sub-chapter 1, Article 4. Noise Insulation Standards.

3. California Office of Noise Control, "Guidelines for the Preparation and Content of Noise Elements of the General Plan," February, 1976.

4. California, State of, Department of Health, Office of Noise Control, "Model Community Noise Ordinance," April 1977.

5. California, State of, "Public Utilities Code," Article 3.5, Section 21670 et. seq.

6. Inglewood, City of, "Municipal Code," Article VIII, Chapter 1.

7. Orange County Airport Land Use Commission, Airport Environs Land Use Plan, August 1975.

8. Sacramento Regional Area Planning Commission, Airport Land Use Commission Policy Plan, June 1975.

9. San Diego Comprehensive Planning Organization, Comprehensive Land Use Plan Palomar Airport, May 1974.

10. San Mateo County, Department of Environmental Management, "Draft Noise Element of the General Plan," May 1978.

11. San Mateo County Regional Planning Committee, Airport Land ~se Commission, Airport Land Use Plan, January 1977.

12. Santa Clara County Airport Land Use Commission, Land Use Plan for Area Surrounding Santa Clara Airports, August 1973.

13. John Wayne Airport, ANCLUC Plan, January 1981.

14. Burbank-Glendale-Pasadena Airport Authority, Rules and Regulations, July 1980.

15. San Francisco International Airport, Airport Noise Mitigation Action Plan, March 1981.

16. San Francisco International Airport, Joint Land Use Study: Working Paper IF.2, July 1978.

17. City of San Jose, San Jose Municipal Airport Master Plan, December 1979.

18. U.S. Department of Transportation-Federal Aviation Administration, Airport-Land Use Compatibility Planning, 1977.

19. City of Torrance, Airport Noise Control and Land Use Compatibility Study, July 1981.

20. Monterey Peninsula Airport District, Airport Noise Control and Land Use Compatibility Study, August 1980.

21. Frank A. Spencer, Transport Jet Aircraft Noise Abatement in Foreign Countries: Growth, Structure, Impact, August 1980.

22. Port of Seattle, Sea-Tac International Airport Plan, 1975.

III. COMMUNITY PLANNING CRITERIA AND STANDARDS

The development and articulation of planning criteria and standards is a crucial aspect of the ANCLUC program. A variety of planning criteria will be used as guidelines in formulating, evaluating, and impleminting effective noise reduction and land use compatibility programs. As such, planning criteria and standards will be used throughout the ANCLUC planning process and will be noted and described in the appropriate sections.

For the purpose of introduction, these planning criteria and standards may include the major categories of:

1) Noise Impact Level Criteria

   Examples:

   - Federal Land Use Guideline (LUG) System
   - State of California Administratiave Code, Noise Standards, Title 4, Chapter 9, Subchapter 6

2) Sound Transmission and Insulation Standards

   Examples:

   - State of California, Administrative Code, Noise Insulation Standards, Part 6, Division T25, Chapter 1, Subchapter 1, Article 4, Section 1002
   - Noise Element of local general plans
   - Local noise and vibration ordinances

3) Airport Noise Control and Safety Standards

   Examples:

   - Secretary of Transportation, Aviation Noise Abatement Policy, 1976.
   - FAA Order WE 1050.4A, Noise Abatement Programs and Airport Restrictions
   - FAA Advisory Circular Noise Abatement Departure Profile
   - FAA Part 91, Subpart E, Operating Noise Limits
   - FAA Order WE 1050.3, Aviation Noise Abatement Policy
   - FAA Part 36, Noise Standards; Aircraft Type 2nd Airworthiness Certification
   - U.S.C., Public Law 96-193, Aviation Safety and Noise Abatement Act
   - FAA Part 77, Objects Affecting Navigable Airspace
   - LAX Noise Abatement Policy

4) Land Use Planning Policies and Standards

Examples:

- FAA part 150, Airport Noise Compatibility Planning
- Federal relocation requirements
- Zoning Ordinances
- Subdivision Regulations

5) Traffic Capacity Criteria

Examples:

- A Handbook for Traffic Engineers
- Highway Capacity Manual

6) Public Facilities and Utilities Adequacy and Sizing Standards

Examples:

- Uniform Building Code

7) Legal, Administrative and Fiscal Criteria

Examples:

- Inverse condemnation
- Institutional arrangements
- Budgetary constraints
- Funding Program Guidelines

8) Community Attitudes

Examples:

- Neighborhood disruption/relocation

9) Other Environmental Considerations
Examples:

- Federal air quality, water quality and energy regulations

Many of these planning criteria and standards are discussed in greater detail in other tasks. Several background tasks in Phases I, II provide an inventory of existing planning criteria and standards. These standards and criteria, together with new ones formulated as part of the ANCLUC Study, will be employed in the development, evaluation and implementation of the noise abatement/land use compatibility programs ultimately recommended.

Finally, to facilitate implementation, all planning criteria and standards employed as part of this study will be coordinated closely with the planning agencies of the cities of Los Angeles, El Segundo, Inglewood and Hawthorne; Los Angeles County; the Southern California Association of Governments; and other federal, state and local agencies as appropriate.

IV. RE-EVALUATION OF ANCLUC STUDY AREA BOUNDARIES

A subtasks of Task 2.05 is to re-evaluate, and if appropriate, revise the preliminary ANCLUC Study area boundaries established as part of the Phase I work effort. As discussed in the Phase I final report (Task 1.04), the Study area boundary was originally delineated based upon the following considerations: noise impact, safety, ground access, neighborhood boundaries, and census tract boundaries.

Noise impact was the most important determinant. The study area boundary encompasses the noise impact area defined by the 1976 65 Community Noise Equivalent Level (CNEL) contour. The CNEL contour is established utilizing a formula that calculates the average annual noise exposure of an area based upon actual niose measurements. The formula incorporates a community disturbance factor, weighting measured noise impacts by time of occurance, i.e., daytime (x), evening (3x), nightime (10x).

The 1976 contour was chosen because it was a record year for total operations at LAX and also because the introduction of quieter aircraft had just begun. In light of continuing trends toward use of quieter, more fuel efficient aircraft, and continued development and implementation of noise abatement programs, future 65 CNEL contours are expected to encompass a substantially smaller area.

Although the CNEL contour does describe areas consistently impacted by significant levels of noise, it does not necessarily encompass all areas that experience periodic, albiet disruptive, noise intrusions. Such noise events, i.e., single events, are for the most part sporadic, both in terms of frequency of occurance and areas impacted. As a result, they are not easily detected by the airport area noise monitoring system, and therefore are not significant factors in the CNEL formula.

During the community workshops conducted as part of the Phase II ANCLUC effort, comments were received regarding noise exposure beyond the northern boundary of the study area. More specifically, a request was received to expand the study area boundary northward to the Westchester bluffs. The motivation behind this request reflects a concern that certain single event noise impacts affecting neighborhoods outside of the current study area not be overlooked. However, in considering this request it was felt that further enlargement of the study area was not appropriate for the following reasons:

1) the current boundary describes the most significantly noise impacted communities, and encompasses an area greater than both the current and expected future 65 CNEL contours;

2) single noise events have been raised as a significant community issue and will be addressed without boundary change; and,

3) Phase III of the study will distinquish between CNEL and single event issues. While the study area boundary is important for impact analysis of CNEL related concerns, the boundary is not relevant to the analysis and/or recommended mitigation of single noise events.

Although no changes are recommended to the study area boundary, there is a need to focus emphasis on those areas of severest impact. Therefore, a base case analysis will be utilized to segregate the study area into impact zones based calculated average (CNEL) noise levels. These zones will be defined as follows:

65 CNEL and below - areas in which noise sensitive uses are normally acceptable

65 to 70 CNEL - areas in which noise sensitive uses may be conditionally acceptable

70 to 75 CNEL - areas in which noise sensitive uses are normally not acceptable

75 CNEL and above - areas in which noise sensitive uses are clearly not acceptable.

Dividing the study area in such a manner, will allow policies and recommended mitigation programs to be tailored to specific circumstances. (See Noise Impact Zones Map)

APPENDIX A

NOISE CONTROL ACTIONS

<u>FAA Circular</u>

- Aircraft retrofit/replacement
- Purchase of land
- Purchase of easements for development rights
- Changes in land use from noise sensitive to noise tolerant
- Acoustical treatment
- Prevention of new incompatibilities through planning, public awareness, and locally adopted land use controls.
- Evaluating alternative development plans such as the construction of new runways extending runways, and displacing thresholds which would shift noise away from populated areas or reduce noise impact over presently impacted areas.
- Investigate the feasibility of establishing a preferential runway use system, preferential approach and departure flight tracks, flight operational procedures such as thrust reduction or maximum climb on takeoff, increasing glide slope angles, or increasing glide slope intercept altitudes.
- Identifying measures that should be taken to reduce the impact of aircraft noise such as installation of noise suppressing equipment, construction of physical barriers, and landscaping.
- Identify times of day when engine run-up for maintenance can be done with the least amount of noise impact.
- Determine location of engine run-up areas.
- Examine feasiblity including the legal restraints of establishing landing fees based on aircraft noise emission characteristics or time of day.
- Examine feasibility including legal restraints and effects on interstate commerce of:

  a) limitations on the use of, or operations at, the airport in a particular time period or by aircraft type;

  b) shifting operations to neighboring airports or rescheduling operations by aircraft type or time of day.

Sea-Tac ANCLUC

- Land areas having the highest noise impacts will be primarily devoted to open space type uses upon removal of the existing incompatible uses. The planned uses include agriculture; parks; landscaped buffer areas; and recreational areas for natural trails, golf courses, soccer, etc. Also, a portion of the area will be reserved for future air facility purposes, i.e., air cargo, maintenance, general aviation, etc.

- Conversion Area. Recognizing the problems involved in converting large areas of land from one use to another, the Planned Unit Development (PUD) zoning format was adopted. Conversions will include: conversion from single family to medium density multi-family with proper sound insulation; high and medium density apartments plus airport-related business uses; and manufacturing and industrial uses.

- Establishment of an ongoing noise monitoring program

- New locations for engine maintenance run-ups

- Enforcement of stricter curfews

- Acquisition of appropriate avigation easements

- Cost sharing and limited cost sharing insulation programs for noise affected structures

- Development controls by public agencies

- Property advisory services

Phoenix Sky Harbor International Airport

- Revision of existing aircraft approach and departure procedures to eliminate pilot misunderstandings

- Development of new air traffic controller procedures and installation of additional navigational aids to provide more positive aircraft direction

- Educate individuals on the nature of the noise problem and formation of an airport/airline working groups to aid in development of the action program steps, thus insuring their cooperation in making the procedural revisions effective.

- Formulation of a continuing airport/community communication channel in the form of a Sky Harbor Noise Abatement Committee

Logan International Airport

- Maximum utilization of preferential runways for noise abatement purposes
- Refinement of operational techniques would include more specific location of ground points over which noise abatement turns are to be made.
- Soundproofing noise impacted schools
- Purchase heavily impacted residential properties

Monterey Airport

- Develop a noise insulation/avigation easement program for housing units and other noise-sensitive land uses remaining within the CNEL 65-70 contour.
- Adopt land use compatibility standards and planning guidelines.
- Amend General Plan and zoning map to preclude new or redeveloped housing units and other noise sensitive land uses within CNEL 70-75 contour.
- Amend local subdivision ordinance requirements to require noise insulation and avigation easements in all new or redeveloped.
- Amend local subdivision ordinances to require acoustical studies and noise insulation to comply with the requirements of Title 25, California Administrative Code.
- Runway improvements and extension
- Designation of site-specific engine run-up areas
- Cooperative enforcement of curfew procedures
- Limitations on the development of new on-airport facilities
- Inclusion of noise oriented provisions in airport use agreements, lease documents, and airport rules and regulations
- Establishment of interagency coordination procedures
- Establish workable noise complaint procedures
- Establish public information sessions

- Prohibitions on new noise-sensitive land uses within the CNEL 70-75 impact area.

San Francisco Joint Land Use Study

- Airport Noise monitoring and management including centralized noise abatement function, improved noise monitoring system, expanded rules and regulations and expanded community information program

- Aircraft flight procedure changes including nighttime noise abatement runway, visual noise abatement departure, increased altitudes, visual noise abatement approach, over Foster City, and noise abatement climb power reduction

- Aircraft noise limits, restrictions and incentives including max noise limit, reduced nighttime runups, noise allocation and economic incentives

- Demonstration soundproofing project

- Neighborhood enhancement program

- Preventative land use planning including prohibit sensitive uses 70-75 CNEL, require noise insulation 65-70 CNEL, require acoustic studies 60+ CNEL, prepare final airport land use plan, update noise elements and encourage land use planning

- Joint powers agreement between cities adjacent to San Francisco International Airport.

San Jose Vicinity Area Plan

- Noise remedy program

- Residential property owners for whom the Noise Remedy Program is unacceptable are offered purchase of property at fair market value.

- Properties so acquired would be given remedial sound attenuation and subsequently sold with the retention of an avigation easement.

- Acquisition of an estimated 285 dwellings in two mobile park areas

- The cities of San Jose and Santa Clara shall amend their respective general plans to reflect the noise compatibilities policies in this plan.

- The cities of San Jose and Santa Clara shall amend their zoning and building code regulations to require the interior noise level standards of this plan.

- Amend zoning, subdivision and building code regulations to require the dedication of an avigation easement.

- Implement building code provisions establishing standard methods, designs, materials and combinations thereof for achieving specified levels of noise insulation in new construction.

John Wayne Airport Master Plan

- Identification of an optimum noise reduction goal in terms of Community Noise Equivalent Level (CNEL) reductions referred to the CNEL for the base year, and a corresponding reduction goal for the amount of existing incompatible land use area within the 65 db CNEL contour.

- Development and implementation of a phased noise reduction program which will be based on establishment of a quantitative noise budget for the Airport, defined in terms of CNEL budget limits at important noise monitoring locations. Annual CNEL reduction goals will be reviewed and adjusted yearly, in order to achieve the identified optimum CNEL reduction goal.

  Basic implementation steps in the noise reduction goal program include:

  - Initially, establish limits for each air carrier in terms of average numbers of daily departures, allowing adjustments for future changes in aircraft and in operating procedures.

  - Upon further study, establish CNEL budget limits for each air carrier and each based business jet operator by share allocations.

  - Establish noise limits for air carrier and general aviation aircraft that will lead to curtailment of operations of noisier air carrier and business jet aircarft.

- Continue implementation of an active aircraft noise control program, all elements of the existing noise abatement program, plus:

- Study of the feasibility of implementing a schedule of fees for air carrier and general aviation aircraft based on noise measured at important noise monitoring stations, and

- Study the feasibility of imposing scaled landing fees for general aviation aircraft based on FAR 36 noise certification levels.

- Displace the takeoff threshold of Runway 19R 737 feet to the north, with coordination of the runway extension with appropriate adjustments in the CNEL budget limits and aircraft noise limits.

Development and implementation of a three-tiered land use compatibility program keyed to the reduction in CNEL contour size according to the optimum CNEL reduction goal and noise reduction program. The land use compatibility program includes:

- Prevention of further encroachment of incompatible land uses within the existing and future 65 dB CNEL contour through establishment of an Overlay Zone corresponding to the annual 65 dB CNEL contour area. Conditions of the Overlay Zone will prohibit development of any new residential uses as long as an area is within the 65 dB CNEL.

- Interim noise impact mitigation in the form of an Interim Acoustical Insulation Program for existing residential areas that will be within the 65 dB CNEL as of 1986 up to the optimum 65 dB CNEL contour boundary.

- Implementation of specific land use compatibility measures within the optimum 65 dB CNEL contour to achieve 100% compatibility according to the State Noise Standards and County of Orange policy as soon as economically and technologically possible. The land use compatibility program outlined in Chapter XIII is designed to achieve such compatibility within the recommended ANCLUC Plan implementation schedule.

- Development of a schedule for phased implementation of the identified CNEL reduction and land use compatibility goals over a ten-year period. Set incremental goals to assure timely achievement of the overall ANCLUC Plan goals by the implementation year. The implementation year is defined by achievement of 100% compatibility within the 65 dB CNEL contour. A ten-year implementation schedule has been identified as a reasonable and effective time frame within which ANCLUC Plan goals may be achieved and current and reasonable future levels of Airport operations may be maintained.

- Establish an overlay zone corresponding to the 65 dB CNEL, to be reviewed and adjusted annually as noise reduction progresses, with which no new residential development or other uses incompatible will be allowed.

- Designation of a redevelopment plan/specific plan for east Santa Ana Heights, with possibility of including west side.

- Implementation of an interim acoustical insulation program for existing residential areas that will be within the 65 dB CNEL as of January 1, 1986 but will be removed from the contour area of the optimum 65 dB CNEL upon achievement of the CNEL reduction goal.

- A specific land use compatibility program keyed to a recommended Ultimate Land Use Plan for the area within the optimum 65 dB CNEL contour. The specific land use compatibility program is designed to provide for modification or conversion of existing incompatible uses to uses compatible with the 65 dB CNEL and compatible with one another through a ten-year phased implementation schedule corresponding to the CNEL reduction schedule.

. Establishment of corresponding administrative mechanisms and public information functions to facilitate achieve of ANCLUC Plan implementation. A number of miscellaneous administrative activities are recommended to enhance and ensure implementation of the comprehensive ANCLUC Plan. These include:

  - Designation of a responsible County agency to conduct a recommended annual review of the status of ANCLUC Plan implementation, and to coordinate any recommended adjustments in the implementation plan and schedule as may be identified by the annual review.

- Conduct a legal review of the comprehensive ANCLUC Plan.

  - Revise the Noise Element and Land Use Element of the Orange County General Plan to be internally consistent (e.g. each element) and inter-consistent (e.g. with one another) for effective implementation and administration of the recommended ANCLUC Plan.

  - Investigate and establish a notification ordinance or other mechanism as one of the conditions of the Overlay Zone (implemented by a GPI District) which would provide notice to prospective property buyers within the 65 dB CNEL of the high aircraft noise exposure potential, property development restrictions and potential existence of acoustical insulation and/or an avigation easement on the property.

  - Establish an ANCLUC Plan information office or officer that would be available to the community and adjacent political jurisdictions for the purpose of disseminating information and answering questions regarding ANCLUC Plan implementation, schedules, status of program elements, options available to plan area residents and funding availability. This office or officer would ideally be located in or near the optimum 65 dB CNEL contour area and could also be given the responsibility of monitoring the progress of each of the land compatibility program elements.

  - Examination of other potential land use compatibility controls which may be needed or which could enhance achievement of the ANCLUC Plan goals.

<u>John Wayne Airport/Orange County</u> (studied alternatives)

- The airport can establish landing fees based on aircraft characteristics or time of day of cp's.

- The airport can limit operations by:

  limiting the number of operations,

  limiting operations at certain hours, and

  limiting operations based on specific aircraft noise levels.

  Such limits must be applied in a nondiscriminatory fashion.

- The airport cannot directly control flight operations by specifying flight procedures or takeoff and landing paths.
- The airport cannot limit the number of air carriers.
- The airport cannot compel airline purchases of quieter aircraft.
- Establish overall airport noise budget administration. Establish quantitative noise figure for both current and future operations, allocate portions of the noise budget to various airport users, and undertake followup actions to ensure that budget limits are not exceeded by users.
- Direct limits on number of operations.
- Single event noise level limits. Noise limits could be established by limits based on basic aircraft performance characteristics or limits at one or more monitoring positions in the community.
- Noise-related cost incentives and penalties, noise related landing fees.
- Night curfews
- Noise abatement departure procedures--Runway 19R
- Optimization of takeoff procedures including attaining maximum height before reaching the critical community area and making as large a power cutback as possible just before reaching the critical community area.
- Use of automatic controls. The flight control parameters required to achieve the designed result are computed and can be input automatically to the aircraft flight and power controls.
- Navigational Aids - ILS, DME, INS, MLS
- Extension of Runway 19R/OIL - the noise reduction achieved by the runway extension is accomplished by increasing the distance between the noise source and the ground receiver.
- Changes in takeoff procedures to take advantage of runway extension.
- Preferential runway noise effects.

- Ground Runup noise control measures (JWA Rules and Regulations No. 75-8, 1977) apply to runups requiring a power setting higher than idle power. The regulation requires formal permission to conduct such runups any time during the day and night. The regulations further specify that the runups must be conducted only at designated areas and, for the jet runups, with the aircraft at a specified reading.

Burbank Airport Resolution No. 77

- Owner/Operator agrees, to the extent feasible, it shall not authorize any actions which will increase the noise levels and/or noise exposure impact boundaries beyond those existing as of the date of said EIS.
- Owner/operator shall obey all laws and regulations of the United States, the State of California, and the California Department of Transportation.
- Owner/operator shall diligently pursue all reasonable avenues available to insure that the adverse effects of noise are being mitigated to the greatest extent reasonably possible.

Burbank Airport (Rules and Regulations 7/2/80)

- Rule #9 aircraft operations during overnight hours. Restrictions on aircraft landings between the hours of 10:00 p.m. and 7:00 a.m.
- Encouraging use of the airport by aircraft classes with lower noise level characteristics.
- Encouraging approach and departure flight paths and procedures to minimize the noise in residential areas.
- Planning runway utilization schedules to take into account adjacent residential areas, noise characteristics of aircraft and noise sensitive time periods.
- Reduction of the flight frequency, particularly in the most noise sensitive time periods and by the noisier aircraft.
- Employing shielding for advantage, using natural terrain, buildings, etc.
- Development of a compatible land use within the noise impact boundary.

- All aircraft shall be in compliance with all Federal Air Regulations respecting noise.
- Each air carrier jet operator shall implement appropriate FAA approved takeoff and arrival procedures consistent with the standards of Case 9A.
- All non-air carrier jet operators shall implement the National Business Aircraft Association's noise abatement procedures.
- Each aircraft operator shall adhere to the FAA preferential runway use program FAA order BUR 7110.53A.
- Each aircraft operator and maintenance and repair facility shall adhere to the FAA Engine Test Run-Up Areas order Bur 7110.75A.
- No air carrier shall inaugurate any operation, or implement any increase in operations, without the written approval of the Commission.
- Between the hours of 10:00 p.m. and 7:00 a.m.: no intersection takeoffs shall be permitted, no maintenance engine run-ups shall be permitted. No flight training operations.
- Establish Noise Abatement Technical Advisory Group.

