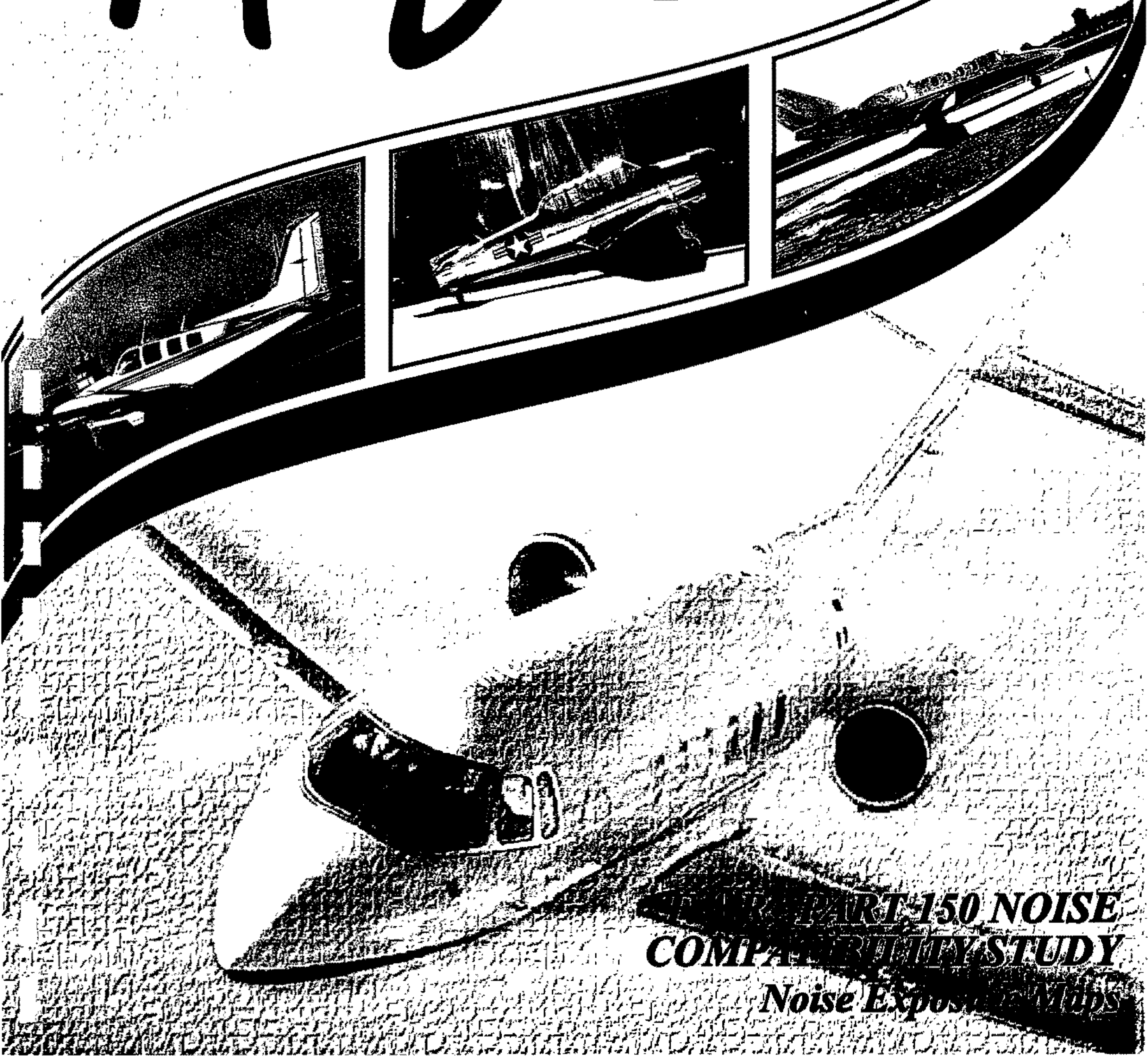
2002 Addison Airport Noise Compatibility Study - Exposure Maps 5000.013

F.AR PART 150
NOISE Exposure Maps

Addison! Airport



FAR PART 150 NOISE COMPATIBILITY STUDY

Noise Exposure Maps

ADDISON AIRPORT

F.A.R. Part 150
Noise Compatibility Study Update

NOISE EXPOSURE MAPS

Prepared For
The Town of Addison

By
Coffman Associates, Inc.