The Burbank Airport EIR/EIS for acquisition of the Airport identifies constraints upon operations and noise levels and comtemplates the continued maintenance of such noise levels.

INTERNATIONAL EXPERIENCE

United Kingdom

- Compensation programs are administered by the national government to reimburse costs associated with loss of property value and for the insulation of buildings.
- Noise "spreading" or allocation efforts are in use at Heathrow and Gatwick. Preferential runway usage and noise abatement flight routes are the methods used.
- A 20% discount on landing fee is used at Manchester as a credit for use of quiet aircraft. The government is currently studying the establishment of a noise-based fee.
- Both Heathrow and Gatwick have a quota on night operations of "noisy" aircraft that decreases until the quota reaches zero in 1987. At the same time, there is an increase in quota for quiet aircraft to a maximum number in 1981. A distinction is drawn between winter and summer months.
- Maximum single-event limits are regulated, monitored and enforced by notice of violation.

France

- Strict land use controls are in affect around Orly and Charles De Gualle for new construction. There is a voluntary purchase plan for existing housing.
- A passenger head tax (1 Franc/domestic pax; 3/international pax) is used to generate funds for a noise insulation program. A study is currently under review to make the charge an economic incentive-based one so as to reduce the use of noisy aircraft. The proposal would relate actual aircraft monitored performance to a reference noise level (like FAR 36) and discount quieter aircraft.
- With the exception of the Charles De Gualle airport, there curfews or slot limits for jet aircraft operations.
- Extensive noise monitoring systems are in place at Orly and Charles De Gualle. Single-event noise levels above the average for a type of aircraft receive written notice of the incident.

Germany

- There is a program for reimbursing the cost of sound insulation and for the loss of property value due to the prohibition of new residential building.
- A noise surcharge of 5% for Annex 16 compliance aircraft and 14% for non-compliance aircraft is assessed.
- There are curfews on certain aircraft greater than 12,500 lbs. MGTOW, but exceptions are granted based upon overall noise performance of individual airlines.
- Publication of noise monitoring results which identify airline and aircraft type is made. Inquiry is made when a monitored noise level exceeds by 4 dB (A) an average noise level for that type aircraft.

Switzerland

- Extensive flight routes and preferential runway usage are in effect at Zurich. The unique feature here is that some of the impacted area involves another nation--Germany.
- Aircraft causing single-event levels of greater than 75 dB (A) are subject to curfew between 10:00 p.m. and 6:00 a.m. Some airports are closed on Sundays and certain holidays.
- Elaborate monitoring and reporting process at Zurich causes notification to an airline when a flight exceeds by 4 dB an average of the lowest noise levels.
- A proposal to apply a surcharge landing fee based upon maximum single-event noise level is presently under consideration. The surcharge would be zero at less than 90 dB (A).

Netherlands

- The curfew at Schipol is related to aircraft type, type of operation (take-off or landing) and to runway used.

Japan

- Special landing fees are assessed to recover the annual cost of noise abatement in Japan ($229 million in 1978). The

Japan (cont'd)

charge ranges from $1,034 for a 747 with 350 seats to $944 for a DC-8 with 120 seats.

In addition, a head tax of $3.00 is charged each passenger.

The purpose of these charges is not to reduce noise, but to obtain revenues for the extremely costly noise program.

- Restrictions on the number of operations and a curfew on night operations by jets are in effect.

Australia

- 80% of the domestic fleet must meet Annex 16 requirements by January 1981 and 100% of all domestic and foreight airlines by the end of 1984.

LOS ANGELES INTERNATIONAL AIRPORT

AIRPORT NOISE CONTROL AND LAND USE COMPATIBILITY STUDY

TASK 2.06

DOCUMENT FEDERAL, STATE, LOCAL AND

AIRPORT LAND USE COMMISSION REQUIREMENTS

TABLE OF CONTENTS

I. INTRODUCTION

The number of requirements pertaining to land use surrounding the airport is quite large. In order to provide a useable summary of these many requirements this paper was prepared. Included within is a review of all pertinent Federal, State, local and Airport Land Use Commission (ALUC) requirements and proposed legislation relating to noise control and land use compatibility.

A compendium of these requirements has been development to provide a valuable reference source during the evaluation and implementation analysis activities which will occur during Phase Three.

II. COMPENDIUM OF REQUIREMENTS

FAA Advisory Circular 150/5050-6 December 30, 1977 Airport Land Use Compatibility Planning

The Advisory Circular was prepared by the Federal Aviation Administration (FAA) to provide generalized guidance for compatible land use planning in the vicinity of both existing and new airports. Compatibility planning has the overall goal of achieving an acceptable balance between the needs and tolerances of both the airport and its neighbors.

The compatibility plan includes both a physical plan and an implementation program which should be prepared through the cooperative efforts of the airport sponsor and the local planning agencies. The physical plan describes the airport's noise and other impacts, fully reflecting agreed-upon noise control actions, and the basic land use and development patterns compatible with the airport's impacts and with the community's planning, goals and needs. The implementation program is the detailed action program which executes and accomplishes the plan. Preparation of the plan normally involves the following planning actions: 1) identification of community goals, values, and needs; 2) development of work program; 3) identification of existing and future aviation needs and resulting impacts; 4) identification of study area; 5) identification of land use-noise exposure criterion; 6) identification of existing and unconstrained future land use patterns; 7) development of alternative compatibility schemes; and 8) selection of preferred alternative and recommendation of a plan for adoption.

The FAA has developed Land Use Guidance (LUG) zones representing varying CNEL noise ranges. The LUG system is a uniform noise evaluation technique which directly relates to land use compatibility planning and which constitutes a single system for determining the impact of noise upon individuals resulting from the operations of an airport. For example, LUG Zone A includes areas lying outside the CNEL 55 and above noise contour. These areas are generally assumed to have "minimal" noise exposure, and no special noise abatement considerations are required. LUG Zone B includes areas lying within the CNEL 55 to 65 contour. These areas are "moderately" exposed to noise, and according to the guidelines, land use control measures should be considered.

LUG Zone C includes areas within the CNEL 65 to 75 contour. These areas have "significant" noise exposure, and land use compatibility controls are recommended. LUG Zone D includes areas within the CNEL 75 and higher contour. These areas have "severe" noise exposure. By all standards of land use compatibility, such noise levels should be confined within the airport boundaries.

The FAA has defined land uses that are compatible with the airport/aircraft noise generated in the CNEL ranges within each LUG zone. Different uses of the land have different sensitivities to noise. Schools, residences, churches, and concert halls are very sensitive to noise. By contrast, factories, warehouses, storage yards, and open farm lands are relatively insensitive to noise. Other uses, such as offices, shopping centers, recreation areas, or hotels have intermediate levels of noise sensitivity.

An FAA goal as expressed in the Aviation Noise Abatement Policy is to confine, insofar as possible, severe aircraft noise exposure levels to the areas included within the airport boundary or over which the airport has a legal interest, to preclude development of noise-sensitive areas therein, and to reduce substantially the number and extent of noise-sensitive areas in the vicinity of airports subject to significant noise exposure.

Implementation of the compatibility plan is accomplished by actions relating to controlling noise and development and to correcting or remedying incompatibilities. Noise control includes airport development and operational controls designed to assure that aircraft noise will be contained within the noise impact areas delineated by the compatibility plan. Development control relates to the land use controls which can protect the noise impact areas from encroachment by unprotected noise sensitive uses within the noise impact areas.

Airport Development - The alignment and location of runways, terminal buildings, access roads, and navigational facilities are prime examples of development actions which influence where noise impacts will occur.

Operational Procedures - control over the operation of aircraft on and around an airport is a sensitive subject involving safety as well as service and efficiency.

Other Options - Other possible noise control actions include preferential runway use, preferential approach and departure flight tracks, etc.

Zoning - the most common and useful land use control is zoning. Zoning is an exercise of the police powers of local governments which designates the uses permitted on each parcel of land. The primary advantage of zoning is that it can promote compatibility while leaving the land in private ownership. Zoning has a number of limitations which must be considered when using it as a compatibility implementation tool. Most significant, zoning is usually not retroactive. That is, changing zoning primarily for the purpose of prohibiting a use which already exist is normally not possible. Benefits will not be realized until the land is recycled.

Easements - Easements may be used as an effective and permanent form of land use control. An easement is a right of another to part of the total benefits of the ownership of real property. The easement should give the easement owner the right of avigation and the right to make noise over the property. In the case of an existing unprotected noise sensitive use, the cost of the easement could include the cost of either soundproofing or removing the noise sensitive uses, from the property. Easements may be obtained in a number of ways including purchase, condemnation, and dedication.

Transfer of Development Right (TDR) - Under the TDR concept, some of the property's development rights are transferred to a remote location where they may be used to intensify allowable development.

Land Purchase - Purchase of noise impacted land in fee simple is the most positive of all forms of land use control. Purchase should usually be limited to critical locations or to hard core cases where other solutions are not workable.

Reducing Noise Transmission - Where noise sensitive uses cannot be reasonably relocated, compatibility may be achieved by reducing their noise sensitivity through soundproofing treatment. Although aircraft noise impacts are reduced after soundproofing, objections could be raised to the internal environment as being "sealed in".

Other Techniques - Encouragement of existing favorable trends, constructive use of planning and zoning, constructive use of public capital improvement projects, purchase assurance program, and voluntary relocation program.

Adoptive procedures and requirements are necessary for the land use and noise controls and the corrective actions recommended in the compatibility plan. Each of these controls may involve the adoption of rules, ordinances, procedures, special legislation, etc. by appropriate local governmental agencies.

State of California, Public Utilities Code, Airport Land Use Commission, Division 9, Part 1, Chapter 4, Article 3.5.

According to the public utilities code an Airport Land Use Commission shall be created in each county with an airport operated for the benefit of the general public and served by an air carrier certified by the Public Utilities Commission or the Civil Aeronautics Board. In Los Angeles County, the Regional Planning Commission serves as the Airport Land Use Commission.

The Commission shall have the following powers and duties:

1) To assist local agencies in ensuring compatible land uses in the vicinity of all new airports and in the vicinity of existing airports to the extent that land in the vicinity of such airports is not already devoted to incompatible uses.

2) To coordinate planning at the state, regional and local levels so as to provide for the orderly development of air transportation, while at the same time protecting the public health, safety and welfare.

In addition to these duties, the Commission shall formulate a comprehensive land use plan that will provide for the orderly growth of the airport and the surrounding land use for the next 20 years. In formulating the plan, the Commission may develop height restrictions on buildings, may specify use of land, and may determine building standards, including soundproofing.

Local jurisdictions within or partially within the area covered by the Airport Land Use Commission's plan shall submit a copy of locally approved general or specific plans, or amendments thereto, to the Commission for review. If in the opinion of the Commission, such locally adopted plans are inconsistent with the Commission's plan, the Commission shall refer the matter back to the appropriate local agency for further consideration. Should the local agency, after holding a public hearing, wish to reaffirm its previous action, it may override the Commission's objection by a two-thirds vote. In doing so however, the involved airport operator cannot be held liable for adverse impacts on new development which may result from such local override actions.

Each public agency owning any airport within the boundaries of the area plan shall file any substantive change in development plans with the Commission. The powers of the Commission shall in no way be construed to give the Commission jurisdiction over the operation of any airport.

<u>State of California, Administrative Code, Noise Insulation Standards, Part 6, Division T25, Chapter 1, Subchapter 1, Article 4, Section 1092</u>

State "Noise Insulation Standards", which are recommended to be adopted as part of local building codes, apply to residential structures located in noise-critical areas (defined as CNEL 60-or-greater).

Residential structures shall be designed to prevent the intrusion of exterior noises beyond an annual interior community noise equivalent level (CNEL) of 45 dB in any habitable room with all exterior doors and windows closed. Further, for airport noise sources, residential structures located within an annual CNEL contour of 60 requires an acoustical analysis showing that the structure has been designed to limit intruding noise to the prescribed allowable levels. CNEL's shall be determined by the local jurisdiction in accordance with its local general plan.

Proper design to achieve this goal can include, but is not limited to, orientation of structure; setbacks; shielding; and sound insulation of the building itself. The State Noise Insulation Standars specify minimum insulation requirement in terms of Impact Insulation Class (IIC) and Sound Transmission Class (STC) for wall and floor-ceiling assemblies.

<u>State of California, Government Code, Noise Element Requirements, Title 7, Section 65302(g)</u>

A noise element shall quantify the community noise environment in terms of noise exposure contours for both near- and long-term levels of growth and traffic activity. Such noise exposure information shall become a guideline for use in development of the land use element to achieve noise compatible land use and also to provide baseline levels and noise source identification for local noise ordinance enforcement. The sources of noise considered in the analysis shall include commercial and general aviation, heliport, military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation.

The noise exposure shall be presented in terms of noise contours expressed in community noise equivalent level (CNEL) or day-night average level (Ldn). Contours shall be shown in minimum increments of 5 db down to 60 db.

A part of the noise element shall include the preparation of a community noise exposure inventory, current and projected, which identifies the number of persons exposed to various levels of noise throughout the community. The noise element shall also recommend mitigating measures and possible solutions to existing and foreseeable noise problems.

The noise element becomes the guideline for determining compliance with the state's noise insulation standards, as contained in Section 1092 of Title 25 of the California Administrative Code.

El Segundo Municipal Code, Noise and Vibration Regulations, Chapter 9.06, 1978, Pages 237-238-10b.

- The goal of the regulations is to prohibit unnecessary, excessive and annoying noises and vibrations.

- Exterior Noise Standards: The following noise levels are the maximum permitted to be created on any property as measured on any other property, except as permitted to be adjusted as further described as follows:

Zone Classification of Receptor Property	Time Interval	Allowable Noise Level dBA
Residential	10 p.m. to 7 a.m.	45
R1, R2, R3, PRD, or OS	7 p.m. to 10 p.m.	50
	7 a.m. to 7 p.m.	55
Commercial	10 p.m. to 7 a.m.	55
C-RS, C2, C3, P or PF	7 a.m. to 10 p.m.	60
Manufacturing, M1 or C-M	anytime	65
Manufacturing, M2	anytime	70

Increases to the above described noise standards are permitted as follows:

Permitted Increase (dBA)	Duration of Increase (minutes)*
0	30
5	15
10	5
15	1
20	less than 1

*Cumulative minutes during any one hour.

- Interior Noise Standards: Noise levels within any receptor dwelling unit should not exceed 45 dBA. May be adjusted +5dBA for one minute periods and +10 dBA for less than one minute.

City of El Segundo, Noise Element, McDonell Douglas Astronautics Company - West, 1976

Contains community goals and objectives pertaining to the control of environmental noise, including guidelines to minimize to noise conflicts. Classification of various land uses as sensitive, conditionally sensitive or non-sensitive and standards for these uses as follows:

Definitions:

- Sensitive - uses where a quiet outdoor environment is important.

- Conditionally sensitive - uses which are noise sensitive, but which can be made compatible with noise insulation. Uses where outdoor lifestyles are not important.

- Non-sensitive - uses where quiet outdoor environment is not critical to indoor or outdoor activities.

USE	S	CS	NS
Residential, single family	X	X	
Residential, two family	X		
Residential, multiple			
Community clubs			
Schools			
Parks, sports oriented			
Parks, relaxation oriented	X		X
Libraries		X	
Churches		X	
Museums		X	
Hospitals, general		X	
Hospitals, convalescent	X		
Sanitariums	X		
Homes for the aged	X		
Commercial activities			X
Industrial activities			X

Land Use Sensitivity Classification	Exterior Noise Standard	Interior Noise Standard
SENSITIVE	L dn 65	L dn 55
CONDITIONALLY SENSITIVE	L dn 75	L dn 55
NON-SENSITIVE	L dn 75	L dn 75

NOTE: For reasons of social and economic feasibility, City Standards permit levels 10 dBA higher than EPA criteria.

Land Use Zoning Criteria: New construction and future planning should be guided by the following criteria:

- Sensitive land uses should not be placed in noise impacted zones unless there are overriding social or economic considerations.

- Conditionally sensitive land uses may be permitted in noise impacted zones providing that noise abatement measures are incorporated to meet standards.

- Non-sensitive land uses are not restricted by noise impacted zones.

The noise element also states the following goals and policies:

- New residential developments, and other uses where noise affects quality of life, planned in conformance to adopted noise standards and criteria.
- Allocation of noise impact mitigation costs to the agency or party responsible for the noise incompatibility.
- Application of technical, procedural, and funding assistance available at the State and Federal level for noise ameliorating measures.
- Identify the sensitivity of the various land uses to noise, and to establish acceptable noise standards and criteria consistent with health and quality of life goals.
- Employ effective techniques of noise mitigation through appropriate provisions in the building code, in the subdivision procedures, and in the zoning and noise ordinances.
- Make use of recently adopted State regulations on noise insulation requirements for dwellings.
- Urge continued Federal and State research into noise problems and recommend additional research programs as problems are identified.
- Maintain updated determinations and evaluations of the present and future noise levels associated with all significant transportation facilities in the City.
- Work with the City of Los Angeles, Department of Airports, to reduce the noise impacted area around Los Angeles International Airport to zero.

<u>City of El Segundo Land Use Element, 1975</u>

- Part V, Area of Concern, cites Los Angeles International Airport as an area of concern. States the need to minimize undesirable side effects to as great a degree as possible.

<u>City of El Segundo Housing Element, 1975</u>

- Identifies need to buffer single family homes from the airport. Suggests multiple family use as buffer within City.

City of El Segundo Open Space Element, 1973

- Maintain and expand the working relationship with the LAX administration, and control noise sources within the City to an acceptable level for the betterment of the community environment.

- Develop minimum performance standards for the control of noise, and smoke and odor emissions.

City of El Segundo Goals, 1975

- Includes reference to the relationship between the airport and the city in the following goals:

General:

- Maintain and expand the working relationship with the Los Angeles International Airport administration and control noise sources within our City to an acceptable level for the betterment of the community environment.

Residential:

- Establish zone changes on Imperial Avenue to provide for construction of medium-rise, multiple family dwellings of high-quality, soundproofed construction, with interior parking.

City of Hawthorne, Hawthorne Municipal Code, Title 17 "Zoning"

The Zoning Code establishes applicable noise standards for all zones as follows:

1) The ambient noise level shall not be less than the following levels at the respective times and zones, irrespective of the ambient noise level actually measured.

Zone	Time	decibels
Residential: R-1, R-2, R-3, R-4, H, P	10:00 p.m. to 7:00 p.m.	50 dba
	7:00 p.m. to 10:00 p.m.	60 dba
Commercial: C-C, C-2, C-M	10:00 p.m. to 7:00 a.m.	50 dba
	7:00 a.m. to 10:00 p.m.	60 dba
	Anytime (not to exceed)	65 dba

Any decibel measurement made pursuant to Code shall be based on a reference sound pressure of 0.0002 microbars as measure in any octave band with center frequency in cycles per second, as follows: 63, 125, 250, 500, 1,000, 2,000, 4,000, and 8,000, or as measured with a sound level meter using the "A" weighting network, using the slow meter response.

Manufacturing:

In the Manufacturing zones sound levels are regulated so as not to become objectionable due to a shrillness; the measurement of sound shall be measured at the exterior property lines and shall be measured to decibels with a sound level meter and associated actave band filter manufactured according to standards prescribed by the American Standards Association. Maximum permissible sound pressure levels shall comply with the following standards:

Octave Band In Cycles per Second	Decibels at Lot Line of Use in the M-2 Zone	Decibels at Adjacent Residential District Boundaries
0-75	79	72
75-150	74	59
150-300	66	52
300-600	59	46
600-1200	53	42
1200-2400	47	39
2400-4800	41	34
4800-above	39	32

City of Hawthorne Noise Element, October 1973

This document provides noise level standards and other information related to the compatibility of land uses.

Noise Element Goal:

> "To prohibit or effectively reduce all unnecessary excessive and offensive noises throughout the City of Hawthorne which are detrimental to the public health and welfare and contrary to the public interest".

Policies:

1. Ordinances

   Based on acceptable noise standards, employ effective techniques of noise abatement through such vehicles as the 1973 Edition of the Uniform Building Code, and Noise, Subdivision, and Zoning Ordinances.

2. Noise Source

   Whenever possible and appropriate, control, at the source, all sounds which exceed community acceptable noise levels.

3. Transportation Noise - Regulatory Measures

Provide for the reduction of the present and future impact of excessive noise from transportation sources through judicious use of technology, planning and appropriate regulatory measures.

4. Local Assistance

Provide governmental assistance, as appropriate, to persons, groups, or organizations engaged in developing and implementing noise abatement procedures including home improvement.

5. Federal and State Legislation

Support Federal and State Legislation which will provide for noise abatement and the distribution of the costs of noise abatement programs among the producers of the noise.

6. Compatible Land Uses

Explore possibilities for and require land use adjustments and urban design techniques that will provide for compatible uses adjacent to major transportation facilities while protecting residential and other characteristically "quiet" land uses from future noise impact.

7. Funding

Be aware of, and seek out, any available funds from appropriate levels of County, State and the Federal government that could be used to underwrite the costs of noise abatement programs, including enforcement of the existing noise regulations of the Hawthorne Zoning Ordinance.

City of Hawthorne Housing Element, October 1973

Housing Goals:

To update or revise present City ordinances and codes in order that all segments of the population, including low, medium and high income groups, and the elderly have the opportunity for decent housing and a suitable quiet living environment.

To preserve the integrity of residential areas by developing policies and programs aimed at eliminating incompatible land useage and mitigating incompatible noise sources.

To continue to assure the fairness and adequacy of compensation and relocation assistance to persons and families displaced by public improvements.

Continue to assure the adequate delivery of municipal services to all residents especially to those whose needs are the greatest.

Encourage housing concepts which preserve land and provide significant open space in a quiet living environment.

Insure that the housing efforts of public and private agencies are coordinated to assure excessive and offensive noise-free neighborhoods.

City of Hawthorne Master Plan, Hawthorne Municipal Airport, R. Dixon Speas Associates, Inc., February, 1978.

This plan provides for the long term expansion of the Hawthorne Municipal Airport to the year 1998 with standards and policies to maintain compatibility with existing and projected aircraft noise contours in conformance with State Noise Regulations. Existing and future plans are designed to maintain compatibility within the 60 CNEL contour.