September 2002

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

TABLE OF CONTENTS

CONTENTS

ADDISON AIRPORT
Addison, Texas

F.A.R. Part 150
Noise Compatibility Study Update

NOISE EXPOSURE MAPS

NOISE EXPOSURE MAPS

Chapter One
INVENTORY

Chapter One (Continued)

Chapter Two
AVIATION DEMAND FORECASTS

Chapter Two (Continued

Chapter Three
AVIATION NOISE

Chapter Four
NOISE IMPACTS

Chapter Four (Continued)

EXHIBITS

EXHIBITS (Continued)

Appendix C
LOCAL ZONING PROVISIONS

Appendix D
EVALUATION OF CURRENT NOISE COMPATIBILITY PROGRAM

Appendix E
INM INPUT ASSUMPTIONS AND OUTPUT REPORT

TECHNICAL INFORMATION PAPERS

GLOSSARY OF NOISE COMPATIBILITY TERMS
THE MEASUREMENT AND ANALYSIS OF SOUND
EFFECTS OF NOISE EXPOSURE
MEASURING THE IMPACT OF NOISE ON PEOPLE
NOISE AND LAND USE COMPATIBILITY GUIDELINES

NOISE EXPOSURE MAPS

NOISE EXPOSURE MAPS

This document is the Noise Exposure Map document prepared for Addison Airport, which is owned by the Town of Addison and managed and operated through a lease/management agreement with the Washington Staubach Addison Airport Venture.

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

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

Chapter Two, Aviation Activity Forecasts, presents forecasts for general aviation activity. Forecasts are broken down by type of activity – single engine aircraft, multi-engine aircraft, turboprop, jet, and helicopter.

Chapter Three, Aviation Noise Analysis Methodology, explains the methodology used to develop aircraft noise contours. It also describes the key input assumptions used for noise modeling.

Chapter Four, Noise Exposure and Impacts, presents existing and forecast aircraft noise exposure based on the assumption of no additional noise abatement efforts. This analysis provides baseline data for evaluating potential noise abatement strategies in the second part of the study. It also analyzes the impact of baseline aircraft noise on noise-sensitive land uses and the resident population.

Supplemental information is provided in appendixes and Technical Information Papers. Appendix A lists the members of the Planning Advisory Committee (PAC) that were consulted throughout the planning process. It also includes an explanation of the role of the SAC in the process.

Appendix B, Coordination, Consultation and Public Involvement, summarizes the planning process, local coordination, and the public involvement process.

Appendix C contains a summary of the various zoning ordinances which apply to the study area.

Appendix D is an evaluation of the current Noise Compatibility Program (NCP). This evaluation provides a status of each recommendation in the 1991 NCP.

Appendix E contains the INM Output Report. This report provides detailed tables which depict reported aircraft operations, runway use, and day/nighttime operation split by aircraft type.

Four Technical Information Papers are provided for reference and background. These papers include the Glossary of Noise Compatibility Terms, The Measurement and Analysis of Sound, Effects of Noise Exposure, and Measuring the Impact of Noise on People.

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

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

AIRPORT NAME: ***Addison Airport***
Addison, Texas

REVIEWER: _______________

	Yes/No/NA	Page No./ Other Reference
I. IDENTIFICATION AND SUBMISSION OF MAP DOCUMENT:		
A. Is this submittal appropriately identified as one of the following, submitted under F.A.R. Part 150:		
1. a NEM only?	Yes	Title Page, p. i
2. a NEM and NCP?	No	
3. a revision to NEMs which have previously been determined by FAA to be in compliance with Part 150?	No	
B. Is the airport name and the qualified airport operator identified?	Yes	Title Page, p. i
C. Is there a dated cover letter from the airport operator which indicates the documents are submitted under Part 150 for appropriate FAA determination?	Yes	p. x
II. CONSULTATION: [150.21(b), A150.105(a)]		
A. Is there a narrative description of the consultation accomplished, including opportunities for public review and comment during map development?	Yes	Appendix B; and supplemental volume, Supporting Information on Project Coordination and Local Consultation
B. Identification:		
1. Are the consulted parties identified?	Yes	Appendices A and B; and supplemental volume, Supporting Information on Project Coordination and Local Consultation
2. Do they include all those required by 150.21(b) and A150.105(a)?	Yes	Appendices A and B; and supplemental volume, Supporting Information on Project Coordination and Local Consultation

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

AIRPORT NAME: ***Addison Airport***
Addison, Texas

REVIEWER: ______________

	Yes/No/NA	Page No./ Other Reference
C. Does the documentation include the airport operator's certification, and evidence to support it, that interested persons have been afforded adequate opportunity to submit their views, data, and comments during map development and in accordance with 150.21(b)?	Yes	p. x; Appendix B, and supplemental volume, Supporting Information on Project Coordination and Local Consultation
D. Does the document indicate whether written comments were received during consultation and, if there were comments, that they are on file with the FAA region?	Yes	Appendix B, and supplemental volume, Supporting Information on Project Coordination and Local Consultation
III. **GENERAL REQUIREMENTS: [150.21]**		
A. Are there two maps, each clearly labeled on the face with year (existing condition year and 5-year)?	Yes	See NEM Maps, Exhibits 1 & 2 after p. x
B. Map currency:		
1. Does the existing condition map year match the year on the airport operator's submittal letter?	Yes	Current year is labeled 2002, based on calender year 2001 operations from airport traffic control tower (ATCT) reports and nighttime operation counts which added an addition six percent to the total operations. This is a fair representation of existing conditions. Based upon the 12 months ending in July 2002, total operations from ATCT reports with the added six percent nighttime activity were 164,975, three percent less than the than the operations modeled for 2002.
2. Is the 5-year map based on reasonable forecasts and other planning assumptions and is it for the fifth calendar year after the year of submission?	Yes	See 2007 NEM after p. x; Chapter Two, pp. 2-26 - 2-34, Chapter Three, pp. 3-7 - 3-18

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

AIRPORT NAME: Addison Airport, Addison, Texas | *REVIEWER:* ____________

	Yes/No/NA	Page No./ Other Reference
3. If the answer to 1 & 2 above is no, has the airport operator verified in writing that data in the documentation are representative of existing condition and 5-year forecast conditions as of the date of submission?	N/A	
C. **If the NEM and NCP are submitted together:**		
1. Has the airport operator indicated whether the 5-year map is based on 5-year contours without the program vs. contours if the program is implemented?	N/A	
2. If the 5-year map is based on program implementation:		
a. are the specific program measures which are reflected on the map identified?	N/A	
b. does the documentation specifically describe how these measures affect land use compatibilities depicted on the map?	N/A	
3. If the 5-year NEM does not incorporate program implementation, has the airport operator included an additional NEM for FAA determination after the program is approved which shows program implementation conditions and which is intended to replace the 5-year NEM as the new official 5-year map?	N/A	
IV. **MAP SCALE, GRAPHICS, AND DATA REQUIREMENTS: [A150.101, A150.103, A150.105, 150.21(a)]**		
A. Are the maps sufficient scale to be clear and readable (they must not be less than 1" to 8,000'), and is the scale indicated on the maps?	Yes	See NEM Maps after p. x
B. Is the quality of the graphics such that required information is clear and readable?	Yes	See NEM Maps after p. x
C. Depiction of the airport and its environs.		
1. Is the following graphically depicted to scale on both the existing conditions and 5-year maps:		
a. airport boundaries?	Yes	See NEM Maps after p. x
b. runway configurations with runway end numbers?	Yes	See NEM Maps after p. x

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

AIRPORT NAME: ***Addison Airport***
Addison, Texas

REVIEWER: ____________

				Yes/No/NA	Page No./ Other Reference
	2.	Does the depiction of the off-airport data include:			
		a.	a land use base map depicting streets and other identifiable geographic features?	Yes	See NEM Maps after p. x
		b.	the area within the 65 Ldn (**or beyond, at local discretion**)?	Yes	See NEM Maps after p. x
		c.	clear delineation of geographic boundaries and the names of all jurisdictions with planning and land use control authority within the 65 Ldn (or beyond, at local discretion)?	Yes	See NEM Maps after p. x
D.	1.	Continuous contours for at least the 65, 70, and 75 Ldn?		Yes	See NEM Maps after p. x
	2.	Based on current airport and operational data for the existing condition year NEM, and forecast data for the 5-year NEM?		Yes	Chapter Two, pp. 2-26 - 2-34 Chapter Three, pp. 3-7 - 3-18
E.	Flight tracks for the existing condition and 5-year forecast timeframes (these may be on supplemental graphics which must use the same land use base map as the existing condition and 5-year NEM), which are numbered to correspond to accompanying narrative?			Yes	Chapter Three, Exhibits 3F, 3G, 3H, and 3J after p. 3-14
F.	Locations of any noise monitoring sites (these may be on supplemental graphics which must use the same land use base map as the official NEMs)			Yes	Chapter Three, Exhibit 3A after p. 3-4
G.	Noncompatible land use identification:				
	1.	Are noncompatible land uses within at least the 65 Ldn depicted on the maps?		Yes	See NEM Maps after p. x
	2.	Are noise-sensitive public buildings identified?		Yes	See NEM Maps after p. x