City of Inglewood, Noise Element, September 1974

- Forty-four percent of Inglewood residents live in a noise environment that is unacceptable for new residential development. Most of these people live in areas impacted by noise from aircraft operations at LAX.

- The following programs are proposed in the Noise Element of the General Plan with regard to LAX:

  - Actively advocate changes to aircraft operations that will reduce aircraft noise to a manageable level. Cooperate with other cities to develop a joint plan for LAX noise abatement.

  - Actively advocate a cooperative program with the airport to provide financial assistance for sound insulation of existing residences where such insulation is capable of reducing interior noise to levels consistent with protection of the public health and welfare.

  - Actively advocate a cooperative program with the airport to provide financial assistance for land conversion where insulation is not capable of reducing interior noise to levels consistent with protection of public health and welfare.

- Actively advocate federal regulations for the control of aircraft noise.

- Take all legal means to recover noise damages from the airport for Inglewood residents.

. Identifies and analyses 22 noise abatement strategies which could be applied at LAX to reduce aircraft noise.

<u>City of Inglewood Public Safety Element, September 1974</u>

. Technical Report No. 3, "Airplane Crash Hazard," included in Safety Element points out the results of a simulated major aircraft crash in Inglewood:

  - Aircrash casulaties would have to be sent to nine area hospitals, creating a critical coordination problems for authorities directing ambulances at the site.

  - On-site authority was complicated by multiple jurisdictions and agencies;

  - Hospital site treatment of incoming casualties required better coordination.

. A combination of firefighters from Inglewood and Los Angeles County would be necessary in order to successfully suppress a fire resulting from aircraft fuel.

<u>City of Los Angeles Citywide Plan, 1974</u>

. Major policy statements with regard to LAX include:

  - LAX passenger traffic volume shall be limited to not more than 40 million passengers per year;

  - An efficient network of freeways, highways and streets shall be developed to serve LAX, including a freeway and/or major highway loop;

  - Adequate peripheral parking facilities and multi-level interior parking shall be provided at LAX;

  - A method of passenger ticketing and baggage handling at locations in major centers should be developed and implemented as a means of reducing vehicular congestion at LAX;

  - Drastic reduction of aircraft noise and emission is essential to the quality of the city's environment.

. Height zoning in conformance with FAA FAR, Part 77 in areas adjacent to airports is included in L.A. City Ordinance.

County of Los Angeles Land Use Element, November 1980

- Protect the character of residential neighborhoods preventing the instrusion of incompatible uses that would cause environmental degradation, such as excessive noise.

- Develop a coordinated process for the preparation, adoption, and implementation of local land use and revitalization plans for communities within the noise impact area of Los Angeles International Airport.

County of Los Angeles Housing Element, November 1980

- Prevent or minimize environmental hazards, such as noise noxious fumes, and heavy traffic in residential neighborhoods.

County of Los Angeles Transportation Element, November 1980

- Stress environmental compatibility including air quality, noise, ecology aesthetics, health, and safety in developing transportation systems.

- Improve the compatibility between aviation facilities and their surroundings through improved land use control mechanisms and technological improvements.

- Improve ground access to and from air terminals.

- Support development of the Palmdale Airport.

- Decentralize passenger terminals to reduce congestion at existing air terminals.

- Encourage air transport industry to eliminate unnecessary duplication of services to increase airline loading factors.

- Develop airport land use compatibility standards and administrative procedures and coordinate with the cities to assure conformance.

County of Los Angeles Noise Element, November 1980

- Encourage use of noise abatement measures adjacent to all major sources of noise pollution such as airport, freeways, and rail lines.

FAA PART 36, NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION, NOVEMBER 1969

The original FAR Part 36 of November 1969, was the first comprehensive Federal regulation prohibiting any further increases in aircraft noise. At the same time, it required new aircraft types to be markedly quieter than those developed in 1956-1964. The regulation dealt separately with approach and takeoff noise test conditions, and specific noise limitations for all newer and older aircraft types. These limitations were based on aircraft gross weight, and noise test measurements were to be taken from three points under the takeoff flight path, on the sideline of the extended runway centerline and under the approach flight path. The relatively low noise levels achieved by the DC-10, B747, A300/A310 and L1011 demonstrate the effectiveness of the program. Unlike the earlier turbojet transports, the wide-body airliners employ quieter, cleaner, more fuel-efficient engines with higher bypass ratios; these engines are known as turbofans. Some of the earlier aircraft, such as the B727, B737, and DC-8-63 will be updated with the latest engines (e.g. the CMF56) to become even quieter than the 1969 Part 36 standards. Complementing these will be a whole fleet of late generation aircraft, including the DC-9-80, B767, B757, and A320.

A June 1974 Amendment to Part 36 noted that a certificate of compliance with the regulation should not be construed as a Federal determination that an aircraft type is "acceptable" in a particular airport environment. This would remain the purview of the airport proprietor. The FAA also noted that many pilots were becoming concerned about potential disparities between the compliance certification method and actual non-test operational performance. This concern stemmed from differences in airline operating techniques.

In December 1976, a new Amendment required all aircraft affected by Part 36 to comply with regulation noise levels, according to a specified time schedule, by 1985.

In October 1977, a new Amendment made provisions for three stages of aircraft noise limitations. Aircraft were classified under each stage and applicants for new type certification applied for after November 5, 1977 were to comply with the more restrictive Stage III limitations.

Two further Amendments, in February and April 1978, were aimed at bringing United States noise standards into greater comformity with standards recently adopted by the International Civil Aviation Organization. The new standards incorporated the latest Environmental Protection Agency recommendations.

In June 1978, a recent Amendment concerned SST operations in the United States; it referred specifically to aircraft noise level and sonic boom requirements.

FAA, FEDERAL REGULATIONS, PART 77, OBJECTS AFFECTING NAVIGABLE AIRPSACE, JANUARY 1975

This regulation establishes standards for determining obstructions in navigable airspace, and sets for the requirements for notifying the FAA of certain proposed construction or alteration.

Notice is required in any of the cases indicated below.

A. Any construction/alteration greater than 200 feet above ground level.

B. Construction/alteration of greater height than an imaginary surface extending outward and upward at one of the following slopes:

   1) 100:1 for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport with at least one runway of more than 3,200 feet;

   2) 50:1 for a distance of 10,000 feet from the nearest runway of each airport with its longest runway of 3,200 feet or less;

   3) 25:1 for 5,000 feet from the nearest landing and takeoff area of a heliport.

C. Any construction/alteration within the airport area.

The regulation establishes obstruction standards applicable to existing and proposed man-made objects, objects of natural growth and terrain.

FAA ORDER WE1050.3, NOVEMBER 1976
AVIATION NOISE ABATEMENT POLICY

This order clarifies the federal responsibility to reduce the impact of aircraft noise on populated areas and to encourage compatible land use in areas adjacent to airports. It deals specifically with the time that will be required to bring the commercial aircraft fleet into compliance with noise standards.

The following information is discussed.

INTRODUCTION AND SUMMARY OF AVIATION NOISE ABATEMENT POLICY

Aviation Noise Abatement Policy

- A. Basic Principles
- B. Authorities and Responsibilities
- C. Federal Action Plan to Implement These Policies
  1. Aircraft Source Noise Regulation
  2. Operating Procedures
  3. Airport Development Aid Program
  4. Airport Noise Policy
- D. Air Carrier Action Plan
  1. Aircraft Compliance
  2. Financing
- E. Local Actions

ANALYSIS OF THE NOISE PROBLEM, LEGAL FRAMEWORK, AND DESCRIPTION OF THE FEDERAL ACTION PROGRAM

Statement of the Problem

- A. The Noise Problem
  1. How Noise is Described
  2. How Noise Affects People
  3. Whom Does Noise Affect and Where Do They Live
  4. The Source of Aircraft Noise: Composition of the Fleet

B. The Financial Problem

1. Ability of Airlines to Finance Aircraft Replacement

2. The Aerospace Industry

Legal Framework

A. Legal Responsibilities of the Federal Government

B. Legal Responsibilities of State and Local Governments

C. Legal Responsibilities of Airport Proprietors

Federal Response

A. Quieting the Air Carrier Fleet

1. Federal Regulation of Existing Aircraft

2. Economic Benefit from a Mixed Replacement and Modification Program

3. Time Frame

4. International Air Carriers

B. Financing Mechanism

C. Additional Federal Action

1. Source Regulation for Future Aircraft

2. Aircraft Operating Procedures

3. Federal Research and Development Technology

D. Protecting the Airport Environment

1. Airport Proprietor's Responsibilities

2. State and Local Government Responsibility

3. Federal Support for Airport Proprietor and Local Government Noise Abatement Activities

4. FAA Review of Proprietary Use Restrictions

E. Private Sector Responsibility

FAA ORDER WE1050.4A, JUNE 1980
NOISE ABATEMENT PROGRAMS AND AIRPORT RESTRICTIONS

The intent of this order is to develop an effective, standardized, and efficient administrative system to process the total regional noise program. To achieve this, the FAA will work with local airport managers and users. This system shall be coordinated by a Regional FAA Noise Abatement Officer (NABO), established within the Air Traffic Division. He shall have program responsibility for all regional noise abatement programs, receiving broad policy guidance from the regional director. The position shall be under the direct supervision of the Chief, Airspace and Procedures Branch. The NABO receives all noise plans and proposals submitted to the region. A project file will be established and maintained within the Airspace and Procedures Branch. Air Traffic Division guidance and administrative staff support will be provided by the Airspace and Procedures Branch.

Selected regional headquarters division, staff and field office chiefs shall be familiar with and sensitive to all aspects of national and regional noise policy. Air Traffic field facilities have the initial local responsibility, and the Air Traffic Division the regional responsibility, for coordination of all air traffic problems. The Airports Division shall have the responsibility for all airport-related development programs, such as day-to-day public contact relating to noise problems. The Flight Standards Division has the ongoing responsibility for the coordination of aircraft safety and flight procedures, including noise abatement departure procedures. Airway Facilities field offices and the Airway Facilities Division have a responsibility to the overall noise abatement program, primarily relative to the construction and modernization of ground facilities. The Aircraft Engineering Division's primary responsibilities are FAR 36 certification and associated noise computation, fleet mix and engine retrofit impacts, fuel economy and aircraft performance. Aircraft Engineering is also responsible for regional involvement in aircraft noise measurement activities and noise level analysis. The Regional Council is involved in the legal interpretation of policy guidelines and regulations pertaining to noise abatement proposals and programs for users, the public, local, and state governments.

Field chiefs are expected and encouraged to consult with airport proprietors and local governments in the development of noise abatement actions and programs. In consulting with the airport proprietors, field chiefs should attempt to direct the planning effort toward <u>realistic</u> improvements. The regional office receiving a proposal, a complaint or request for an action from a facility or from the public, should refer the request to the NABO, who will determine which division or staff office will act as the regional action office. The delegated action office shall determine the coordination necessary with other divisions and offices.

The FAA will not support or enforce airport management noise abatement action, city ordinances, resolutions, or prohibitions that are contrary to guidelines contained in DOT/FAA policy statement of Order 1050.11. Decisions to cooperate or not cooperate in an airport management proposal contrary to the provisions of the DOT/FAA policy will be determined by the NABO (after consultation with the Airports and Flight Standards Division, Regional Council, Regional Planning and Appraisal Officer, air traffic facility chiefs concerned and the Air Traffic Division). After coordination with the NABO, the terminal facility chief will assist the airport manager in preparing and distributing informal noise abatement program information through letters to airmen, pilot meetings and so on. No reference to any local rules or ordinances will be made or will prohibitions be included. Phraseology to be used by air traffic control, when necessary to advise pilots of informal proagrams, should refer to noise abatement and shall not state or imply prohibition or make reference to local rules, unless the FAA agrees after following due process as described in the DOT/FAA policy statement. In no instance shall noise advisories interfere with control duties.

Field office chiefs (Air Traffic, Flight Standards, and Airports as a team) are responsible for (a) taking affirmative action to validate noise complaints by contacting or meeting with the complainant to explain and discuss the situation (b) follow-up action with aircraft operators, flight schools and airport managers (c) ensuring that controllers are fully aware of their responsibilities in noise abatement efforts, and being cognizant of local noise sensitive areas.

FAA PART 91, SUBPART E, JANUARY 1977
OPERATING NOISE LIMITS

This subpart updates WE5010.3 and prescribes operating noise limits and related requirements that apply, as follows, to the operation of civil aircraft in the United States.

(1) Sections 91.303, and 91.307 apply to U.S. registered civil subsonic turbojet airplanes with maximum weights of more than 75,000 pounds and having standard airworthiness certificates.

(2) Sections 91.309 and 91.311 apply to registered civil supersonic airplanes having standard airworthiness certificates. Tradeoffs may be used for the following airplanes:

   (a) Airplanes shown to comply with Part 36 before January 1, 1977.

   (b) Airplanes shown to comply with Part 36, prior to the issuance of an original standard airworthiness certificate, on or after January 1, 1977.

   (c) Airplanes for which the operator shows that, after full application of existing technology, the use of tradeoffs is required for compliance with Part 36.

On and after January 1, 1985, except as provided in Section 91.307, no person may operate any subsonic airplane covered by this subpart, in the United States, unless that airplane has been shown to comply with Part 36. Airplanes shall be shown to comply with Part 36, in accordance with the following schedule:

(1) By January 1, 1981:

   (i) At least one quarter of the airplanes in each airplane type that has four engines with no bypass ratio, or with a bypass ratio less than two.

   (ii) At least one half of the airplanes in each other airplane type.

(2) By January 1, 1983:

   (i) At least one half of the airplanes in each airplane type that has four engines with no bypass ratio, or with a bypass ratio less than two.

   (ii) All other airplanes.

Airplanes may be operated if, under an approved plan, replacement airplanes have been ordered and are scheduled for delivery prior to January 1, 1985, but not after the dates specified in the plan. For the purpose of this paragraph, replacement airplanes are airplanes shown to comply with Part 36 prior to the issuance of an original standard airworthiness certificate.

FAA ADVISORY CIRCULAR, OCTOBER 17, 1978
NOISE ABATEMENT DEPARTURE PROFILE

This advisory circular describes safe standard noise abatement departure profiles for turbojet-powered airplanes with a maximum certificated takeoff weight over 75,000 pounds, consistent with Federal Aviation Regulation (FAR) Section 91.87, and Aviation Noise Abatement Policy, dated November 18, 1976. It addresses turbojet-powered airplanes with a maximum certificated takeoff weight over 75,000 pounds, because they present one of the most significant noise impacts on the airport community and because their operating characteristics are different from other airplane groups.

Current air carrier departure profiles result in varying degrees of noise control and abatement at different points along the departure flight tracks. The FAA recommends the use of a standardized noise abatement departure profile, to assess the noise impact of operations at particular airports and for airport proprietors to fulfill their "local option" obligations in a comprehensive aircraft noise abatement program, under the Aviation Noise Abatement Policy.

Noise Abatement Departure Profiles

Takeoff and climb at an airspeed of liftoff speed plus 10 to 20 knots, until attaining an altitude of 1,000 feet above airport elevation.

Upon attaining 1,000 feet above airport elevation, accelerate to the zero flap minimum safe maneuvering speed (V_{DF}) while retracting flaps on schedule and reduce thrust. Thrust should not be reduced below the minimum thrust at which compliance has been shown with the required final takeoff climb performance gradient with one engine inoperative under Section 25.121(c) of Part 25 "final takeoff engine out climb gradient". Thrust should be reduced consistent with the following:

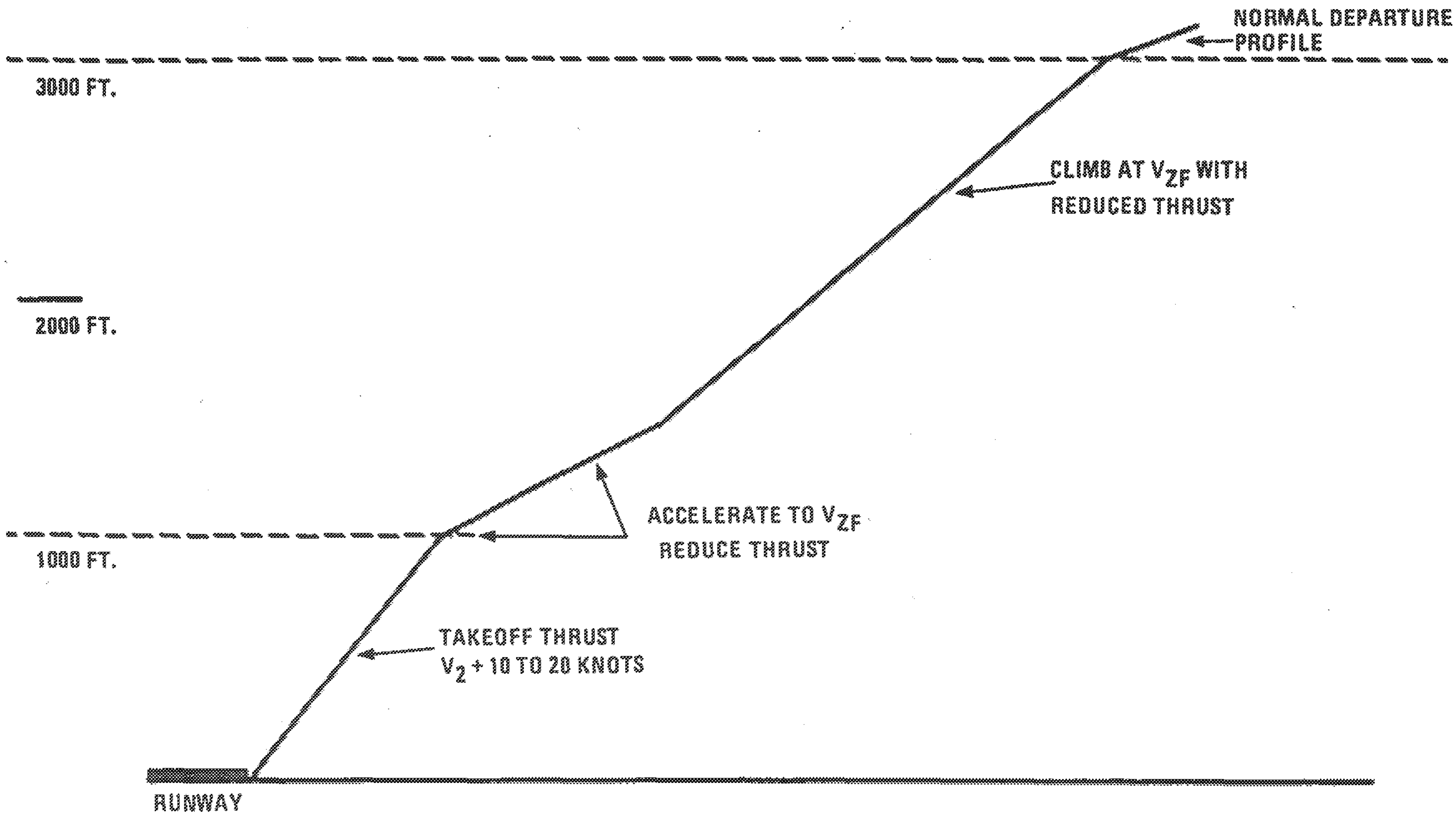
(1) Thrust for airplanes with high bypass ratio engines should be reduced to normal climb thrust.

(2) Thrust for airplanes with low bypass ratio engines should be reduced below normal climb thrust but in no case lower than that necessary to maintain the final takeoff engine-out climb gradient.

(3) Thrust for airplanes with slow flap retraction rates should be reduced at an intermediate flap setting.

Continue climb at an airspeed not greater than V_{ZF} + 10 knots at the reduced thrust to an altitude of not less than 3,000 feet

FIGURE 1. STANDARD NOISE ABATEMENT DEPARTURE PROFILE



AAE whereupon the pilot should smoothly initiate a normal climb profile (Figure One). However, the reapplication of power can be delayed if that event would occur over a noise sensitive area.

Discussion

Due to safety factors, the standard noise abatement profile contains a minimum altitude for thrust reduction of 1,000 feet and a limitation on the amount of thrust reduction based on the performance characteristics of the airplane and its takeoff weight. There are several noise abatement techniques which are effective depending on the location of the noise sensitive area. Airports which have noise problems can achieve noise abatement through developing and using a preferential runway use program in combination with the use of noise abatement departure profiles. Reviews of various noise abatement departure profiles have shown that they are most effective within ten miles of an airport. Therefore, the standard noise abatement departure profiles contained in this circular primarily addresses noise problems.

These standardized noise abatement profiles have three major benefits. They improve safety by reducing flightcrew workload during a critical phase of flight; they improve the ability of the airport proprietor, local bodies, and local residents to assess the noise impact of operations at a particular airport; and they improve the ability of the airport proprietor and the FAA to monitor flightcrew adherence to the profile. The standard noise abatement profile will also encourage fuel conservation.

Operational flexibility in the profile is essential in order to operate each airplane type most efficiently in terms of both noise abatement and fuel conservation.

(1) Thrust for airplanes with high bypass ratio engines (e.g., DC-10, B747, L1011, A300) should not be reduced below normal climb thrust on departure. This is because the noise generated by these engines is not significantly affected by reducing thrust below normal climb thrust, but the climb performance is significantly reduced. A reduced thrust climb would result in more noise on the ground since the airplane would remain at lower altitudes longer.

(2) Thrust for airplanes with low bypass ratio engines (e.g., B-707/727/737, DC-8/9) should be reduced below normal climb thrust but in no case lower than that necessary to maintain the final takeoff engine-out climb gradient. Review of airplane data has shown that reducing thrust below normal climb thrust on these engines can provide significant noise benefits.

(3) Thrust for airplanes with slow flap retraction rates (e.g., B-747), should be reduced at an intermediate flap setting rather than waiting until the flaps are fully retracted. Otherwise, because of their flap retraction rate, these airplanes could be at takeoff thrust significantly longer than other airplanes. This longer time at takeoff thrust could result in a greater noise impact than if they had climbed out at reduced thrust beginning at an intermediate flap setting.

This advisory circular, including the publication of a standard noise abatement profile, should not be construed to affect the responsibilities and authority of the pilot in command for the safe operation of the airplane under FAR § 91.3 or other regulations.