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

AIRPORT NAME: ***Addison Airport, Addison, Texas*** — *REVIEWER:* ______________

	Yes/No/NA	Page No./ Other Reference
3. Are the noncompatible uses and noise-sensitive public buildings readily identifiable and explained on the map legend?	Yes	See NEM Maps after p. x
4. Are compatible land uses, which would normally be considered noncompatible, explained in the accompanying narrative?	N/A	
V. NARRATIVE SUPPORT OF MAP DATA: [150.21(a), A150.1, A150.101, A150.103]		
A. 1. Are the technical data, including data sources, on which the NEMs are based adequately described in the narrative?	Yes	Chapter Three, pp. 3-7 - 3-15 Appendix E
2. Are the underlying technical data and planning assumptions reasonable?	Yes	Chapter Three, pp. 3-7 - 3-15 Appendix E
B. Calculation of Noise Contours:		
1. Is the methodology indicated?	Yes	Chapter Three, p. 3-7
a. is it FAA approved?	Yes	Chapter Three, p. 3-7
b. was the same model used for both maps?	Yes	Chapter Three, p. 3-7
c. has AEE approval been obtained for use of a model other than those which have previous blanket FAA approval?	N/A	
2. Correct use of noise models:		
a. does the documentation indicate the airport operator has adjusted or calibrated FAA-approved noise models or substituted one aircraft type for another?	No	Chapter Three, pp. 3-7 - 3-15. No calibrations done. Some composite aircraft descriptors used.
b. if so, does this have written approval from AEE?	N/A	All aircraft INM designators used are on AEE's pre-approved list of substitutions.

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

AIRPORT NAME: ***Addison Airport***
Addison, Texas

REVIEWER: ______________

	Yes/No/NA	**Page No./ Other Reference**
3. If noise monitoring was used, does the narrative indicate that Part 150 guidelines were followed?	Yes	Our measurement program is discussed in Chapter Three and can be described as a "survey type" program. Please see FAA AC 150/5020-1, Noise Control and Compatibility Planning for Airports, pp. 12-17. Our results indicate reasonable agreement between measurements and INM predictions. Where the measured values deviated from INM predictions, it was explained by operations differing from average annual conditions.

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

***AIRPORT NAME:* Addison Airport**
Addison, Texas

REVIEWER: ______________

	Yes/No/NA	Page No./ Other Reference
4. For noise contours below 65 Ldn, does the supporting documentation include explanation of local reasons? (Narrative explanation is highly desirable but not required by the Rule.)	N/A	
C. Noncompatible Land Use Information:		
1. Does the narrative give estimates of the number of people residing in each of the contours (Ldn 65, 70, and 75 at a minimum) for both the existing condition and 5-year maps?	Yes	Chapter Four, pp. 4-6 - 4-7, pp. 4-10-4-11
2. Does the documentation indicate whether Table 1 of Part 150 was used by the airport operator?		Chapter Four, pp. 4-2 - 4-3 Exhibit 4A
a. If a local variation to Table 1 was used;		
(1) does the narrative clearly indicate which adjustments were made and the local reasons for doing so?	N/A	
(2) does the narrative include the airport operators complete substitution for Table 1?	N/A	
3. Does the narrative include information on self-generated or ambient noise where compatible/noncompatible land use identification consider non-airport/aircraft sources?	No	
4. Where normally noncompatible land uses are not depicted as such on the NEMs, does the narrative satisfactorily explain why, with reference to the specific geographic areas?	N/A	
5. Does the narrative describe how forecasts will affect land use compatibility?	Yes	Chapter Four, pp. 4-7 - 4-11
VI. **MAP CERTIFICATIONS: [150.21(b), 150.21(e)]**		
A. Has the operator certified in writing that interested persons have been afforded adequate opportunity to submit views, data, and comments concerning the correctness and adequacy of the draft maps and forecasts?	Yes	Certification statements on NEM Maps and p. x
B. Has the operator certified in writing that each map and description of consultation and opportunity for public comment are true and complete?	Yes	Certification statements on NEM Maps and p. x

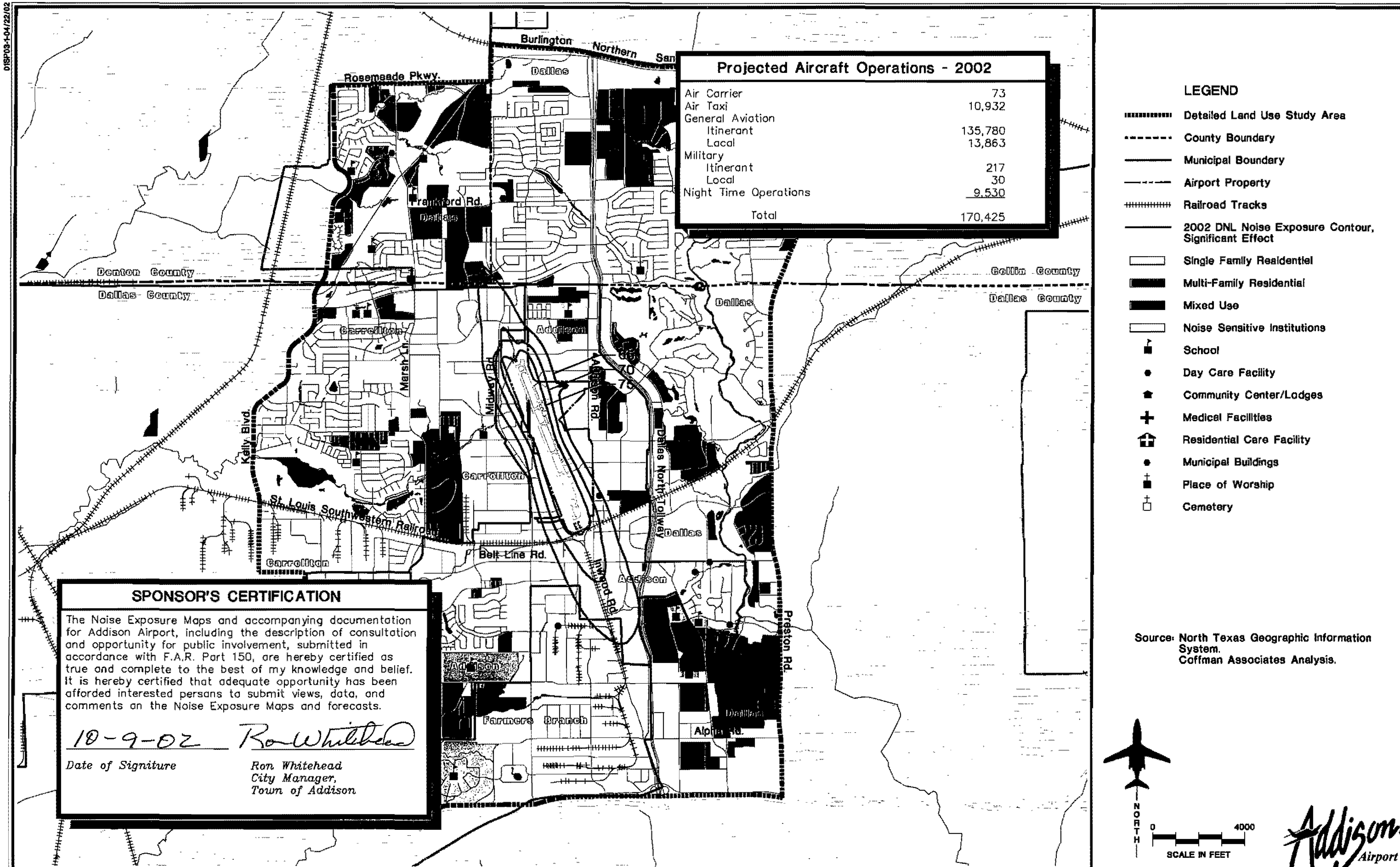
SPONSOR'S CERTIFICATION

The Noise Exposure Maps and accompanying documentation for Addison Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with F.A.R. Part 150, and hereby certified as true and complete to the best of my knowledge and belief. It is hereby certified that adequate opportunity has been afforded interested persons to submit views, data, and comments on the Noise Exposure Maps and forecasts. It is further certified that the 2002 Noise Exposure Map and supporting data are fair and reasonable representations of existing conditions at the airport.

10-9-02

Date of Signature

Mr. Ron Whitehead
City Manager, Town of Addison



Projected Aircraft Operations - 2002

Air Carrier	73
Air Taxi	10,932
General Aviation	
Itinerant	135,780
Local	13,863
Military	
Itinerant	217
Local	30
Night Time Operations	9,530
Total	170,425