FAA (NEW) PART 150, JANUARY 1981
AIRPORT NOISE COMPATIBILITY PLANNING

This new proposed Part 150 is to integrate airport operators' noise compatibility planning programs (ANCLUC) with the FAA's administrative process for evaluating and determining the effects of those programs.

It is an interim regulation which implements portions of Title 1 of the Aviation Safety and Noise Abatement Act of 1979.

Title 1 of the Act required the U.S. Department of Transportation (DOT), after consulting with the FAA and the Environmental Protection Agency and other federal, state, and interstate agencies to establish the following.

1. A single system of measuring noise at airports and the areas surrounding such airports.

2. Identify land uses which are normally compatible with various exposures of individuals to noise.

As of February 28, 1981, any airport operator may submit a noise exposure map to DOT, in accordance with Part 150. Non-compatible uses (after a given date) in each area of the map must be identified, a description made of the airport's projected aircraft operations during 1985 and the ways delineated in which such operations will affect the map. After submission of the exposure map, any change in the airport's operations that create a substantial new non-compatible land use will entail the airport operator to submit a revised noise exposure map showing each new non-compatible use.

Airport noise compatibility planning necessitates the development of information necessary to prepare and submit the noise exposure map and related information. This includes any costs associated with obtaining the information, as well as the preparation of a noise compatibility program for submission to DOT. DOT may make grants for airport noise compatibility planning to those airports whose projects are eligible for terminal development costs. After consultation with all concerned government, air carrier, and airport officials any airport operator who has submitted a noise exposure map may set forth the measures proposed for reduction of existing and any new non-compatible land uses.

Measures that airport operators may take, but are not limited to, are the following:

1. Preferential runway system.

2. Restriction of any type or class of aircraft, based on the noise characteristics of such aircraft.

3. Construction of barriers and the soundproofing of public buildings.

4. Use of flight procedures; the FAA must approve any new flight procedures.

5. Land acquisition and interests therein, including, but not limited to, air rights, easements and development rights, so as to assure the use of property for purposes which are compatible with airport operations.

Part 150

150.1 Scope and Purpose. Prescribes the procedures, standards and methodology governing development, submission and review of airport noise exposure maps, airport noise compatibility programs, and the process for evaluating and approving or disapproving those programs.

(a) It prescribes single system for measuring noise at airports - Ldn.

(b) Land uses which are normally compatible with various levels of exposure to noise by individuals. Land use compatibility/non-compatibility are identified in a table commencing with below 65 Ldn., in 5 db intervals into areas identified over 85 Ldn.

150.3 Applicability. Airport noise compatibility planning activities of air carrier airports whose development projects are eligible for terminal development costs under Airport Improvement Program.

150.5 Limitations of This Part

(a) Approval or disapproval, in whole or in part, of any map or program submitted should not constitute the use of land which is acceptable or unacceptable under federal, state, or local law.

(b) Approval neither represents a commitment to support or financially assist the implementation of the program.

(c) Approval does not direct any implementating action.

150.9 Designation of Noise Systems.

(a) Noise may be measured in A-weighted sound level in units of dBA. (The DOA monitoring system does this.)

(b) Exposure of individuals must be established in terms of yearly day-night sound level (Ldn). (The DOA monitoring system also prints out this index.)

(c) Uses of land must be based on professional planning criteria, utilizing comprehensive land use planning and zoning, or building and site designing, as appropriate. Compatibility must be based on that use which is most adversely affected by noise.

150.11 Incorporations by Reference. This part prescribes certain standards and procedures which are not set forth in full text.

150.21 Noise Exposure Maps and Related Descriptions. Exposure maps are to identify non-compatible land uses, as of the date of submission, together with a description of:

1. Projected aircraft operations for 1985 and, if submitted after 1982, for the fifth calendar year beginning after the date of submission, based on reasonable assumptions concerning future aircraft operations, planned airport development, planned use changes, and demographic changes.

2. Each map must be developed in consultation with public and planning agencies inside the 65 Ldn contour depicted on the map. Consultation must include all aircraft operators using the airport. Prior to submission of the map, the airport operator shall afford interested persons adequate opportunity to submit their views as to the adequacy of the draft noise exposure map and the descriptions of projected aircraft operators.

150.23 Noise Compatibility Programs. This section describes at length what should be submitted to the FAA to constitute a noise compatibility program.

150.31 Preliminary Review Acknowledgements.

150.33 Evaluation of Programs.

150.35 Determinations on Programs Publication Effectivity.

STATE OF CALIFORNIA, ADMINISTRATIVE CODE, NOISE STANDARDS
TITLE 4, CHAPTER 9, SUBCHAPTER 6, JUNE 1979

The purpose of this regulation is to cause airport proprietors, aircraft operators, local governments, pilots and the Division of Aeronautics to work cooperatively to diminish aircraft noise in communities near airports. The regulation establishes mandatory standards and procedures applicable to all existing and future airports in the State. Legal grounds for the standards are based on:

1) the power of airport proprietors to impose noise ceilings on the use of the airport;

2) the power of the State to act within the boundaries of Federal law.

The quantitatiave framework that the various parties will use to reduce aircraft noise problems is largely based on use of the commonly accepted A-weighted noise level and the Daily Community Noise Equivalent Level (CNEL).

The methodology for dealing with noise problems include the following:

1) Encouraging use of only quieter aircraft classes.

2) Encouraging noise-minimizing flight paths and procedures.

3) Runway utilization that accounts for adjacent residential areas, aircraft noise characteristics and noise sensitive time periods.

4) Reduced flight frequency in noise sensitive periods, by noisier aircraft classes.

5) Use of acoustical buffers.

6) Developmet of compatible land use within the noise impacted CNEL boundary.

The schedule by which the CNEL criterion for airports with four-engine jet transports and at least 25,000 annual air carrier takeoffs/landings is as follows:

Date	CNEL (in decibels)
1-1-81 to 12-31-85	70
1-1-86 and thereafter	65

Compatible land uses within the noise impacta boundary are listed below.

1) Agricultural

2) Airport property

3) Industrial property

4) Commercial property

5) Property subject to navigational noise easements

6) Zone, open space

7) Apartments sound insulated to 45dB

8) Existing homes (near existing airports) appropriately sound insulated

UNITED STATES CONGRESS, AIRPORT AND AIRWAY DEVELOPMENT ACT OF 1970, TITLE I OF PUBLIC LAW 91-258 AS AMENDED THROUGH 1976

This Act laid the legislative foundation for the improvements of the nation's airport/airway system. This was necessary to enable the system to meet the increasing demands of interstate commerce, the postal service and national defense.

To do this, a National Transportation Policy was formulated. Its goals were the following:

1. Coordination of the development and improvement of all modes of transportation.

2. Establishment of priorities with respect to the development and improvement of each transport mode.

3. Coordination of all recommendations relating to development of the national system.

Inherent in the Act are the need for "airport master planning", including the potential use and development of land surrounding an actual or potential airport site.

To promote these actions, the Secretary of Transportation was authorized to make Federal grants to planning agencies. The Governor of the state in which these developments took place was to certify that all applicable air and water quality standards were adhered to.

UNITED STATES CONGRESS, PUBLIC LAW 96-193, AVIATION SAFETY AND NOISE ABATEMENT ACT OF 1979, FEBRUARY 1980

This Act delays the Federal aircraft noise standards scheduled up to 1985, for certain types of aircraft. Two-engine jetliners with fewer than 101 seats will not have to comply with the standards until January 1983. Two-engine jets with more than 100 seats are exempted from compliance until after January 1985, unless they are sold after January 1983. Some two-thirds of the 500 twin-engine jets now in use have less than 101 seats. Airlines would be able to fly any two-engine aircraft until January 1986, if the operator has entered into a binding contract by January 1983, for delivery, prior to January 1986, of a quieter replacement meeting FAA Stage III noise limits. Three-engine jets can be operated through 1985 if Stage III replacements are purchased. Four-engine liners will still have to meet the current noise control compliance schedule.

The Act also requires all foreign aircraft to comply with FAA noise standards. Noise from domestic and foreign aircraft must be measured by a common noise monitoring system, at the airport and in the surrounding areas.

The Act further specifies that people buying property around airports, to which a noise exposure map has been submitted, cannot recover damages from aircraft noise, if such people have "active or constructive knowledge" of the map. This provision is negated if the airport's operation or layout changes significantly from when the exposure map was made.

FAA ORDER 5100.36 - LAND ACQUISITION

Paragraph 604, entitled, "Land Acquisition - Clear, Approach, Transition and Horizontal Zones", defines areas eligible for acquisition with Federal funds under the new superceded ADAP. It is anticipated that the new legislation under the airport improvement program (AIP) will incorporate a similar land acquisition process. An opportunity for additional land acquisition with Federal funds could exist within the "Approach Areas" as defined in this order as..."Land necessary to restrict the use of areas adjacent to, or in the immediate vicinity of the airport as defined below to activities and purposes compatible with normal operations as well as to meet current and anticipated development at the airport. Where sponsors have the capability to acquire property which will satisfy the total ultimate forecast needs of their airport based on an approved master plan they should be encouraged to do so. The dimensions cited below are to be considered as desirable minimums" (see Figure 6-1).

At airports serving or anticipated to serve turbojet aircraft, such areas of land may extend up to 1250 feet laterally from the runway centerline, extending 5000 feet beyond the end of the primary surface.

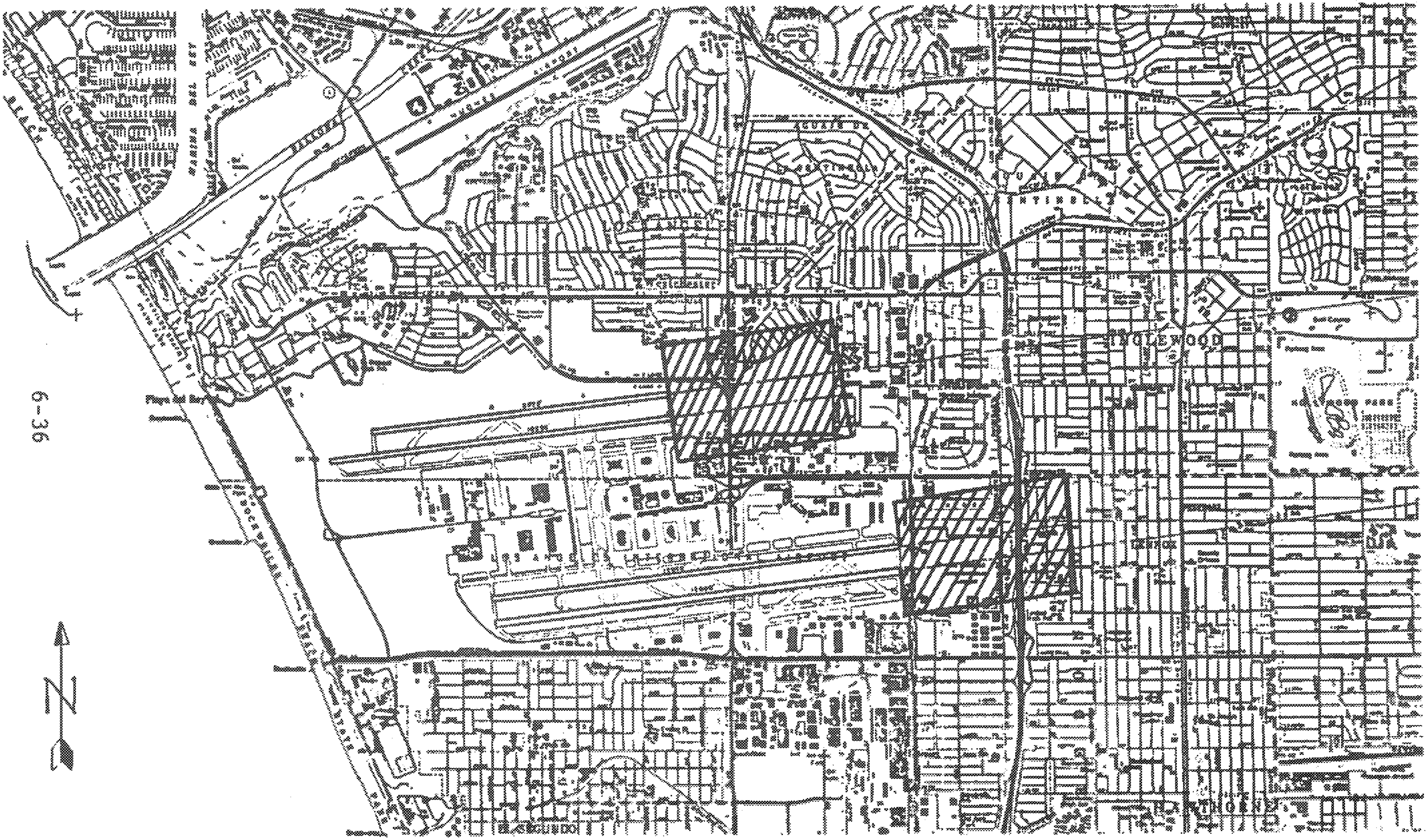


FIGURE 6-1 FAA Defined Approach Zone Areas
(Scale: 1"=4,000 ft.)

LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL/LAND USE COMPATIBILITY STUDY

TASKS 2.07 & 2.08

PRELIMINARY PROBLEMS AND ISSUES

IDENTIFICATION AND PUBLIC REVIEW PROCESS

Table of Contents

I. INTRODUCTION

Phase II of the LAX Airport Noise Control/Land Use Compatibility Study (ANCLUC) placed major emphasis on the identification of key problems and issues related to achieving greater compatibility between the airport and adjacent communities.

The following provides a summary of efforts to identify and articulate major problems and issues as perceived by both those who operate and utilize the airport and those who live and work in adjacent communities. More specifically, this paper describes the manner in which key problems and issues were initially identified; summarizes the results of the subsequent public review process; and, outlines the process by which information generated during this phase will be employed to guide development of alternative mitigation programs.

II. PRELIMINARY IDENTIFICATION OF PROBLEMS AND ISSUES

The process of identifying major problems and issues began in mid-1981. Study participants first prepared a listing of potential concerns based upon professional experience and expertice. Utilizing this initial material, staff working sessions were devoted to clarifying the nature of various problems and issues raised, and compiling a revised listing.

In order to obtain initial public comment, an open meeting was conducted on September 2, 1981. The meeting, held in the Westchester Municipal Center, was attended by over 200 community residents, and provided a forum for all who wished to express their concerns and/or offer suggestions. Public comments and suggestions were noted and subsequently added to the preliminary listing of potential problems and issues.

Based upon preliminary staff work and public comment, a draft Problems and Issues paper was prepared. The paper identifies six major areas of concern, including Aircraft Noise; Incompatible Land Use; Public Health and Safety; Fiscal, Legal and Political Constraints; Distribution of Costs and Benefits; and, Ground Access. Within each general area of concern, specific problems and issues are listed. "Problems" are defined as adverse situations or conditions which must be resolved. The term "issue" refers to a dispute among varying interests as to the nature of a problem and/or the means by which it might best be addressed.

The draft Problems and Issues paper was next submitted to the ANCLUC Steering Committee for review and comment. In response to Committee recommendations, the draft paper was revised and released for a second, and more intensive round of public review (see Appendix A. - Preliminary Problems and Issues Paper).

III. PUBLIC REVIEW PROCESS

A. Description of Community Workshops

At the request of the Steering Committee, ANCLUC staff prepared and presented an outline of the proposed Phase II public participation process (see Appendix B. - Public Participation Process). A key objective of the process was to maximize opportunity for public participation in the ANCLUC Study. For this reason, a series of community workshops was felt to provide the most productive overall approach.

Three public workshops were conducted during December 1981 and January 1982. The first was held on December 10th, in conjunction with a joint meeting of the Los Angeles Citywide and Areawide Airport Advisory Committees. The second and third workshops were conducted on January 11th and 12th, and were held in the Inglewood City Hall and the Westchester Municipal Center respectively. Each workshop was designed to achieve three primary objectives.

- To inform members of the community as to the objectives and status of the LAX ANCLUC Study.
- To obtain public assistance in describing specific compatibility problems and in prioritizing issues to be addressed in the ANCLUC Study.
- To create expectations for greater airport/community compatibility.

In terms of format, the public workshops relied upon small group discussion techniques. Following brief opening remarks, workshop participants were divided into small discussion groups, typically ranging from 8 to 15 persons. ANCLUC staff worked with each citizens group, serving as discussion facilitators. The draft Problems and Issues paper was used to guide group dialogue, although participants were encouraged to raise and discuss additional concerns which had not been previously identified.

Approximately one hundred persons attended the three workshops. While persons living throughout, and even outside the study area attended, the Playa del Rey, Westchester and north Inglewood areas were best represented.

B. Summary of Public Comments

Citizens attending the community workshops generally agreed that the draft Problems and Issues paper identified most major concerns. Comments received essentially focused on describing the specific nature of problems experienced in various communities surrounding the airport, and to a lesser degree on what might be done to resolve them (see Appendix C. - Summary of Public Comment).

Not surprisingly, low altitude overflights (approach and departure) of homes and schools emerged as the major community concern in terms of both noise and safety. Interuption of normal daily activities as a result of overflight noise, exhaust residue (soot and oil droplets), and fear of falling debris were commonly cited problems.

The concept of "sensitive hours" was consistently raised with regard to the whole range of noise issues identified. Citizens expressed particular annoyance with single noise events occuring during evening and nightime hours.

Westchester community residents opposed further land use modifications and/or acquisitions as a means of resolving compatibility conflicts. However, others suggested that land use changes may be the only means of achieving compatibility in the most severly noise impacted areas. It was noted that in the past, land use changes have occured on a piecemeal basis, sometimes creating more compatibility problems than were solved. Citizens recommended that where necessary, lands should be recycled to airport-compatible uses on a neighborhood by neighborhood basis, taking into consideration the impact of new development on remaining residential areas. It was further suggested that community leaders (i.e. elected and appointed officials) should be more aggressive in discouraging incompatible land use and stimulating new compatible development, utilizing whatever tools and resources can be made available.

Safety issues receieved considerable attention. While various changes in airport operations were suggested as means of reducing noise impacts, workshop participants agreed that the safety of community residents and airline passengers should never be jeopardized. In this regard, the question of "how safe is safe enough?" was often raised. By and large, community residents felt that it is the combined responsibility of the FAA, the aiport proprietor and the airline industry to establish and maintain acceptable safety levels for all aircraft operations.

Although community residents acknowledged the legitimate roles of the various local, state and federal agencies involved in airport operations and air traffic regulation, many were frustrated by the inability to clearly fix responsibility for the mitigation of noise impacts. This lack of clarity was often perceived as "buck-passing". It was suggested that the Department of Airports take a stronger lead in developing and enforcing noise abatement policies in those areas where its jurisdiction is relatively clear (i.e., ground operations, variance proceedings for access of new airlines, etc.), and work more actively with the FAA and airline industry to achieve noise reductions in areas where the responsibility is shared (i.e., premature turns, overocean operations, enforcement of "tank turn" procedures, etc.).

Issues pertaining to ground access and congestion were essentially viewed from a localized perspective. For example, citizens of the Westchester community were primarily concerned with potential congestion problems associated with proposed new development on the airport's northern periphery; Inglewood residents viewed traffic, particularly truck traffic, on Arbor Vitea Street as a major issue; and, representatives of the El Segundo business community expressed concern regarding current and future access for office complexes and industrial parks now being developed within the city. In most instances, the concerns voiced did not deal with regional access to LAX, but rather with local difficulties associated with getting around or through LAX and its immediate environs.

While most community concerns had, in one form or another, been identified in the draft Problems and Issues paper, additional concerns were broght to light during workshop discussions. The most consistently mentioned was the growing and anticipated future volume of helicopter traffic. A common perception was that there is little or no regulation of helicopter traffic, and that increased helicopter operations would aggrevate current noise and safety problems. It was recommended that the Airport adopt strict regulations to govern helicopter operations, including the establishment of approach and departure routes to eliminate overflights of residential areas, flight altitude requirements, and restrictions on hours of operations, i.e., curfews.

Other problems not previously identified included the impact of thrust reversal noise on communities both north and south of the airport, and noise and safety concerns associated with smaller, "unregulated" general aviation aircraft.

The workshop process provided only general guidance in terms of prioritizing problems and issues. Citizens suggested that no one solution can significantly reduce compatibility problems. Instead, it was felt that an incremental approach, combining several programs which individually make small improvements, may produce the most beneficial cumulative results.

IV. DEVELOPMENT OF ALTERNATIVES

The process of identifying major problems and issues is critical to the success of the next step in the ANCLUC Study - that of developing effective mitigation programs. Information gathered during the problem definition phase must now be employed to guide the identification, evaluation and selection of those program alternatives that best respond to articulated community concerns. The following briefly outlines the manner in which these two processes are to be linked (i.e., problem definition and alternatives development, Tasks 2.11 & 2.13).

A. Problem Definition

Utilizing the information gathered to date, identified problems will be defined as specifically as possible. Each will be described in terms of unique characteristics (i.e., areas impacted, time and frequency of occurance, magnitude/severity, etc.), current mitigation efforts will be reviewed, and the future outlook will be assessed assuming no additional mitigating actions.

B. Possible Mitigations

A range of possible mitigations will be identified, including those initially raised as issues. As appropriate, such mitigations will include possible airport operational changes, sound attenuation programs, and potential land use modifications.

C. Analysis Methodology

Having clearly defined the problem and listed potential mitigation alternatives, the next step is to identify how each reasonable alternative can best be explored. It may be that some alternatives can be evaluated for effectiveness utilizing computer assisted modeling techniques, such as the Integrated Noise Model approach. Others, such as the development of a community sound insulation program, may best be evaluated within the context of an existing or ongoing research program. Still other alternatives may require new programs or studies to properly assess their value. In addition to identifying how each alternative can best be evaluated, it is also important to estimate the timing of the evaluation process (when will the study be initiated? - when will we know if the alternative is both feasible and effective?).

D. Program Strategy

Program strategy development clearly involves both a technical and political decision-making process. The range of problems that have been identified and defined must now be prioritized. Prioritization will be based upon both technical capabilities and the level of community interest in resolving the problem. Those given high priority will be addressed first, while those of lower priority will be deferred until resources necessary for thier resolution can be made available.

A second set of decisions involves selecting the alternative mitigations to be evaluated as well as the method of evaluation. Time and fiscal constraints will limit the number of alternatives to be evaluated, as well as the scope and specificity of the evaluation process.