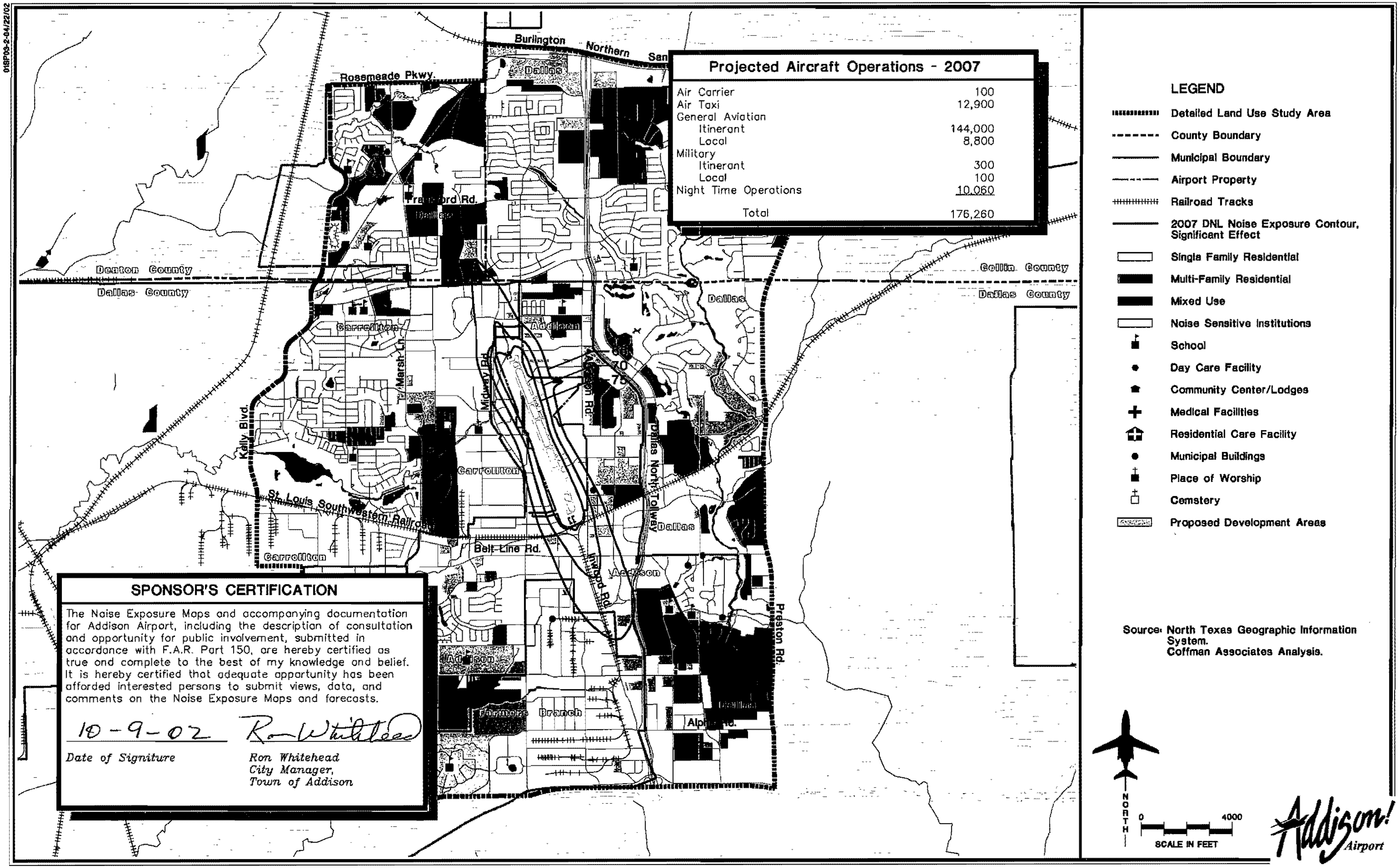
SPONSOR'S CERTIFICATION

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

10-9-02 — *Date of Signiture*

Ron Whitehead
City Manager,
Town of Addison

Exhibit 1
2002 NOISE EXPOSURE MAP
CONTOUR WITH LAND USE



Projected Aircraft Operations - 2007

Air Carrier	100
Air Taxi	12,900
General Aviation	
Itinerant	144,000
Local	8,800
Military	
Itinerant	300
Local	100
Night Time Operations	10,060
Total	176,260

SPONSOR'S CERTIFICATION

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

10-9-02 [signature]

Date of Signiture

Ron Whitehead
City Manager,
Town of Addison

Exhibit 2
2007 NOISE EXPOSURE MAP
CONTOUR WITH LAND USE

Chapter One
INVENTORY

INVENTORY

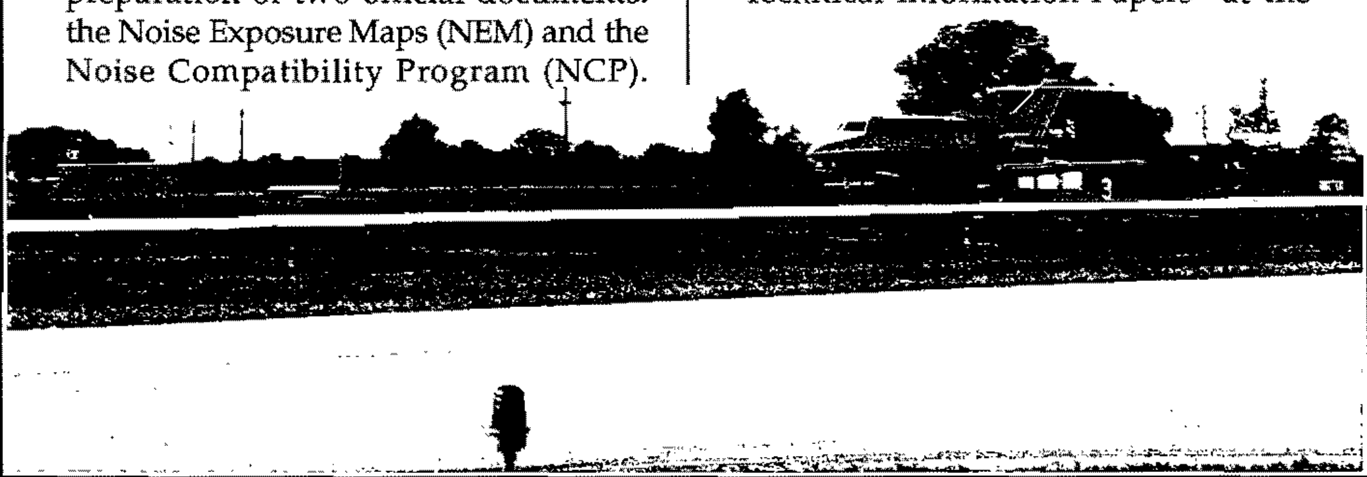
This chapter presents an overview of Addison Airport (ADS) and its relationship to the surrounding community. The background information in this chapter will be used in later stages of the noise compatibility planning process and is as follows:

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

This noise study involves the preparation of two official documents: the Noise Exposure Maps (NEM) and the Noise Compatibility Program (NCP).

The NEM document is a baseline analysis showing existing and potential future noise conditions at the airport. It will include Chapters One, Two, Three, and Four of this study. The NCP document, which will include Chapters Five, Six, and Seven, presents a plan for effectively dealing with adverse noise impacts based on a three-part perspective. First, it addresses steps to abate or reduce aircraft noise. Second, it addresses noise mitigation techniques to reduce the impact of noise on sensitive land uses in the area. Third, it addresses land use planning to encourage future development that is compatible with the airport.

A glossary in the section titled "Technical Information Papers" at the



back of this document provides a description of airport terms and acronyms.

JURISDICTIONS AND RESPONSIBILITIES

Reduction of aircraft noise impacts is a complex issue with several parties sharing in the responsibility: the federal government, state and local governments, planning agencies, the airport proprietor, airport users, and local residents. All interests must be considered in the noise compatibility planning process.

FEDERAL

Aviation plays a vital role in interstate commerce. Recognizing this, the federal government has assumed the role of coordinator and regulator of the nation's aviation system. Congress has assigned administrative authority to the Federal Aviation Administration (FAA). Specific responsibilities of the FAA include:

- The regulation of air commerce in order to promote its development, safety, and to fulfill the requirements of national defense.
- The promotion, encouragement, and development of civil aeronautics.
- The control of the use of navigable airspace and the regulation of civil and military aircraft operations to promote the safety and efficiency of both.
- The development and operation of a common system of air traffic control and navigation for both military and civil aircraft.

The FAA also administers a program of federal grants-in-aid for the development of airport master plans, the acquisition of land, and for the planning, design, and construction of eligible airport improvements. In addition, Congress has passed legislation and the FAA has established regulations governing the preparation of noise compatibility programs. Laws and regulations were also implemented that required the conversion of the commercial aircraft fleet to quieter aircraft.

F.A.R. Part 150 Noise Compatibility Studies

The *Aviation Safety and Noise Abatement Act of 1979* (ASNA, P.L. 96-193), signed into law on February 18, 1980, was enacted, ". . . to provide and carry out noise compatibility programs, to provide assistance to assure continued safety in aviation, and for other purposes." The FAA was vested with the authority to implement and administer the Act.

Federal Aviation Regulation (F.A.R.) Part 150, the administrative rule promulgated to implement the Act, sets requirements for airport operators who choose to undertake an airport noise compatibility study with federal funding assistance. As previously discussed, Part 150 provides for the development of two final documents:

noise exposure maps and a noise compatibility program.

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

Part 150 requires the use of standard methodologies and metrics for analyzing and describing noise. It also establishes guidelines for the identification of land uses which are incompatible with noise of different levels. Airport proprietors are required to update noise exposure maps when changes in the operation of the airport would create any new, substantial non-compatible use. This is defined as an increase in the Yearly Day-Night Average Sound Level (DNL) of 1.5 decibels over noncompatible land uses.

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

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

The ASNA Act provides that "constructive knowledge" shall be attributed to any person if a copy of the noise exposure map was provided to him at the time of property acquisition, or if notice of the existence of the noise exposure map was published three times in a newspaper of general circulation in the area. In addition, Part 150 defines "significant increase" as an increase of 1.5 DNL. (See F.A.R. Part 150, Section 150.21 [d], [f] and [g]; Airport Environmental Handbook Order 5050.4A, 47e [1] [a].) For purposes of this provision, FAA officials consider the term "area surrounding an airport" to mean an area within the 65 DNL contour.