E. Steering Committee Review and Recommendation

The above outlined process will result in a series of proposals regarding how to proceed during Phase III of the ANCLUC Study, and to a large degree, will define the range of action programs to be considered. At this point, it is most important to develop an effective level of agreement as to the relative priority of identified problems and the acceptability of potential alternative mitigation programs.

The analysis required to suppoort this initial decision-making process is substantial. For this reason, an incremental review process will be employed. Specific problems or problem sets will be evaluated by ANCLUC staff. As such evaluations are completed, they will, together with a recommended course of action, be brought before the Steering Committee for review and action. Because implementation of ANCLUC recommendations will ultimately depend upon the acceptance and support of airport management and the governing bodies of surrounding local jurisdictions, Steering Committee guidance is critical at this juncture.

Draft
December 1981

APPENDIX A

LAX-ANCLUC Study Phase II: Problems and Issues

I. Introduction

Phase II of the Airport Noise Control/Land Use Compatibility Study focuses upon identification of key problems and issues related to achieving greater compatibility between airport activities and surrounding community land use patterns. This document represents the initial attempt to define those problems and issues as percieved by both community residents and the commercial aviation industry.

This effort is intended to provide direction for the next step in the ANCLUC process - developing alternative mitigation programs.

II. Problems and Issues

To date, six major problem areas have been identified. These include:

A. Aircraft Noise;
B. Incompatible Land Use;
C. Public Health and Safety;
D. Fiscal, Legal and Political Constraints;
E. Distribution of Costs and Benefits; and,
F. Ground Access.

Within each topical area of concern, specific problems and related issues have been identified. For purposes of this paper, the term "problem" has been defined as an adverse situation which needs to be resolved. The term "issue" refers to a matter to be decided as a means of resolving the problem.

A. AIRCRAFT NOISE

Specific Problems

1. Easterly jet aircraft arrivals over residential and other noise sensitive areas.

   Impacted Communities
   North runways: Inglewood, Westchester, So. Central L.A.
   South runways: Inglewood, Hawthorne, Lennox, Del Aire, El Segundo, So. East L.A.

2. Westerly jet aircraft departures impacting residential and other noise sensitive areas.

   Impacted Communities

   North runways: Westchester, Playa del Rey.
   South runways: Lennox, Del Aire, El Segundo.

3. Over ocean arrivals.

   Impacted Communities

   North runways: Westchester, Playa del Rey.
   South runways: El Segundo.

4. Easterly departures.

   Impacted Communities: All.

5. Take off related drift and/or premature turns resulting in overflights of residential and other noise sensitive areas.

   Impacted Communities: El Segundo, Playa del Rey.

6. Aircraft operations at sensitive hours.

   Impacted Communities: All.

7. Jet aircraft taxiing noise, particularly associated with night time cargo operations.

   Impacted Communities: El Segundo, Del Aire, Lennox, Westchester.

8. Night time jet engine maintenance runups.

   Impacted Communities: El Segundo, Westchester, Lennox, Del Aire.

9. Use of Auxilary Power Units (APUs) by grounded aircraft at gates or on holding positions.

   Impacted Communities: El Segundo, Westchester.

10. Jet aircraft operations at Imperial Terminal.

    Impacted Communities: El Segundo.

<u>Outstanding Issues</u>

1. How and to what extent can jet aircraft drifts/premature turns on westerly departures be controlled to reduce overflights of noise sensitive areas?

2. To what degree can CNEL values be reduced through modification of, or greater control over evening and night time operations?

3. To what degree can aircraft taxi noise be reduced by towing?

4. How will future air traffic be distributed on the four runways in terms of aircraft type and operations?

5. To what extent can significant reductions in noise impacts for all communities be achieved with westerly extentions to existing runways and threshold displacement?

6. To what extent can Part 36, Stage 3 (quieter) aircraft be required for flights under 500 miles?

7. To what extent will the use of new terminals effect noise impacts?

8. To what degree can jet engine runup noise be controlled by decreasing duration of thrust, enforcing night time regulations, using portable noise supressors or installing monitors in maintenance areas?

9. Can limiting the number of night time cargo operations reduce noise significantly?

10. To what extent can noise barriers or other buffers be effective at LAX?

11. When will nonconforming uses in the South Airport Buffer Area, including the use of the West Imperial Terminal, be discontinued?

12. To what extent can noise from APUs (Auxilary Power Units) be controlled?

13. Should compliance with State noise regulations be established as a goal to be achieved through coordinated actions by the airport and surrounding communities?

14. Should the current level of enforcement of State noise regulations within the study area be improved?

15. Is total compliance with existing noise regulations possible?

16. Should the noise monitoring system be improved (e.g., to identify aircraft operations)?

17. Should the 65 CNEL contour be established as the basis for the coordinated efforts of the on- and off-airport noise control program, (i.e., to establish the maximum CNEL guideline for land use actions and serve as a target for the airport's noise boundary) or is there a more adequate noise measure?

18. How can noise reduction be accomplished in an equitable manner so that relieving one area will not further impact another?

19. How can the procedures for granting variances to LAX noise abatement regulations be made more effective in reducing aircraft noise?

20. To what extent can differential landing fee schedules be be instituted based upon aircraft noise characteristics and/or hours of operations?

B. INCOMPATIBLE LAND USE

Specific Problems

1. Incompatible land uses presently exist within known noise impact areas.

2. Existing incompatible land uses are typically not being recycled.

3. New incompatible, noise sensitive land uses are being constructed within existing noise impact areas, contrary to State noise regulations.

Outstanding Issues

1. How can LAX and the surrounding communities agree upon, and commit to an effective Noise Control Program (i.e., mutually supportive airport operations and land use policies) to achieve a reduction in noise sensitive and/or incompatible land uses?

2. To what extent can local jurisdictions employ zoning, subdivision, redevelopment and other planning techniques to reduce existing, and prevent development of new noise sensitive and/or incompatible land uses?

3. How and to what degree can an acoustical treatment program be developed in residential and other noise-sensitive areas to effectively mitigate noise impacts?

4. How and to what degree can acoustical specifications be made part of each affected jurisdiction's building permit and inspection procedures?

5. To what extent should there be relocation and disruption of residential and other noise-sensitive uses in order to achieve noise compatibility?

6. How and to what extent can local General Plan land use policies show greater sensitivity to LAX as a regional transportion facility?

7. Should guidelines for the acquisition of avigation easements be developed for each city so as to assure a minimum and uniform level of noise protection and compensation?

8. Should avigation (noise) easements, which State law provides, create legal compatibility with airport noise, be used even though they do nothing to abate noise impacts?

C. PUBLIC HEALTH AND SAFETY

Specific Problems

1. Intensively used aircraft landing tracks over populated areas.

   Impacted Communities: Inglewood, Lennox.

2. Existing and future high occupancy land uses (i.e., major public assembly uses) under intensively used landing and take off tracks.

   Impacted Communities: Inglewood, Lennox.

3. Unhealthful noise levels in noise sensitive areas.

   Impacted Communities: All.

4. Jet engine soot fallout.

   Impacted Communities: All.

5. Mitigation and/or abatement of aircraft noise can preclude enhanced safety procedures.

   Impacted Interest Groups: All.

Outstanding Issues

1. To what extent can nuisances and health hazards associated with aircraft emissions and soot be reduced?

2. To what extent does attainment of more acceptable noise levels conflict with the maintenance of an acceptable margin of safety in all flight operations?

3. Should additional high occupancy and major public assembly uses be permitted under aircraft approach and departure paths?

4. To what extent can over ocean operations be expanded?

D. FISCAL, LEGAL, AND POLITICAL CONSTRAINTS

Specific Problems

1. No agreement as to assignment of responsibility for mitigating aircraft noise.

2. As a result of litigation, the airport proprietor bears a major liability/responsibility for limiting aircraft noise, but alone does not have adequate resources, nor authority, to solve the total noise problem.

3. Competing priorities require full compliance with the California State Noise Regulations by 1986 while simultaneously satisfying demand for projected air travel, and preserving the valuable stock of impacted housing.

4. Abatement and mitigation of aircraft noise constrains airport operations, and interfers with the airlines response to market demand.

5. Priority of mitigating aircraft noise in relation to total corporate airline budgetary constraints.

Outstanding Issues

1. Should the operations at LAX continue to increase with demand or should some constraint based on noise levels be established?

2. To what extent can limitations be imposed (time slotting, operations budget, etc.) on aircraft operations to achieve a significant noise reduction?

3. If aircraft operations are reduced or limited, at what point is there an illegal restraint of interstate or international trade?

4. How and to what extent can projected air traveler demands beyond 40 MAP be satisfied by existing or new reliever airports?

5. Would restriction of access at LAX frustrate federal statutory schemes for deregulation of the airline industry?

6. Is the use of MAP as the principle capacity descriptor for planning and forecasting appropriate in terms of noise impacts?

E. DISTRIBUTION OF COSTS AND BENEFITS

Specific Problems

1. There is an inequitable distribution of costs and benefits between those in the region who use LAX and those who live nearby.

Outstanding Issues

1. Who should contribute toward the abatement/mitigation of airport noise impacts?

2. How and to what extent can a portion of the surrounding communities' airport-related development revenues be allocated toward mitigating airport noise compatibility problems?

F. GROUND ACCESS

Specific Problem

1. Key intersections and routes are over capacity.
   Impacted Interests: All

2. As a regional economic center, LAX is an attractant to development which further aggravates existing traffic congestion.
   Impacted Interests: All

Outstanding Issues

1. Should projects be approved which are compatible with the noise environment but create traffic congestion problems and other impacts?

2. How will the remaining capacity of the existing system of traffic arterials be divided?

3. How can the cumulative effects of each community's continuing growth and its effect on access to LAX be measured?

4. What measures (e.g. off-site terminals, shuttle-buses) can the airport and airline companies take to decrease the number of private automobiles coming to LAX?

5. Should Century Boulevard, which serves as a principal access route to LAX and is presently congested during peak periods, be planned for additional high density uses?

6. How can the northside airport development, local land uses and airport traffic demands be resolved relative to Manchester Avenue?

7. What will be the impact of planned improvements to Arbor Vitae Street west of the San Diego Freeway on traffic congestion to the east?

PHASE II PUBLIC PARTICIPATION PROCESS: ANNOTATED OUTLINE

PROPOSED COMMUNITY WORKSHOPS

I. Purpose

The proposed community workshops should be designed to serve three purposes.

A. To inform members of the community as to the objectives and status of the LAX ANCLUC Study.

B. To obtain public assistance in specifically describing compatibility problems and in prioritizing issues to be addressed in the ANCLUC Study.

C. To create expectations for greater airport/community compatibility.

II. Format

Three public workshops will be held. The first will be on December 10th, 7:00p.m., LAX BOAC conference room, in conjunction with the joint meeting of the Airport Area Advisory and Citywide Airport Advisory Committees.

The second workshop will be held on January 11th, 7:00 p.m., at Inglewood City Hall. This meeting will be publically noticed and open to all community residents.

The third meeting will be on January 12th, 7:00 p.m., at the Westchester Municipal Center, and again will be noticed and open to the general public.

A. Setting the Stage

Key pre-meeting activities should include the following.

1. Preparation and distribution of press releases. Follow up contact with local newspaper editors to lobby for appropriate coverage.

2. Mail out workshop materials to groups and individuals on ANCLUC notification list. Prepare and attach Notice memo describing objectives and importance of workshop.

   For the first meeting, workshop materials will essentially consist of the draft Problems and Issues paper, with prehaps some minor editorial revisions. Based upon the result of this meeting, the paper may be more substantially revised prior to distribution for subsequent workshops.

Proceeding or following mail out, key groups and individuals should be contacted to ascertain any major problems and clarify possible points of confusion.

B. Workshop Organization

Pre-meeting activities involve greeting participants as they arrive. Have them sign in, assure that they have necessary materials, and give them a "discussion group number" to facilitate later break down into smaller groups.

The actual workshop will be split into four key segments, and will last two to three hours.

1. Welcome and orientation (20-30 minutes)

   a. Staff will give a brief presentation regarding the general objectives and status of the ANCLUC study.

   b. Staff will then introduce a Steering Committee member who will discuss how the study is different from past planning efforts and why it is important.

   c. Following comments by the Steering Committee member, staff will explain the specific purpose and mechanics of that evening's workshop.

2. Small Group Discussion Session I (1 hour)

   a. Following the welcome and orientation session, participants will be asked to break down into small discussion groups based on their previously assigned numbers. (i.e., all persons assigned to discussion group number one will be asked to move a chair to discussion station number one.)

   b. The precise number of discussion groups at each of the workshops will of course depend on both the number of participants attending, and the number of staff discussion facilitators present. We should be prepared to handle ten to twelve discussion groups. Depending on attendance, we may combine discussion groups (i.e., ask all those assigned to groups 1, 3, and 5 to form around discussion station number one) and have discussion facilitators work in teams.

   A brief recess will be called to accomplish the above.

One or two staff discussion facilitators will man each discussion station. Each facilitator (or team) will have an easel with large blank flip chart paper and a variety of broad-tip color marking pens to record group comments. Each station should be located to maximize wall space for hanging up discussion notes, and to provide adequate separation from other groups. (partitions would be nice if available)

Each facilitator (or team) will also have a map of the study area. The discussion session will begin by identifying the residence, property or specific area of concern for each participant.

The main role of the facilitator is to elicit comments from the group pertaining to the nature of problems they experience, and what specific issues and alternatives they would like the ANCLUC Study to focus on. The draft Problems and Issues paper (as modified) can be used to guide the discussion. Although no comment should be rejected, the facilitator should attempt to structure the discussions around the basic areas of concern identified in that paper (i.e., Noise, Land Use Compatibility, Safety, Constraints, Costs and Benefits, and Ground Access).

c. Prior to initiating the discussion period, the facilitator should work with the group to establish this basic framework, and to agree upon approximately how much time should be devoted to each topic, i.e.:

   Noise - 20 minutes
   Land Use - 20 minute
   Safety - 5 minutes
   Constraints - 5 minutes
   Costs/Benefits - 5 minutes
   Ground Access - 5 minutes

d. Under this scheme, the initial discussion session will last approximately one hour. Following this, there will be a recess of approximately 15 minutes, during which coffee and refreshnents may be served. Participants should be encouraged to visit other discussion stations and discuss workshop products with others.

3. Small Group Discussion Session II (1 hour)

Following the recess, each group will reform. At this point, the group may wish to devote additional time to any new or previously discussed topic.

a. During the discussion periods, the facilitator must attempt to keep the discussion focused. If a comment is made pertaining to a topic not currently being considered, the facilitator should write it down, and ask the group to consider it at the appropriate time.

   If the facilitator has difficulties getting the discussion going, he must try to stimulate comment through "information giving", i.e., explain how the initial identification of problems was approached, and how various issues are related. If the group can not be stimulated into a productive discussion, the facilitator might suggest that it disolve and join other groups who are more active.

b. At the end of the second discussion period, each facilitator should provide some closing comments. Such comments might pertain to the nature and value of input received, how it will be incorporated into the ANCLUC Study, what the next steps in the process are, and how participants can obtain further information or work products.

4. Rap Up Session (10-20 minutes)

Staff will conduct a brief rap up session, thanking those present for their participation, and reiterating the next major steps in the process, what materials will be generated based on the public workshops, and how community residents can obtain additional materials and participate in subsequent Study phases.

Based on the workshops and other public participation activities, staff will prepare a summary report (Tasks 2.07, 2.08 and 2.11) and make it available to interested parties.

III. Responsibilites

A. Each meeting host (i.e., DOA, LA City and Inglewood staff) will be responsible for making the necessary facility arrangments, with assistance from other Study participants.

B. Each facilitator should bring to each workshop the necessary materials (i.e., easel, pens, tape, etc.)

C. DOA, in cooperation with L.A. County, will handle the necessary notification tasks, and reproduction and distribution of Study materials.

D. L.A. County will prepare the Study Area maps to be used at each discussion station.

E. L.A. County, in cooperation with DOA, will produce the summary report required by Tasks 2.07, 2.08, and 2.11.

F. L.A. County and DOA will work with the Steering Committee Coordinator in scheduling a future Steering Committee meeting to report on the outcome of the community workshops.

COMMUNITY WORKSHOPS: SUMMARY OF PUBLIC COMMENTS

I. AIRCRAFT NOISE

A. Staff Identified Problems

1. Easterly jet aircraft arrivals over residential and other noise sensitive areas.

   Impacted Communities
   North runways: Inglewood, Westchester, S. Central L.A.
   South runways: Inglewood, Hawthorne, Lennox, Del Aire, El Segundo, S. East L.A.

Community Perception

- Eastern arrivals on south runways produce the greatest impact on citizens in Hawthorne.
- Residents under flight paths are exposed to noise on 24-hour basis.
- Vibration and noise from overflights interrupt everyday activities (i.e., television viewing, telephone conversation etc.), and may be responsible for structural damage to buildings (i.e., cracks in walls, etc.).
- Commuter aircraft arrivals from the northeast, landing on the north runways, produce the greatest impact on north Inglewood, particularly during overcast weather conditions.
- The Briarwood area is impacted by jet landings from east. High pitch turbine whine can be heard from long distances. Low altitide jets, particularly 707s and DC8s, appear to be the worst.
- The Arbor Village Area, Century Corridor/Inglewood and Lennox are impacted by all operations. Noise seems worse in clear, dry weather conditions.
- Landing frequencies appear to be increasing in recent months, worsening noise impacts.
- Approach overflights southeast of south runways are a problem.
- Reverse thrust noise impact areas both north and south of the airport, - impacts areas outside of the 65 CNEL contour (particularly the Westchester bluffs area at McComell).

- Missed approaches resulting in emergency pull ups and turns over the Kentwood community in Westchester cause noise disturbances, particularly during foggy weather.

- Aircraft do not appear to be adhering to "tank turn" procedures. Cut-ins north of north runways and south of south runways result in additional residential areas being overflown.

- Southwesterly approach loop impacts beach communities to the south of El Segundo.

- Some airlines are noisier than others, yet fly the same aircraft.

2. Westerly jet aircraft departures impacting residential and other noise sensitive areas.

   Impacted Communities
   North runways: Westchester, Play del Rey
   South runways: Lennox, Del Aire, El Segundo

Community Perception

- Inglewood is also impacted by westerly departures.

- Jet backblast, particularly from older aircraft is disruptive.

- There are specific noise corridors associated with thrust reversal noise on landings and take off thrust noise at the point aircraft becoming airborne.

- Westerly takeoffs are too low when turning over West Los Angeles.

3. Over-ocean arrivals

   Impact Communities
   North runways: Westchester, Playa del Rey
   South runways: El Segundo

Community Perception

- Nightime over-ocean operations impact Playa del Rey and areas south of Manchester, particularly during low weather conditions. Sleep disruption is a common problem.

4. Easterly departures

Impacted Communities: All

Community Perception

- Easterly departures result in 24-hour noise exposure in both Lennox and Inglewood.
- Easterly departures, with aircraft climbing over residential areas increases public safety risks.
- Premature turns on easterly departures increases noise.
- Easterly departures at any time, but primarily during nighttime are very disturbing.
- There appears to be an increase in the number of easterly take-offs.
- It is perceived that non-stop long distance flights are noisier on take-off (to both east and west) due to heavier passenger and fuel loads.
- One aircraft consistently requests and receives control tower approval for an easterly departure just before midnight.

5. Take-off related drift and/or premature turns resulting in overflights of residential and other noise sensitive areas.

Impacted Communities: El Segundo, Playa del Rey

Community Perception

- Premature turns/"drifts" from both runway complexes result in unnecessary overflights of residential areas both north and south of the airport.
- Complaints were voiced regarding pilots not using "quiet" flying procedures, not only premature turns to the west, but also from the east on TANK approaches. Citizens were particularly critical of Western Airlines.

6. Aircraft operations at sensitive hours.

Impacted Communities: All

- Overflights in the evening hours, particularly after midnight, are most annoying to residents in the community.

7. Jet aircraft taxiing noise, particularly associated with night time cargo operations.

Impacted Communities: El Segundo, Del Aire, Lennox, Westchester

Community Perception

- Taxiing Noise disturbs adjacent residential communities and is worse in certain weather conditions.

8. Night time jet engine maintenance runups

Impacted Communities: El Segundo, Westchester, Lennox, Del Aire

Community Perception

- Engine runups at night are discernible at great distances.
- Engine run-ups seem worse just prior to midnight and impact all adjacent communities.
- The nightime runup curfew is being violated.
- Maintenance run-ups which occur at peak takeoff times result in increased fumes and odor.

9. Use of Auxilary Power Units (APUs) by grounded aircraft at gates or on holding positions.

Impacted Communities: El Segundo, Westchester

Community Perception

- The citizens expressed annoyance with the use of APUs.
- APUs impact all neighboring communities and are a high priority issue.

10. Jet Aircraft Operations at Imperial Terminal

Impacted Communities: El Segundo

Community Perception

- Ground operation noise from Imperial Terminal and expanding cargo operations on south side is a 24-hour problem. Nighttime hours are most sensitive.

B. New Problems

1. <u>Helicopter Operations</u>

Community Perception

- Helicopter activity in the area appears to be increasing, aggrevating existing noise problems.

- Helicopter operations along the beach routes are below 500 feet and are too close to the shore.

- Noise from low flying helicopters at night is disruptive in the north Inglewood area.

- There is no apparent control of helicopter operations in terms of routes, altitude, and overflights of residential areas.

2. <u>General Aviation (Small) Aircraft</u>

Community Perception

- Noise from small, unregulated jet and prop aircraft (Lear Jet, etc.) is a problem, particularly landings on the north runways.

- Lower, slower flying general aviation and commuter flights contribute to noise exposure problem.

- Small aircraft using visual flight rules (VFR) illegally violating the terminal control area (TCA) decrease overall operational safety.

- Increasing number of general aviation aircraft based at LAX increase noise and potential for collision.

- Pilot procedures make a difference with noise, especially in executive jets and props ('hot shot' attitude).

3. <u>Variance Procedure</u>

- Citizens questioned the quality of the airline variances procedure. Some of these variances allow the noisiest aircraft access to the airport.

- Concern and anger expressed regarding the variance procedure which enables older, noisier aircraft to remain in service at LAX.

- Deregulation is encouraging older, noisier aircraft (such as Pacific Express BAC-111-200's) to use LAX.

- Some noisy aircraft have been transferred from the more stringently regulated John Wayne airport.

C. Possible Mitigation (Issues)

1. <u>How and to what extent can jet aircraft drifts/premature turns on westerly departures be controlled to reduce overflights of noise sensitive areas?</u>

Public Comment

- Airlines and individual pilots should be fined for premature turns and other violations of procedures.

- More regulations and fines should be imposed on airlines whose pilots make premature turns.

2. <u>To what degree can CNEL values be reduced through modification of, or greater control over, evening and night time operations?</u>

Public Comment

- Airport activity be more should be more balanced throughout the day.

- Night curfews should be reinstituted.

3. <u>To what degree can aircraft taxi noise be reduced by towing?</u>

Public Comment

- Towing of aircraft should be employed , especially on the south side of LAX, to reduce ground noise.

- Taxiing aircraft should utilize interior taxiways near industrial uses rather than exterior taxiways nearer to neighboring residential areas (El Segundo).

4. <u>How will future air traffic be distributed on the four runways in terms of aircraft type and operations?</u>

Public Comment

- Complaints were voiced regarding the imbalanced use of the two runway complexes.

- Total noise exposure in the community should be used as a criteria for assigning aircraft to the runways. Total noise would include total number of operations, as well as the noise characteristics from individual aircraft.

- What is the preferrential runway when both runways are clear?

- A 50/50 runway split would be bad for central Inglewood.

- Will the north runway be noisier after improvements than it was before improvements.

- Noisy aircraft should be restricted to operating on inboard runways only.

- Four runways should have balanced usage, especially for the widebody aircraft.

- Too many 'larger jets' are using the north runways.

5. <u>To what extent can significant reductions in noise impacts for all communities be achieved with westerly extentions to existing runways and threshold displacement?</u>

Public Comment

- Extend runways westerly to reduce noise exposure of existing communities. West field could be used to construct the extended runways.

- Use ANCLUC money for runway extensions.

6. <u>To what extent can Part 36, Stage 3 (quieter) aircraft be required for flights under 500 miles?</u>

(No comment received)

7. <u>To what extent will the use of new terminals effect noise impacts?</u>

Public Comment

- Concerned was expressed regarding the impact of new terminals on the use of northern runways.

- The citizens were aware that modifications to existing airport operations may expose new areas to higher levels of noise.

8. To what degree can jet engine runup noise be controlled by decreasing duration of thrust, enforcing night time regulations, using portable noise supressors or installing monitors in maintenance areas?

Public Comment

- The DOA should increase enforcement of noise regulations against airlines and pilots, including fines.

- LAX should regulate itself. Federal regulations affect aircraft in the air. LAX, not FAA, should regulate airport ground activities.

9. Can limiting the number of night time cargo operations reduce noise significantly?

(No comment received)

10. To what extent can noise barriers or other buffers be effective at LAX?

Public Comment

- Noise barrier are not effective in decreasing 'sideline' noise, except for immediately adjacent areas.

- The existing noise barrier should be extended easterly.

11. When will nonconforming uses in the South Airport Buffer Area, including the use of the West Imperial Terminal, be discontinued?

(No comment received)

12. To what extent can noise from APUs (Auxilary Power Units) be controlled?

Public Comment

- A central electrical hook-up system should be installed.

13. Should compliance with State noise regulations be established as a goal to be achieved through coordinated actions by the airport and surrounding communities?

14. Should the current level of enforcement of State noise regulations within the study area be improved?

15. Is total compliance with existing noise regulations possible?

Public Comment

- An argument used in the past has been various noise reduction techniques would not significantly reduce noise. However, an incremental approach, benefiting from the cumulative impact of several actions, would significantly reduce noise. The citizens recommended employing several programs which alone have a small impact, but together may constitute greater benefits. These actions include noise barriers, towing of aircraft, reduced engine run-up, shuttling passengers to and from aircraft rather than viceversa, etc.
- Establisht reasonable noise limits that will not be exceeded.
- Make laws and regulations work through increased organization and enforcement.
- FAA flight regulations require upgraded enforcement.
- State and Federal regulations (SNEL as well as CNEL), should be enforced.
- Violation of noise regulations is a major problem.
- FAR, Part 36, should be modified to encourage greater compliance with regulations.
- State noise variances should be reviewed yearly.
- Establish uniform set of standard operating procedures for all air carriers serving LAX.
- Noise regulation should be strengthened, especially in regards to engine retrofitting requirements.
- Review existing laws for effectiveness and enforceability and amend them as necessary to increase effectiveness.
- Violators should be penalized.
- Larger airlines with more flexibility are still flying noisy early jet aircraft (TWA B707, & B727, Flying Tigers DC-8, etc.)

17. Should the 65 CNEL contour be established as the basis for the coordinated efforts of the on- and off-airport noise control program, (i.e., to establish the maximum CNEL guideline for land use actions and serve as a target for the airport's noise boundary) or is there a more adequate noise measure?

Public Comment

- CNEL does not measure single events (SNEL).

- It will be difficult to standardize a level of noise intrusion acceptable to all individuals in the community. Citizens have varying sensitivity to noise.

18. <u>How can noise reduction be accomplished in an equitable manner so that relieving one area will not further impact another?</u>

Public Comment

- A regional plan is necessary to resolve airport/community compatibility problems.

19. <u>How can the procedures for granting variances to LAX noise abatement regulations be made more effective in reducing aircraft noise?</u>

Public Comment

- Access to LAX should be restricted for noisy aircraft.

- The DOA should require the latest engine technology on all aircraft using LAX.

20. <u>To what extent can differential landing fee schedules be instituted based upon aircraft noise characteristics and/or hours of operations?</u>

(No comment received)

21. <u>To what extent can over-ocean operations be expanded?</u>

Public Comment

- Expansion of ocean operations should be investigated. An operating scenario resulting in arrivals of the southerly runways and departures on the northerly runways should be evaluated.

- Over-ocean operations are helpful in providing relief from aircraft noise to Inglewood residents.

- Extend over-ocean operation to full 24-hour operations. A study should be funded to prove that this is a feasible recommendation in order to convince the FAA and DOA.

- Over-ocean operations should be imposed from 10:00 p.m. to 6:30 a.m.

- Similar avigation aids should be installed for arrivals from both the east and west.

D. New Issue

1. Control of Helicopters

Public Comment

- Noise impacts from proposed helicopter operations (i.e. 300/day) should be quantified and a clear policy developed to establish operational noise abatement routes, operating minimums, etc. (Freeway corridors suggested for flight paths).
- The FAA should establish noise and safety standards for helicopters.
- Future plans should include helicopter noise considerations.
- Nighttime helicopter operations and heavily loaded helicopter operations should not be allowed.
- Helicopter flight tracks should not be located over residential zones.
- LAX should establish a helicopter policy.
- Helicopter policy should be predicated on detailed studies of both routes and noise exposure.
- Helicopters allowed access to LAX should be a quiet as the Hughes 500D.

2. General Aviation (small) Aircraft

Public Comment

- Small aircraft and helicopters should be directed to other airports capable of handling that type of aircraft.
- Small airlines should not be exempt from Part 36 retrofitting requirements.

II. INCOMPATIBLE LAND USE

A. Staff Identified Problems

1. Incompatible land uses presently exist within known noise impact areas.

Community Perception

- Municipalities are not controlling growth in impacted areas.

- Some schools not adequately noise insulated (St. Bernards High School, Lennox High, Inglewood High, Larch Elementary School, etc.)
- Schools under the approach path to LAX do not appear to be a responsible land use. Overflights of noise sensitive land uses appear to be the biggest problem.
- Noise interfers with learning activities at area schools including Loyola Marymount University.
- Noise disrupts outdoor recreation including school playground and Little League activities.
- High noise levels reduce property values and marketability.

2. <u>Existing incompatible land uses are typically not being recycled.</u>

Community Preception

- Citizens indicated that increased housing demand within their communities makes it difficult to eliminate incompatible uses.

3. <u>New incompatible, noise sensitive land uses are being constructed within existing noise impact areas, contrary to State noise regulations.</u>

Community Perception

- The construction of the Century Freeway will force housing to be relocated under the flight paths. It would have been far more logical to have placed the noise compatible Century Freeway under the flight tract.
- Cities continue to allow construction of incompatible land uses within airport environs.

B. New Problem

1. <u>Northside Development Plans</u>

- Northside airport development plans pose traffic and congestion problems for neighborhoods south of Manchester between Pershing and Lincoln. No north/south access should be provided through these neighborhoods.

- Concerns were expressed that planned food processing/freight forwarding facilities adjacent to Playa del Rey/Westchester will result in adverse smells, reflections (night lighting) and noise.

C. Possible Mitigation (Issues)

1. How can LAX and the surrounding communities agree upon, and commit to, an effective Noise Control Program (i.e., mutually supportive airport operations and land use policies) to achieve a reduction in noise sensitive and/or incompatible land uses?

Public Comment

- Use airport-related development revenues (derived by certain communities around LAX) to help reduce/mitigate aircraft noise.

- Increased cooperation between the airport and adjacent communities is needed.

- Airport construction should be required to meet the same State requirements that are imposed on local developers relative to compatibility.

2. To what extent can local jurisdictions employ zoning, subdivision, redevelopment and other planning techniques to reduce existing, and prevent development of new, noise sensitive and/or incompatible land uses?

3. How, and to what extent, can local General Plan land use policies show greater sensitivity to LAX as a regional transportation facility?

Public Comment

- Municipal zoning controls are needed to control and/or exclude new residential development in noise impacted areas.

- Rezoning to encourage compatible land uses (i.e., from residential to commercial/industrial) increases market value.

- Recycle high density residential uses under heavily used flight paths.

- New incompatible uses should be prohibited using various land use techniques.

- Land use changes should only be considered after the airport has exhausted all operational changes that could reduce noise.

- Land use adjustments should not be seen as the entire solution. Attention should also be given to aircraft noise control.

- Land use conversion is the best solution in the most severly impacted areas.

- Land use conversion/recycling is needed along Arbor Vitae Avenue in L.A. City's jurisdiction.

- Land use conversion/redevelopment must be approached on a neighborhood basis rather than parcel-by-parcel.

- More ANCLUC progress could be made through (political) land use controls than airport operations.

- Real estate agents/brokers should be required to notify prospective buyers that the subject property is noise impacted.

4. <u>To what extent should there be relocation and disruption of residential and other noise-sensitive uses in order to achieve noise compatibility?</u>

Public Comment

- The airport should not pursue additional land acquisition.

- Balanced residential and commercial communities must be protected.

- Displacement/relocation of additional residents is considered a negative alternative in Inglewood, but is viewed as positive by some Lennox residents.

- Eminent domain powers should not be used for the acquisition of additional residential property.

5. <u>Should guidelines for the acquisition of avigation easements be developed for each city so as to assure a minimum and uniform level of noise protection and compensation?</u>

6. <u>Should avigation (noise) easements, which State law provides, create legal compatibility with airport noise, be used even though they do nothing to abate noise impacts?</u>

Public Comment

- The public should be better informed about avigation easements.

- Strict compliance with existing State law requiring sound insulation and the granting of an avigation easement makes it difficult to reduce the amount of incompatible land uses.

7. <u>How and to what degree can an acoustical treatment program be developed in residential and other noise-sensitive areas to effectively mitigate noise impacts?</u>

8. <u>How and to what degree can acoustical specifications be made part of each affected jurisdiction's building permit and inspection procedures?</u>

Public Comment

- Citizens questioned the effectiveness of a sound insulation program given the fact that opening doors and windows would negate any sound suppression benefits.

- The outdoors will be noisy regardless of noise mitigating interior treatment.

- Soundproofing would be a great help, but it would have to screen out low frequency, as well as high frequency, vibrations. The communities might be willing to pay for up to half the cost of an effective soundproofing program, if the airline industry also paid for at least half the cost.

- What FAA funds (amounts and types) are available for insulation and other abatement procedures.

- A residential noise insulation program (airport sponsored) is necessary.

- Financial assistance for sound proofing should include double pane windows.

- Municipal enforcement of state noise regulations for new development should be increased.

- New hi-rise development shields other areas from noise.

- Design and develop commercial properties on airports' north side to provide a noise barrier.

- Local jurisdictions should combine soundproofing of all new structures with energy conservation measures to qualify for available subsidies.

- Soundproofing of northside communities is considered beneficial.

III. PUBLIC HEALTH AND SAFETY

A. Staff Identified Problems

1. <u>Intensively used aircraft landing tracks over populated areas.</u>

   <u>Impacted Communities: Inglewood, Lennox</u>

2. <u>Existing and future high occupancy land uses (i.e., major public assembly uses) under intensively used landing and take-off tracks.</u>

Community Perception

- The potential for falling debris and aircraft parts is a major safety concern in communities dirtectly under the flight tracts.
- Citizens expressed concern regarding the potential for air disasters over populated areas.
- Aircraft collision potential is increasing due to increased general aviation activity.
- Any increases in the total number of operations will affect the overall safety of the airport.
- Aircraft not adhering to "tank" approach procedures may causes safety problems with north runway flight abort procedures.
- Community safety hazards result from the use of abort procedures.

3. <u>Unhealthful noise levels in noise sensitive areas.</u>

   <u>Impacted Communities: All</u>

Community Perception

- Noise has psychological effects on various age groups.
- Aircraft noise causes headaches and loss of sleep.
- Aircraft noise may be responsible for increased stress.
- Citizens should retain the right to enjoy their property. Airport related noise has caused higher crime rates, increased vacant rentals, and high blood pressure.
- Unhealthful living conditions result from airport operations (noise, acid rain, oil droplets, soot, etc.)

- There is concern for the known long term (as well as the visable short term) effects of aircraft noise, exhaust soot/odor, oil and fuel spills-particularly at the approach/ departure ends of the runways.

- Citizens voiced a concern regarding noise related health problems, including deafness, breathing problems, high blood pressure and nervousness.

4. Jet engine soot fallout

   Impacted Communities: All

Community Perception

- The level of soot and exhaust emissions is increasing.

- Unidentified allergic reactions and respiratory problems may be associated with soot fallout.

- Fuel dumping should be better controlled in non-emergencies.

- Aircraft soot emissions require increased maintenance and cleanup of residences, both interior and exterior.

- Odor/fumes seem to be worse in certain weather conditions.

5. Mitigation and/or abatement of aircraft noise can preclude enhanced safety procedures.

Community Perspective

- Safety has to be considered the number one concern from a passenger perspective, as well as the communities surrounding the airport.

- Operational changes to reduce noise should not be implemented at the expense of safety.

B. New Problems

1. The storage of gasoline and volatile fuels around the airport increases the likelihood of disasters in the event of an airline crash.

Public Comment

- Safety procedures for refueling and fuel storage must be strengthened.

3. <u>Criminal activity is increasing in Central Terminal Area (CTA) and peripheral parking lots.</u>

Public Comment

- The airport serves as attractant to criminal elements which spills over into residential and commercial areas.

4. <u>Local fire stations are not notified of emergency/near disasters situations.</u>

Public Comment

- How are residents notified in emergency situations? Residents need to know what to do in case of aircraft disaster.

- Better notification is needed in emergency situations.

C. Possible Mitigation (Issues)

1. <u>To what extent can nuisances and health hazards associated with aircraft emissions and soot be reduced?</u>

2. <u>To what extent does attainment of more acceptable noise levels conflict with the maintenance of an acceptable margin of safety in all flight operations?</u>

3. <u>Should additional high occupancy and major public assembly uses be permitted under aircraft approach and departure paths?</u>

Public Comment

- Land use patterns could optimize safety.

- Minimum air pollution standards must be established with strong outside enforcement procedures.

- 24 hour over-ocean operations would limit number of people under flight patterns in an emergency.

- Over-ocean operations are not safe (reduced margin of safety due to head-on nature of procedures). Centerline approach lights should be extended into the ocean.

IV. CONSTRAINTS

A. Staff Identified Problems

1. <u>No agreement exists as to assignment of responsibility for mitigating aircraft noise.</u>

2. As a result of litigation, the airport proprietor bears a major liability/responsibility for limiting aircraft noise, but alone does not have adequate resources, nor authority, to solve the total noise problem.

Community Perspective

- The number one difficulty in solving the noise compatibility problem is that the authority to solve the problem is shared by too many agencies at varying levels of government and private enterprise. The solution is for the Department of Airports to be given central authroity and let other agencies react to their mandate.

- FAA is less responsive to the communities' problems than DOA.

- Citizens noted that individuals in charge of the complaint service are powerless to make changes.

- Most often those agencies bearing some responsibility for noise abatement pass the obligation of correcting the problem to some other agency.

- The City of Inglewood is not doing enough to correct the noise problem.

- Violation complaint procedures are unknown and inadequate.

- LAX should act, not react, and move toward self-regulation.

3. Competing priorities require full compliance with the California State Noise Regulations by 1986, while simultaneously satisfying projected demand for air travel, and preserving the valuable stock of impacted housing.

4. Abatement and mitigation of aircraft noise constrains airport operations, and interfers with the airlines response to market demand.

5. Priority of mitigating aircraft noise in relation to total corporate airline budgetary constraints.

Community Perspective

- Airlines, through their marketing efforts, create demand for travel which is then satisfied.

- Over-competiveness for passengers by airlines creates redundant operations.

- Poor business management no excuse for air carriers to not comply with laws (i.e., Part 36).

- Poor airline management techniques have contributed to economic and environmental (noise) problems now facing the industry.

B. New Problems

None Idemtified

C. Possible Mitigations (Issues)

1. Should the operations at LAX continue to increase with demand or should some constraint based on noise levels be established?

2. To what extent can limitations be imposed (time slotting, operations budget, etc.) on aircraft operations to achieve a significant noise reduction?

3. If aircraft operations are reduced or limited, at what point is there an illegal restraint of interstate or international trade?

4. Would restriction of access at LAX frustrate federal statutory schemes for deregulation of the airline industry?

Public Comment

- Establish a long term policy to regulate noise levels.

- The DOA should be responsible for coordinating LAX noise mitigation programs, but with more elected public representation on the Commission.

- FAA should adopt and enforce definite noise abatement policies.

- Establish time slotting to limit hourly operations (especially during sensitive hours).

5. How and to what extent can projected air traveler demands beyond 40 MAP be satisfied by existing or new reliever airports?

6. Is the use of MAP as the principle capacity descriptor for planning and forecasting appropriate in terms of noise impacts?

Public Comment

- If the 40 million annual passenger limit was strictly enforced, airlines would seek other airports to satisfy additional demands.
- The 40 million annual passenger figure does not accurately reflect the potential noise impact, since cargo operations are not covered by this indicator.
- Limit LAX to 4,000,000 annual passengers. This point was disputed. It was argued that the total number of flight operations is a better indicator of noise exposure than passenger levels.
- Develop additional airports.
- Is the use of reliever airports economically feasible.

V. COSTS AND BENEFITS

A. Staff Identified Problems

1. There is an inequitable distribution of costs and benefits between those in the region who use LAX and those who live nearby.

Community Perspective

- LAX depresses property values.

B. New Problems

None Identified

C. Possible Mitigation (Issues)

1. Who should contribute toward the abatement/mitigation of airport noise impacts?

2. How and to what extent can a portion of the surrounding communities' airport-related development revenues be allocated toward mitigating airport noise compatibility problems?

Public Comment

- If any compatibility benefit is to be realized at LAX, new funding sources must be developed.

- Taxes could be leveed on airlines based on noise or type of aircraft.

- When contracts are being negotiated between the airlines and DOA, funds should be earmarked for noise abatement.

- Funds should be rechanneled into noise abatement from advertising and airport expansion.

- A passenger boarding tax and cargo tax should be implemented at LAX.

- Fare structure should be adjusted to spread usage among existing airports.

- Create an additional business tax for airport related businesses.

VI. GROUND ACCESS

A. Staff Identified Problems

1. Key intersections and routes are over capacity.

   Impacted interests: All

2. As a regional economic center, LAX is an attractant to development which further aggravates existing traffic congestion.

   Impacted interests: All

Community Perspective

- Existing street capacity is saturated around LAX.

- There are no real problems in Westchester at present, but congestion south of Manchester is anticipated in the future.

- There are traffic problems on Arbor Vitae east of the San Diego Freeway during peak commuting hours.

- Airport and airport related uses consume a large proportion of traffic capacity.

- Traffic and accidents have increased as a result of car rental development in the vicinity of Airport and Arbor Vitae Streets.

- Traffic congestion through airport environs is being further degraded by continued high density development along principal airport access routes.

- Traffic flow is disrupted by the railroad crossing at Florence and Manchester offramp during peak evening hours.

- Freight forwarding activity along Arbor Vitae generates high levels of truck traffic.

- LAX employees park on neighboring residential streets.

B. New Problems

None Identified

C. Possible Mitigation (Issues)

1. Should projects be approved which are compatible with the noise environment but create traffic congestion problems and other impacts?

2. How will the remaining capacity of the existing system of traffic arterials be divided?

3. How can the cumulative effects of each community's continuing growth and its effect on access to LAX be measured?

4. What measures (e.g. off-site terminals, shuttle-buses) can the airport and airline companies take to decrease the number of private automobiles coming to LAX?

5. Should Century Boulevard, which serves as a principal access route to LAX and is presently congested during peak periods, be planned for additional high density uses?

6. How can the northside airport development, local land uses and airport traffic demands be resolved relative to Manchester Avenue?

7. What will be the impact of planned improvements to Arbor Vitae Street west of the San Diego Freeway on traffic congestion to the east?

Public Comment

- Weight limits on residential streets should be used to restrict their use by cargo facility trucks.

- Double deck Century Boulevard to the 405.

- With the completion of the LAX construction program, it is hoped that pedestrian traffic lights will not be needed in the CTA.

- Change operations to not coincide with peak traffic hours.
- LAX should provide shuttle bus service for passengers that link to existing public transportation routes.
- Better and increased park-and-ride service should be promoted.
- Do not make Manchester Avenue a throughway for airport traffic.
- Better access from I-405 to LAX is needed.
- Arbor Vitae Street widening is critically needed.
- Reduced airfares at under utilized airports will result in less ground traffic at LAX.
- An Arbor Vitae interchange at the 405 Freeway should be encourage.

LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL/LAND USE COMPATIBILITY STUDY

TASKS 2.10

STATEMENT OF OBJECTIVES

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I. INTRODUCTION

As has been stated repeatedly, the primary goal of the ANCLUC Study is to reduce airport related noise impacts and increase land use compatibility between LAX and its neighboring communities. Phase III of the Study involves the formulation of specific programs which will effectively contribute to the achievement of this goal.

This primary goal can further be expressed through a number of more definitive objectives that collectively, will influence the course of Phase III activities, and shape the noise control/land use compatibility program ultimately produced. It is useful to articulate these objectives at the outset of the Phase III effort, both to indicate the Study's intended direction, and to provide a series of touch stones by which to gage its progress.

The objectives listed below generally fall into two categories. Some are procedural in nature and address programs and processes involved in the implementation of ANCLUC Study recommendations. Others deal with more substantive long term airport and community planning concerns. The listing is ordered from the more general to the more specific. No priorities are implied by this ranking.

II. OBJECTIVES

1. Satisfy the demand for air travel services in a safe, convenient, economic and financially sound manner while protecting and enhancing environmental quality in the surrounding communities.

2. Comply with applicable State Airport Noise Regulations.

3. Develop and implement a Noise Control Program to reduce and control aircraft noise.

4. Establish a Land Use Compatibility Program that will serve as a basis for the airport land use compatibility planning activities of local communities and the Los Angeles County Airport Land Use Commission.

5. Promote the establishment of compatible land use patterns in those noise-impacted communities and neighborhoods adjacent to Los Angeles International Airport.

6. Develop and adopt a coordinated and integrated Airport Noise Control/Land Use Compatibility Program that is consistent with federal requirements governing submittal of a noise mitigation program under 14 CFR Part 150.

7. Gain eligibility for federal funding of specific noise mitigation and abatement programs by developing and adopting an Airport Noise Control/Land Use Compatibility Program that meets federal requirements under 14 CFR Part 150.

8. Establish means of implementing the Airport Noise Control/ Land Use Compatibility Program by utilizing legally, economically, and environmentally sound techniques which may include, but are not limited to the following:

   - specific noise control provisions in airline operating leases
   - overlay zoning
   - State Airport Noise Regulation variance conditions
   - Federal funding programs
   - community redevelopment/revitalization
   - accoustical treatment programs
   - avigation/restrictive use easements
   - airport development and operation policies

9. Preserve and enhance stable residential neighborhoods.

10. Promote specific programs to maintain and enhance ground access and address related ground access impacts so as to maintain adequate service levels at Los Angeles International Airport.

11. Establish an expanded and ongoing forum for community participation in future airport noise control/land use compatibility planning and implementation activities in order to foster greater understanding, communication, and coordination between Los Angeles International Airport and the neighboring communities.

LOS ANGELES INTERNATIONAL AIRPORT

NOISE CONTROL/LAND USE COMPATIBILITY STUDY

TASK 2.11/2.13

ANALYSIS OF PROBLEMS AND ISSUES

RECOMMENDATIONS FOR FURTHER STUDY

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Page

I. INTRODUCTION

As a result of staff analysis and community input, a series of 34 potential airport/community compatibility concerns have been identified. The next phase of the ANCLUC Study will focus primarily on evaluating potential measures for resolving or reducing such compatibility conflicts.

The transition from a problem identification to a problem solving mode is a critical juncture in the ANCLUC program. Here it must be decided which areas of concern will receive priority attention, and how remaining Study resources can best be directed toward formulating a workable and effective noise control/land use compatibility program.

As a means of accomplishing this transition, the following approach has been adopted.

Annotated outlines for each identified concern have been prepared. These outlines generally indicate:

1) The manner in which the specific concern will be described (i.e., data to be used in quantifying the nature and/or characteristics of the problem).

2) Potential mitigation measures to resolve or reduce compatibility conflicts.

3) The approach to be employed in analyzing the usefulness of potential mitigations measures (i.e., their effectiveness and general feasibility).

4) The relative priority of each concern and the timing of the analysis process for potential mitigation measures*.

5) The recommended course of action for further study (i.e., who is responsible for pursuing the analysis and what product is expected).

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*"Priority" rankings (high, medium, and low) are based upon two primary criteria--the relative importance of the specific concern in terms of overall study objectives based upon community input, and a staff assessment of the technical capabilities for effectively addressing the concern. "Timing" simply refers to the time-frame and context within which potential mitigation measures will be analyzed for effectiveness and feasibility.

The purpose of the above referenced outlines is to provide focus for Phase III of the ANCLUC Study and set the direction for further work efforts. The analysis suggested will be carried out in the initial months of Phase III, and will serve to identify potential effective components of an overall airport noise control/land use compatibility program. These components will next be evaluated from a number of perspectives, including environmental, fiscal and institutional impacts. Based upon this feasibility analysis, a range of alternative airport/community compatibility programs will be formulated (i.e., minimum, moderate and maximum effort program alternatives) and published for review by all interests involved in the ANCLUC Study.

It should be noted here that a number of the specific concerns initially identified through staff analysis and the community workshops have been recommended for deletion as discrete problem areas. In most cases, such recommendations are based upon the contention that the problem:

1) Does not in fact exist,

2) does exist but is not considered within the scope of the ANCLUC study;

3) is an integral component of another problem and need not be considered separately.

There are, however, some recommended deletions which do not fall within the above categories. These involve the potential health effects of noise, the relationship between noise abatement and flight safety procedures, and the potential fiscal impacts of noise abatement programs on the airline industry. In these instances, it is felt that the issues involved are in fact central and pervasive concerns of the ANCLUC effort, and rather than being discrete problem areas, constitute key criteria to be employed in the evaluation and selection of any proposed noise control/land use compatibility program. In all cases, recommendations for deletion are supported by a summary statement outlining the specific factors and reasoning involved.

II. SUMMARY: Identified Concerns and Recommended Disposition

A. AIRCRAFT NOISE

1. Easterly jet aircraft arrivals over residential and other noise sensitive areas

   Lead Staff Investigator - DOA   Priority & Timing - high/immediate
   Recommendation & Product - study and report

2. Westerly jet aircraft departures impacting residential and other noise sensitive areas

   Lead Staff Investigator - DOA   Priority & Timing - high/immediate
   Recommendation & Product - study and report

3. Over-ocean arrivals

   Lead Staff Investigator - DOA   Priority & Timing - high/immediate
   Recommendation & Product - study and report

4. Easterly departures

   Lead Staff Investigator - DOA   Priority & Timing - high/immediate
   Recommendation & Product - study and report

5. Take-off related drift and/or premature turns resulting in overflights of residential and other noise sensitive areas

   Lead Staff Investigator - DOA   Priority & Timing - high/immediate
   Recommendation & Product - study and report

6. Aircraft operations at sensitive hours

   Lead Staff Investigator - DOA   Priority & Timing - high/immediate
   Recommendation & Product - study and report

7. Jet aircraft taxiing noise, particularly associated with nighttime cargo operations

   Lead Staff Investigator - DOA   Priority & Timing - low/defer
   Recommendation & Product - re-evaluate as resources permit

8. Nighttime jet engine runups

   Lead Staff Investigator - DOA   Priority & Timing - high/immediate
   Recommendation & Product - study and report

9. Use of Auxilary Power Units (APUs) by aircraft at gates or on holding positions

   Lead Staff Investigator - DOA   Priority & Timing - high/immediate
   Recommendation & Product - study and report

10. Jet aircraft operations at Imperial Terminal

Lead Staff Investigator - DOA Priority & Timing - high/immediate
Recommendation & Product - study and report

11. Helicopter operations

Lead Staff Investigator - DOA/DRP Priority & Timing - high/immediate
Recommendation & Product - study and report

12. General aviation (small) aircraft

Lead Staff Investigator - DOA Priority & Timing - low/defer
Recommendation & Product - re-evaluate as resources permit

13. Reverse thrust

Assess as component of noise impacts associated with aircraft landings.

14. Variance procedures/policies

Lead Staff Investigator - DOA Priority & Timing - high/immediate
Recommendation & Product - study and report

B. INCOMPATIBLE LAND USE

15. Incompatible land uses presently exist within known noise impact areas and are not typically being recycled

Lead Staff Investigator - DRP Priority & Timing - high/immediate
Recommendation & Product - study and report

16. Existing incompatible land uses are typically not being recycled

Combined with #15

17. New incompatible, noise sensitive land uses are being constructed within existing noise impact areas, contrary to State noise regulations

Lead Staff Investigator - DRP Priority & Timing - high/immediate
Recommendation & Product - study & report

18. Airport Northside Development Plans: Impacts on adjoining residential neighborhoods

Lead Staff Investigator - DOA Priority & Timing - medium/long-term Recommendation & Product - study within context of Northside Project

C. PUBLIC HEALTH AND SAFETY

19. Intensively used aircraft landing tracks over populated areas

Assess as component of noise and safety concerns related to landing and departing aircraft.

20. Existing and future high occupancy land uses (i.e., major public assembly uses) under intensively used landing and take-off tracks

Lead Staff Investigator - DRP Priority & Timing - low/defer
Recommendation & Product - re-evaluate as resources permit

21. Unhealthful noise levels in noise sensitive areas

Reduction of noise impacts is the key objective of the ANCLUC program. As such, excessive noise levels will be addressed in the context of other more specific areas of concern.

22. Jet engine soot fallout

Lead Staff Investigator - DOA Priority & Timing - low/defer
Recommendation & Product - re-evaluate as resources permit

23. Mitigation and/or abatement of aircraft noise can preclude enhanced safety procedures

Flight safety considerations will be employed as the primary criteria for evaluating the feasibility of potential noise mitigation measures and therefore are not viewed as a discrete area of concern.

24. The storage of gasoline and volatile fuels around the airports increases the likelyhood of disasters in the event of an airline crash

There is no evidence that present fuel storage practices pose identifiable safety risks at LAX.

25. Criminal activity is increasing in the Central Terminal Area (CTA) and peripheral parking lots

While crime prevention is given considerable attention at LAX, associated problems are not within the scope of the ANCLUC study.

26. Local fire stations are not notified of emergency/near disaster situations

An elaborate emergency notification procedure presently exists, which provides for the notification of all emergency response/ disaster relief agencies.

D. CONSTRAINTS

27. <u>No agreement exists as to the assignment of responsibility for mitigating aircraft noise</u>

    Lead Staff Investigator - <u>DOA</u> Priority & Timing - <u>high/ immediate</u> Recommendation & Product - <u>study & report</u>

28. <u>As a result of litigation, the airport proprietor bears a major liability/responsibility for limiting aircraft noise but alone does not have adequate resources nor authority to solve the total noise problem</u>

    Combined with #27

29. <u>Competing priorities require full compliance with the California State Noise Regulations by 1986 while simultaneously satisfying projected demands for air travel and preserving the valuable stock of impacted housing</u>

    Lead Staff Investigator - <u>DOA</u> Priority & Timing - <u>low to medium/ long term</u> - Recommendation & Product - <u>re-evaluate as resources permit</u>

30. <u>Abatement and mitigation of aircraft noise constrains airport operations and interfers with the airline's response to market demand</u>

    Impacts on airport and airline operations will be employed as key criteria in evaluating the feasibility of potential noise mitigation measures, and need not be addressed as discrete areas of concern.

31. <u>Priority of mitigating aircraft noise in relation to total corporate airline budgetary constraints</u>

    Airline budgetary constraints will be employed as a key criterion in evaluating the feasibility of potential noise mitigation measures, and need not be addressed as a discrete area of concern.

E. COST AND BENEFITS

32. <u>There is an inequitable distribution of cost and benefits between those in the region who use LAX and those who live nearby</u>

    Lead Staff Invesatigator - <u>DRP/DOA</u> Priority & Timing - <u>high/immediate</u> Recommendation & Product - <u>study and report</u>

F. GROUND ACCESS

33. Key intersections and routes are over capacity

Combine with #34

34. LAX is a traffic generator as well as an attractor for new development which further aggravates existing traffic congestion

Lead Staff Investigator - DRP Priority & Timing - medium/long term Recommendation & Product - monitor and report

III. Analysis Outlines

Introduction

The following outlines are meant to provide focus on how staff proposes to address each identified concern and sets the direction for Phase III of the ANCLUC study. The completion of the staff analysis based upon these outlines will identify potentially effective components of an overall airport noise control/land use compatibility program.

Item #1

Easterly jet aircraft arrivals over residential and other noise sensitive areas (DOA)

a. Description

- Basecase INM run using peak traffic levels (1979) and the 1987 projected base case.
- Operational characteristics of air carrier fleet aircraft including reverse thrust.
- Summarized public comment from community workshops.
- FAA flight procedures.

b. Alternative Mitigations

- Runway extension west/landing threshhold displacement.
- Increased duration of over-ocean operations.
- Reduced number of operations.
- Runway utilization patterns adjustments. (north/south and inboard/outboard splits).
- Fleet mix (increased FAR Part 36 compliance).
- Alternative glide slopes.
- Augmented nav-aids to further define specific flight tracks.
- Restrictions during sensitive hours.

c. Analysis Methodology

- INM computer modeling to provide quantification of acres and population affected by the scenario components listed above.
- Quantitative analysis of reverse thrust noise impacts in El Segundo.
- Qualitative observation of changes in noise exposure.

d. Strategy

Priority: Work required to evaluate this concern is within the study team's capabilities, is considered essential for completion of ANCLUC--considered high priority. Timing: Required analysis to be conducted in conjunction with the initial Phase III study efforts.

e. Recommendation

DOA will conduct necessary computer analysis for each scenario to provide a comparitive assessment of the noise relief benefits.

Item #2

<u>Westerly jet aircraft departures impacting residential and other noise sensitive areas (DOA)</u>

a. Description

- Basecase INM run using peak traffic levels (1979) and the 1987 projected basecase.
- Operational characteristics of air carrier fleet aircraft.
- Public comment from community workshops.
- FAA flight procedures.

b. Alternative Mitigations

- Reduced operations during sensitive hours.
- Number of operations.
- Runway extensions.
- Runway utilization pattern adjustments (north/south and inboard/outboard splits).
- Possible improvement to existing noise abatement departures.
- Fleet Mix.

c. Analysis Methodology

- INM Computer modeling to provide quantification of acres and population affected.
- Qualitative assessment of changes in noise exposure.

d. Strategy

Priority: Work required to evaluate this concern is within the study team's capabilities, is considered essential for completion of ANCLUC--considered high priority. Timing: Required analysis to be conducted in conjunction with initial Phase III study efforts.

e. Recommendation

DOA to be lead agency in conducting necessary computer analysis for each alternative scenario.

Item #3

Over-ocean arrivals (DOA)

a. Description

- El Segundo, Playa del Rey, and Westchester impacted while Inglewood, Lennox, Del Aire, Hawthorne, and Southwest Los Angeles are relieved from approach and reverse thrust touchdown noise.
- Safety of operation.
- Restrictions on capacity (VFR/IFR).
- Public comment from community workshops.
- Existing information (i.e. Over-Ocean Operations EIR).

b. Alternative Mitigations

- Displace landing threshhold east so that reverse thrust occurs adjacent to compatible uses along the south runway complex.
- Partial or total curfew during sensitive hours.
- New aviation technology.
- Runway utilization pattern adjustments (north/south and inboard/outboard splits).

c. Analysis Methodology

- INM computer modeling to provide quantification of acres and population affected.
- Emperical observations (exposure/relief).

d. Strategy

Priority: Considered high priority. Timing: Required analysis to be conducted in conjunction with initial Phase III study efforts.

e. Recommendation

DOA to be lead in conducting computer assessment and literature search to prepare draft report assessing potential mitigations.

Item #4

Easterly Departures (DOA)

a. Description

- Public comment from community workshops.
- Criteria and frequency of occurrence.
- Review language in LAX Noise Regulation.

b. Alternative Mitigations

- Noise abatement departures.
- Preferential runway use during sensitive hours.
- Discourage variation from over-ocean operations during late night operations.
- Closure of runway to easterly departures during sensitive hours.
- Tailwind criteria.
- Runway extension.
- Maintenance of runway heading
- Other

c. Analysis Methodology

Feasibility study for the purpose of determining to what degree easterly departures can be further regulated.

d. Strategy

Priority: With FAA and ATA assistance assess the technical feasibility to address this concern--considered high priority. Timing: Required analysis to be conducted in conjunction with initial Phase III study effort.

e. Recommendation

DOA to conduct necessary analysis and prepare draft report evaluating the alternative mitigations outlined above.

Item #5

<u>Aircraft drifts and premature turns resulting in overflights of noise sensitive residential land uses (DOA)</u>

a. Description

- Public comment from community workshops.
- Noise complaint records.
- Describe existing federal and local regulations and policies for both commercial and general aviation aircraft.

b. Alternative Mitigations

- Improved noise complaint response system.
- Revise FAA air traffic controller pilot instruction procedure.
- Provide lighting for existing airfield signs instructing pilots not to turn early.
- Improve violation reporting process.
- Publish newsletter tabulating noise violations by airlines.
- Strengthen FAA flight procedures.
- Upgrade FAA radar and LAX monitoring systems to facilitate premature turn identification.

c. Analysis Methodology

Prepare a feasibility study of the alternative mitigations listed above for potential costs involved and effectiveness.

d. Strategy

Priority: This issue appears to be readily solveable--considered high priority. Timing: Required evaluation to be conducted in conjunction with initial Phase III study effort.

e. Recommendation

While improvement of this situation will have no affect on the noise impact contours, it could reduce "single event" type complaints and be perceived as an improvement. DOA will be lead agency in preparing a feasibility study to review existing procedures and potential improvements.

Item #6

Aircraft operations at sensitive hours (DOA)

a. Description

- Describe hours of extreme sensitivity to jet aircraft noise.
- Public comment from community workshops.
- Documentation of economic and geographic air travel factors as to why operations occur during the hours to service distant city pairs.

b. Alternative Mitigations

- Reduction of nighttime operations.
- Allow only Part 36 compliant aircraft to operate during sensitive hours.
- Exclusive over-ocean operations during sensitive hours.
- Increased landing fees during sensitive hours.
- Total curfew during sensitive hours.
- Time-slot bidding.

c. Analysis Methodology

- INM computer analysis.
- Feasibility study to identify opportunities to develop variable landing fee schemes and the related constraints.

d. Strategy

Priority: Principal methodology is related to other issues and problem analyses to be dealt with through the INM--considered high priority. Timing: Required analysis to be conducted in conjunction with initial Phase III study effort.

e. Recommendation

DOA to be lead in conducting computer analysis for operation scenarios and documentation of non-operational components to prepare a draft report describing the results.

Item #7

<u>Jet aircraft taxiing noise particularly associated with nighttime cargo operations (DOA)</u>

a. Description

- Related to Problem #6.
- Public comment from community workshops.

b. Alternative Mitigations

- Towing to and from peripheral airport locations adjacent to sensitive receptors.
- Noise barriers.
- Remote loading-busing passengers to aircraft.
- Preferential landing and takeoff pattern to minimize taxiing (fuel conservation).

c. Analysis Methodologies

Feasibility studies assessing the potential of the mitigation measures listed above.

d. Strategy

Priority: Taxi noise is a component of all operations and is addressed in many of the evaluations--considered low priority. Timing: Defer until time and resources become available.

e. Recommendation

DOA will re-examine this issue and alternative mitigations separately as resources become available.

Item #8

Nighttime jet engine runups (DOA)

a. Description

- Concern may be overemphasized because of the difficulty in distinguishing runup noise from taxi or reverse thrust noise (which are similar) during nighttime hours.
- Nighttime runups presently regulated.
- Public comment from community workshops.
- Review noise complaints records.

b. Alternative Mitigations

- Increase restriction on runup noise.
- Portable noise suppression units.

c. Analysis Methodology

- Survey airport tenants to quantify frequency of engine runup occurrence.
- Analyze noise monitor data.

d. Strategy

Priority: Ability to quantify and clarify situation currently exists--considered high priority. Timing: Required analysis to be conducted in conjunction with initial Phase III work efforts.

e. Recommendation

DOA to undertake a study of the frequency and duration of engine runups and prepare a report on current situation plus additional control measures as required.

Item #9

<u>Use of Auxiliary Power Units (APU's) by aircraft at gates or in holding positions (DOA)</u>

a. Description

- Describe APU technology and purpose.
- Detail established regulations and policies.
- Public comment from community workshops.
- Examine noise complaint records.

b. Alternative Mitigations

- Restrict use of APU's to non-sensitive time periods.
- Supply ground power to ramp and maintenance areas at LAX.
- Relocate Imperial Terminal.
- Upgrade noise complaint recording procedure.
- Instruct stiff enforcement of LAX Noise Regulation.
- Encourage development of APU noise suppression equipment.
- Noise barriers.

c. Analysis Methodology

- Feasibility study evaluating providing groundpower to all gates and reviewing the potential of the suggested alternatives.
- Review experience in other areas (the ATA has conducted studies which indicate that while initial develoment costs are high, groundpower systems rapidly amortize the investment due to fuel conservation).

d. Strategy

Priority: Reductions in the use of APU's during sensitive hours could produce a perceived improvement in the impacted residential area, but would not achieve an increase in overall compliance to state noise laws--considered high priority.
Timing: Required analysis to be conducted in conjunction with the initial Phase III study effort.

e. Recommendation

DOA to prepare a draft report describing the potential to further control APU noise emission impacts.

Item #10

Jet aircraft operations at Imperial Terminal (DOA)

a. Description

- El Segundo the impacted community.
- Detail utilization of Imperial Terminal.
- Public Comment from community workshops.
- Related to number 9.

b. Alternative Mitigations

- Installation of ground power service.
- Towing to eliminate taxi noise during sensitive hours.
- Relocation of the terminal.
- Restricted hours of operations.
- No direct aircraft access, use field buses to transport passengers to aircraft parked at remote location.

c. Analysis Methodology

Feasibility study discussing the alternatives suggested.

d. Strategy

Priority: Preparation of feasibility study will require many staff hours to determine solution(s) to Imperial Terminal operations--considered high priority. Timing: Required analysis to be conducted in conjunction with initial Phase III work efforts.

e. Recommendation

DOA to prepare draft report describing potential to reduce impacts from Imperial Terminal operation.

Item #11

<u>Helicopter activity in the vicinity of LAX is increasing, further aggravating existing noise and safety problems (DOA/DRP)</u>

a. Description

- The issue involves the potential for large increases in rotorcraft operations including regularly scheduled operations to occur in the future.
- Public Comment from community workshops/historical experience.
- Proposed future commuter operations/facilities.
- Existing policies and regulations.
- Cumulative description of heliports.

b. Alternative Mitigations

- Encourage noise standards for rotorcraft.
- Enforce existing policies and regulations of the FAA.
- Develop more stringent and uniform regulations pertaining to flight routes, altitudes, and heliports/helistops.
- Limit helicopter access to LAX.
- Establish noise limit per rotorcraft operation.

c. Analysis Methodology

- Review of experience in other areas.
- Feasibility study and legal review of programs to limit access and/or regulate helicopter operations.
- Development of citywide and regional rotorcraft policy.

d. Strategy

A high level of community concern regarding current and future levels of helicopter activity exists. Action is now required to help prevent future airport/community compatibility and safety problems--considered high priority. Timing: Required analysis to be conducted in conjunction with initial Phase III study efforts.

e. Recommendation

DOA in cooperation with DRP, FAA, and other involved agencies will conduct necessary analysis and prepare a preliminary report evaluating potential mitigation measures as outlined above.

Item #12

<u>General aviation (small) aircraft (DOA)</u>

a. Description

- Evaluate general aviation activity at LAX in terms of number of operations and air traffic control procedures.
- Describe noise emission levels for general aviation aircraft.
- Public Comment from community workshops.

b. Alternative Mitigations

- Reduce general aviation activity at LAX.
- Institute landing fees for general aviation operations.
- Institute stiffer penalties for pilots violating the terminal control area (TCA).
- Develop noise emission standards for general aviation aircraft.

c. Analysis Methodology

- Examine current policies dealing with general aviation activity at LAX.
- A feasibility study to address the mitigation measures cited above.

d. Strategy

Priority: Involves major work effort by study staff regarding assessment and development of DOA policy--considered low priority. Timing: Deferred until time and resources become available.

e. Recommendation

DOA to prepare analysis of the problem using FAA input and defer indepth study until staff and budget are available.

Item #13

Reverse Thrust

a. Discussion

Reverse thrust (in combination with brakes) is used to slow arriving aircraft. The INM computer model is sensitive to reverse thrust as a component of the noise generated by jet aircraft operations. Noise contours generated by the INM model illustrate the effect of reverse thrust as a "shoulder" on the sideline segments of the contour. The computer modeling of the various operational scenarios will assess reverse thrust impacts on the contour. The scenario components which will directly effect reverse thrust impacts are displaced land thresholds and runway utilization patterns (i.e. percent of landings on inboard runways, etc.). Therefore, dealing with reverse thrust as a separate issue is not considered practical nor productive.

b. Recommendation

Based upon the above discussion, item number 13 should be deleted.

Item #14

Variance to LAX Noise Regulation procedures/policies (DOA)

a. Description

- Define current variance procedures.
- Public comment from community workshops.
- The LAX Noise Regulation is perceived as ineffectual due to the automatic variance approval procedure.
- Historical overview.

b. Alternative Mitigations

- Revise/strengthen regulations:

  . Delete the automatic provisions of the variance procedure.
  . Modify variance procedures requiring verified commitment of air carrier resources to reduce noise emmissions.
  . Require operator to demonstrate that his operations will not increase the CNEL noise contours beyond the 1979 limits.
  . Expand LAX Noise Regulation to include foreign air carriers.

c. Analysis Methodology

Prepare a feasibility study to determine the authority limits of Los Angeles City to regulate noise associated with operations of LAX.

d. Strategy

Priority: Create task force of federal, airport, airline, and legal officials to determine the feasibility of adjusting the existing noise regulation. Timing: Required analysis to be conducted in conjunction with initial Phase III study efforts.

e. Recommendation

DOA, City Attorney's Office and others to proceed with the investigation regarding potential revisions to the current LAX Noise Regulation and report.

Items #15 & #16

Incompatible land uses presently exist within known noise impact zones and are typically not being recycled (DRP)

a. Description

- 65+ CNEL impact area analysis, i.e. number of acres and population impacted (1979 peak levels and 1987 projections).
- Assumptions regarding land use sensitivity; current and future.
- Public Comment.
- Review of public and private redevelopment programs and trends.
- Description of alternative scenarios analysis, acres, and population impacted.

b. Alternative Mitigations

- Sound proofing.
- Avigation easements/restrictive use easements/dedication of construction rights.
- Noise barriers.
- Land use change.

  . Community planning
  . ALUC planning
  . Public redevelopment
  . Private recycle
  . Rezoning
  . Retroactive building code enforcement
  . Nonconforming use review
  . Benefit Assessment District

- Acquisition
- Other (enforcement of current L.U. policies, State noise regulations, FAR Part 36, etc.).

c. Analysis Methodology

- Legal Analysis/Feasibility Studies.

d. Strategy

Priority: Involves major work effort which is essential the completion of ANCLUC; high priority. Study all feasible alternatives. Timing: Required analysis to be conducted in conjunction with initial Phase III study efforts.

e. Recommendation

DRP in cooperation with cities, county agencies, and SCAG, will conduct necessary research and prepare a draft report evaluating potential mitigation measures as outlined above.

Item #17

<u>New incompatible, noise sensitive land uses are being constructed within noise impact areas contrary to state noise regulations (DRP)</u>

a. Description

- Cities continue to allow construction of incompatible land uses within noise impacted airport environs.

  . Definition of compatible land use.

- Historical pattern of practice.

  . Existing standards, policies, and enforcement practices.
  . Examples of incompatible land uses recently constructed in participating jurisdictions.

b. Alternative Mitigation

- Increased enforcement of existing state and local planning, zoning, and building standards.

- Establish and enforce more stringent local planning, zoning, and building standards to prohibit incompatible uses.

- Adopt regional land use guidelines; i.e., ALUC Airport Area Land Use Plan, LUG zones, etc.

- Clarify and/or modify state legislation regarding incompatible land uses (i.e., redefine compatible land uses).

- Devise incentive programs; i.e., Feds. or LAX assist cities with redevelopment efforts in exchange for tighter use controls.

c. Analysis Methodology

- Review local planning, zoning, building standards, and enforcement practices for effectiveness in fostering airport/land use compatibility.

- Literature research to identify model ordinances designed to foster airport/land use compatibility.

- Investigate legal and instituional requirements and authorities for adoption and enforcement of an Airport Area Land Use Plan.

- Investigate potential incentives programs.

Item #17

d. Strategy

Priority: Must do to avoid further incompatible land uses; high priority. Study all feasible alternatives and identify workable, effective programs. Timing: Required analysis to be conducted in conjunction with initial Phase III study efforts.

e. Recommendation

DRP in cooperation with cities, county agencies, and SCAG will conduct necessary analysis and prepare draft report evaluating potential strategies to discourage the introduction of new incompatible land uses.

Item #18

<u>Airport Northside Development Plan: Impacts on adjoining residential neighborhoods (DOA)</u>

a. Discussion

The Northside Development Plan is directly related to, and compatible with the goals of the ANCLUC study. The plan initially produced a negative response from adjacent residents, due to many potentially adverse impacts, including traffic congestion, parking, noise, odors, and economics. However, the comprehensive public participation program utilized in preparing the plan addresses these problems and is developing mitigation measures to offset these concerns. These mitigations will be included in the forthcoming EIR. Incompatible land uses have been removed, and the land is now being recycled to compatible non-noise sensitive uses. This planning and environmental review process is therefore viewed as the most appropriate vehicle for addressing issues associated with development of the northern periphery of LAX.

b. Recommendation

DOA staff will continue to monitor the progress of the Northside Development Plan and report on its relationship to the goals of the ANCLUC program.

Item #19

Intensively used aircraft flight tracks over populated areas

a. Discussion

Los Angeles International Airport is situated adjacent to the Pacific Ocean to the west. To the north, south, and east are the communities of Westchester, El Segundo, Inglewood, Hawthorne, Southwest Los Angeles, Lennox and Del Aire. Each are developed in urban uses, primarily single family residential development. The normal operation of the airport is to land from the east and take off to the west. This situation has resulted in the overflight of populated areas on approaches to LAX. Given the location of LAX, the increased use of over-ocean operation, including approaches and departures, is the only measure which would reduce the number of flights over populated areas. The work required to evaluate this issue through the increased usage of over-ocean operations is interrelated with items 1, 3, 4, 5, and 6.

b. Recommendation

Over-ocean operations, as a means of reducing overflights of populated areas, will be addressed as indicated above. Therefore, Item #19 should be deleted as a discrete area of concern.

Item #20

Existing and future intensive land uses (i.e., major public assembly uses) under intensively used landing take-off tracks (DRP/DOA)

a. Description

- Public Comment from community workshops.
- Identify intensively use flight tracks.
- Identify existing and proposed high occupancy land uses under flight tracks.
- Analyze peak operations hours vis-a-vis peak use hours for high occupancy land uses.

b. Alternative Mitigation

- Initiate maximum feasible over-ocean operations - minimizing overflights of high occupancy use.
- Establish policies, standards and/or restrictions regarding high occupancy uses below flight tracks.
- Prepare emergency response plans.
- Change flight tracks/modify tracks during certain hours.
- Enforce current policies.

c. Analysis Methodology

Feasibility studies and literature review of other ANCLUCs, ALUCs, and airport plans.

d. Strategy

Priority: Low level of community concern expressed. Difficult and speculative to define precise flight tracks and corresponding overflight zones; low priority. Some potential mitigations covered under other outlined concerns. Timing: Re-examine as time and resources become available.

e. Recommendation

DRP in cooperation with DOA, cities, and emergency response agencies will re-examine issues and alternative mitigations as resources become available.

Item #21

Unhealthful noise levels in noise sensitive areas

a. Description

- Public Comments

  - Noise has psychological effects on various age groups
  - Noise may be responsible for increased stress
  - Noise related health problems including deafness, breathing problems, high blood pressure, nervousness, headaches and loss of sleep
  - Noise interferes with normal activities including speech, TV viewing, and sleep

- Published Research

b. Alternative Mitigation

Noise impact is the central issue of the ANCLUC study. While no analysis is proposed to correlate noise exposure with specific health factors, many mitigation techniques listed under other problem areas will address, albeit indirectly, this issue.

c. Analysis Metodology

Covered elsewhere

d. Strategy

Priority: Assumed noise adversely impacts people. Definition of precise medical, i.e. unhealthful, effects beyond scope of ANCLUC study. Low priority for study as a discrete problem area.

e. Recommendation

Do not study as independent problem area. Problem will be indirectly but adequately addressed under other problem analyses.

Item #22

<u>Jet engine soot fallout (DOA)</u>

a. Description

- Quantify jet engine emission levels.
- Utilize pertinent Air Pollution Control District (APCD) data.
- Public comment from community workshops.

b. Alternative Mitigations

- Federal Aviation Regulation (FAR) Part 36, Noise Standards requires introduction of quieter jet engines which are also more fuel efficient and less polluting in progressive stages until full compliance by the entire Domestic Air Carrier fleet is achieved in 1988.
- Technological Advancements.

c. Analysis Methodology

- Quantify LAX contribution to regional air emmission levels.
- Literature research to identify potential health effects from exposure to engine soot.

d. Strategy

Priority: Addressing this concern in the initial Phase III study effort would reduce resources available to address the many problems associated with reducing aircraft noise impacts, which is the central goal of the ANCLUC study. Therefore, in the hierarachy of importance, jet engine soot is considered low priority. Timing: Defer until resources become available.

e. Recommendations

This concern, while inherent to jet aircraft operations, has been gradually reduced through technological advances and this trend is expected to continue. This concern is considered peripheral and need not be directly addressed by ANCLUC at this time.

Item #23

<u>Mitigation and/or abatement of aircraft noise can preclude enhanced safety procedures (DOA)</u>

a. Discussion

Safety is the principal criteria by which each recommended airport operational adjustment will be evaluated. The next echelon of criteria include noise benefits, economic costs and environmental consequences. The participation of the FAA and ALPA in this evaluation ensures that safety requirements will not be negatively impacted as a result of the study's set of recommendations. There is no apparent need to deal with this problem on an individual basis since the effect of all recommended alternatives on operations safety will be assessed.

b. Recommendation

It is not practical nor productive to consider safety as a separate issue because the detailed alternative evaluation will be extremely sensitive to this criteria. For this reason item number 23 should be deleted as a discrete area of concern.

Item #24

<u>The storage of gasoline and volatile fuels around the airport increases the likelihood of disasters in the event of an aircraft crash (DOA)</u>

a. Discussion

There is no evidence that fuel storage at or around LAX is a problem. The storage of gasoline and other volatile fuels is strictly regulated by many levels of government which the operations at LAX fully comply with. No major accident of this type has occurred to date.

b. Recommendation

There is no indication that this problem exists. Therefore, item number 24 should be deleted.

Item #25

<u>Criminal activity is increasing in the Central Terminal Area (CTA) and peripheral parking lots (DOA)</u>

a. Discussion

Criminal activity is increasing throughout our society and LAX is no exception. While this phenomena is entirely unacceptable, it is not unexpected. The airport as a public facility is utilized by large numbers of people who must leave their automobiles, and any valuables within, unattended. The large number of unattended personal automobiles etc., attracts the criminal element. The airport has, as have many other public and private facilities, increased its security force and taken other measures to control crime, at great expense. Therefore, while crime is a recognized problem at LAX as well as society in general, it is well outside the scope of the ANCLUC study.

b. Recommendation

Allocation of the limited resources available to ANCLUC to this issue is not practical nor productive. Item number 25 should be deleted.

Item #26

<u>Local fire stations are not notified of emergency/near-disaster situations</u>

a. Discussion

An elaborate procedure exists for the notification of emergency response facilities in the event of emergency/near-disaster situations. The system alerts tower personnel, the Superintendent of Airport Operations, the Los Angeles City Fire Department Operation Control Dispatch, local fire departments and local hospitals. In the event the emergency is over water, additional agencies are notified. The system distinguishes between standby/potential emergencies and imminent emergencies and whether they are over land or water. Existing system appears to be an adequate emergency notification and response system.

b. Recommendation

In light of existing emergency notification system, inclusion of this issue is not justified and should be deleted.

Items #27 & #28

No agreement exists as to the assignment of responsibility for mitigating aircraft noise. As a result of litigation, the airport proprietor bears a major liability/responsibility for limiting aircraft noise, but alone does not have adequate resources, nor authority, to solve the total noise problem (DOA)

a. Description

- Brief discussion of fragmented authority between (FAA, DOA, Caltrans, CAB, ALUC, etc.).
- Summary of inconclusive litigation which provides no clear direction.
- Public comments from community workshops.

b. Alternative Mitigations

- Define specific authority and responsibility through legislation.
- Invite litigation to resolve authority/responsibility question.
- Enter into joint powers agreement between all aviation and/or community interests.
- Adopt and implement Part 150, ALUC Plan etc.

c. Analysis Methodology

- Conduct a feasibility study of actions to incrementally define the potential for resolving this issue through the ANCLUC study including:

  . Review and document experience in other areas.
  . Legal/policy analysis to determine and document local perogatives, possible airport/community cooperative arrangements, potential legislative initiatives, etc.

d. Strategy

Priority: Complete resolution of this issue is outside the scope of this study and not considered essential to complete the study. However, two prime objectives of the study are to foster increased cooperations between the airport and the surrounding communities and to work toward clarification of legal/institutional authority and responsibilities--considered high priority. Timing: Ongoing, related to study progress.

Items #27 & 28

e. Recommendation

The DOA with the support of the City Attorney's Office and other involved interests will prepare a preliminary evaluation of legal/policy issues as they emerge throughout the ANCLUC program and document pertinent findings, conclusions and recommendations.

Item #29

Competing priorities require full compliance with the California State Noise Regulation by 1986, while simultaneously satisfying projected demand for air travel and preserving the valuable stock of impacted housing (DOA)

a. Description

- Describe effectiveness of existing noise regulations.
- Projected air travel demand levels.
- Quantify impacted housing stock.
- Public comment.

b. Alternative Mitigations

- Retention of the housing stock while complying with the State Noise Regulation would necessitate a significant (± 80%) reduction in airport operations.

- Compliance with the State Noise Regulation could be achieved by reducing either aircraft operations or impacted housing stock or a graduated combination of both.

- Air travel demand can be satisfied and the State Noise Regulation complied with by eliminating the impacted housing stock, through adjusting the State Noise Regulation to redefine compatibility (Example: Single family residences with or without soundproofing but with an easement considered compatible) or some combination.

c. Analysis Methodology

- Conduct cost/benefit analysis of the three problem components (Compliance, Demand and Housing). For example, the cost of maintaining the housing stock and satisfying demand is a new airport, while the cost of satisfying demand at LAX and complying with the State Noise Regulation would involve relocation of the housing.

- Other parameters in the cost benefit analysis would involve the economic contribution of LAX to the area, satisfaction of federal, state, regional, and local goals as expressed by the elected officials and a thorough environmental analysis.

d. Strategy

Priority: Reconciliation of these competing priorities may not be within the scope of the study. Addressing this issue will require a high level of effort from the study staff, augmented by legal staff time. The attempt to balance the priorities is considered high priority, but resolution of this issue is considered low. Timing: Considered long term.

Item #29

e. Recommendation

This problem reflects many of the inherent difficulties associated with blanket environmental legislation. Many of the components of this problem will be dealt with in the resolution of a number of the stated problem areas. Therefore, the DOA should delay further work until the other problem evaluation work is completed.

Item #30

Abatement and mitigation of aircraft noise constrains airport operations and interferes with the airlines' response to market demand (DOA)

a. Discussion

Los Angeles International Airport (LAX) is a major transportation facility serving all of Southern California, which significantly effects the regional economy. The airlines have invested heavily to provide effective, attractive airport facilities and comfortable aircraft to meet increasing air travel demand while complying with stiffening noise regulations. Millions of dollars have been committed by the airlines and airport to mitigate aircraft noise at LAX and additional funds are budgeted to maintain and increase compliance levels.

The ANCLUC study program is not expected to jeopardize the airlines current investment or future capability to meet demand or generate revenues. These capabilities will be maintained while measures to increase community compatibility are being developed. The ANCLUC program could also identify opportunities for the airlines to increase revenues. However, all ANCLUC recommendations will undergo a comprehensive impact assessment which will include fiscal implications as a key criteria, to assure that the prime concerns of all involved including the airlines are considered.

Therefore, it is considered unnecessary to address this item separately.

b. Recommendation

Delete as discrete area of concern.

Item #31

<u>Priority of mitigating aircraft noise in relation to total corporate airline budgetary constraints (DOA)</u>

a. Discussion

Refer to item number 30.

b. Recommendation

Delete as discrete area of concern.

Item #32

<u>There is an inequitable distribution of costs and benefits between those in the region who use LAX and those who live nearby (DRP)</u>

a. Description

- Public Comment

  . Social Costs - mostly to residential population adjacent to LAX: noise, pollution, congestion, etc.

  . Economic Benefits - regional business interests, employees, and airport user: economic viability for some uses, travel convenience, etc.

  . Varying degrees of costs and benefits depending on proximity to LAX, frequency of use, nature of use, and sensitivity to aircraft noise.

b. Alternative Mitigations

- Passenger head tax - whereby those using the airport would compensate those subjected to the nuisance. Money to be earmarked for airport noise impact mitigation.

- Parking surcharge - to be used the same way as passenger head tax.

- Land use development tax - a percentage of the tax proceeds generated by airport related development to be earmarked for airport noise impact mitigation.
- Potential Regional Airport Authority.

- Other

c. Analysis Methodology

Feasibility study (legal analysis) to determine the technical and economic viability of the mitigation techniques.

d. Strategy

Priority: Alternative mitigation funding strategies are critical to the success of ANCLUC implementation efforts; high priority. Analyze all feasible alternatives.
Timing: Required analysis to be conducted in conjunction initial Phase III study efforts.

Item #32

e. Recommendation

DRP in cooperation with DOA, cities, and other involved agencies to conduct necessary research and prepare a draft report evaluating potential mitigation measures as outlined above.

Items #33 & #34

<u>LAX is a traffic generator as well as an attractor for new development which further aggravates existing traffic congestion</u>

a. Description

- Public comments from community workshops.

- Average daily traffic volumes exceeding 60,000 or 70,000 vehicles are common on sections of Century and Sepulveda Boulevards.

- Many other streets in the study area now carry traffic volumes exceeding 30,000 vehicles per day.

- LAX Ground Access Study.

- LAX Final Environmental Impact Report, August 1978.

- LAX Hub of Activity/Attractor of Development:

  . Marina del Rey
  . El Segundo
  . Century Freeway/Del Aire
  . Northside Development
  . Summa-Playa Vista

- Existing Transportation Improvements and Programs:

  . Century Freeway/Transitway
  . Elevated CTA roadway and other road improvements
  . 96th Street widening
  . Airport Boulevard widening
  . Arbor Vitae widening (Airport to Sepulveda)
  . Upgrade Arbor Vitae/Sepulveda intersection
  . Arbor Vitae widening (Lincoln to Pershing Drive)
  . New CTA parking structures
  . Expand Lot C and the VSP Lot
  . 20 medium capacity buses for Lot C and VSP service
  . Three new FlyAway-type buses for expanded regional service
  . El Segundo Light Rail proposal
  . Marina Light Rail proposal
  . El Segundo Employers Association Transportation System Management Program
  . SCAG Corridor Studies

b. Alternative Mitigation

- Work with El Segundo Employers Association regarding implementation of Transportation System Management (TSM) actions.

- Promote actions by airport to reduce the amount of vehicular traffic entering the airport.

- Investigate possibility of linking the proposed light rail systems with LAX, the Century Freeway and each other.

- Implement signal interconnect system and preferential street system, including: one-way streets, exclusive lanes and contraflow lanes designed to enhance traffic movement and eliminate traffic on residential streets.

- Reschedule peak airport activity hours to not coincide with peak traffic hours.

- Investigate the formation of Transportation Assessment District.

c. Analysis Methodology

- Feasibility studies.
- Monitoring and coordination activities.

d. Strategy

Priority: Medium level of community concern expressed. Secondary impact of ANCLUC study. Suggested strategy to monitor and support appropriate recommendations and proposals of others. Timing: Long term activity.

e. Recommendation

DRP in cooperation with DOA, and participating cities, monitor activities of above reference transit studies and prepare a report recommending appropriate cooperative role for LAX.