Acceptance of the noise exposure maps by the FAA is required before it will approve a noise compatibility program for the airport.

Noise Compatibility Program. A noise compatibility program includes provisions for the abatement of aircraft noise through aircraft operating procedures, air traffic control procedures, airport regulations, or airport facility modifications. It also includes provisions for land use compatibility planning and may include actions to mitigate the impact of noise on noncompatible land uses. The program must contain provisions for updating and periodic revision.

F.A.R. Part 150 establishes procedures and criteria for FAA evaluation of noise compatibility programs. Among these, two criteria are of particular importance: the airport proprietor may take no action that imposes an undue burden on interstate or foreign commerce, nor may the proprietor unjustly discriminate between different categories of airport users.

With an approved noise compatibility program, an airport proprietor becomes eligible for funding through the Federal Airport Improvement Program (AIP) to implement the eligible items of the program.

The FAA established a policy in 1998 for Part 150 approval and funding of noise mitigation measures. The FAA will not approve measures in Noise Compatibility Programs proposing corrective noise mitigation actions for new noncompatible development that is allowed to occur in the vicinity of airports after October 1, 1998, the effective date of this policy. As of the same effective date, AIP funding under the noise set-aside will be determined using criteria consistent with this policy. Specifically, corrective noise mitigation measures for new noncompatible development that occurs after October 1, 1998 will not be eligible for AIP funding under the noise set-aside regardless of previous FAA approvals under Part 150.

This policy increases the incentives for airport operators to discourage the development of new noncompatible land uses around airports and to assure the most cost-effective use of federal funds spent on noise mitigation measures.

The latest policy does not affect funding under the AIP for noise mitigation projects that do not require Part 150 approval, that can be funded with Passenger Facility Charges (PFC) revenue, or that are included in FAA-approved environmental documents for airport development.

F.A.R. Parts 36 And 91
Federal Aircraft Noise Regulations

The FAA has required reduction of aircraft noise at the source through certification, modification of engines, or replacement of aircraft. F.A.R. Part 36 prohibits the further escalation of noise levels of subsonic civil turbojet and transport category aircraft. It also requires new airplane types to be markedly quieter than earlier models. Subsequent amendments have extended the noise standards to include small, propeller-driven airplanes and supersonic transport aircraft.

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

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

Pursuant to the Congressional mandate in the *Airport Noise and Capacity Act of 1990* (ANCA), FAA has established amendments to F.A.R. Part 91 by setting December 31, 1999 as the date for discontinuing use of all Stage 2 aircraft exceeding 75,000 pounds. Stage 2 aircraft operating non-revenue flights can operate beyond the December 31, 1999 deadline for the following purposes:

1.1_ To sell, lease, or scrap the aircraft;

1.2_ To obtain modifications to meet Stage 3 standards;

1.3_ To obtain scheduled heavy maintenance or significant modifications;

1.4_ To deliver the aircraft to a lessee or return it to a lessor;

1.5_ To park or store the aircraft;

1.6_ To prepare the aircraft for any of these events; or

1.7_ To operate under an experimental airworthiness certificate.

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

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

F.A.R. Part 161 sets forth requirements for notice and approval of local restrictions on aircraft noise levels and airport access. Part 161 was developed in response to ANCA. It applies to local airport restrictions that would have the effect of limiting operations of Stage 2 or 3 aircraft. These include direct limits on maximum noise levels, nighttime curfews, and special fees intended to encourage changes in airport operations to lessen noise.

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

Noise or access restrictions on Stage 3 aircraft can be implemented only after receiving FAA approval. Before granting approval, the FAA must find that the six conditions specified in the statute, and listed below, are met.

(1) The restriction is reasonable, non-arbitrary, and nondiscriminatory.

(2) The restriction does not create an undue burden on interstate or foreign commerce.

(3) The proposed restriction maintains safe and efficient use of the navigable airspace.

(4) The proposed restriction does not conflict with any existing federal statute or regulation.

(5) The applicant has provided adequate opportunity for public comment on the proposed restriction.

(6) The proposed restriction does not create an undue burden on the national aviation system.

In its application for FAA review and approval of the restriction, the airport operator must include an environmental assessment of the proposal and a complete analysis addressing the six conditions. Within 30 days of receipt of the application, the FAA must determine whether the application is complete. After a complete application has been filed, the FAA publishes a notice of the proposal in the *Federal Register*. FAA must approve or disapprove the restriction within 180 days of receipt of the completed application. Very few Part 161 studies have been undertaken since the enactment of ANCA. **Table 1A** summarizes the studies that have been done to date. Currently, no F.A.R. Part 161 Study has received FAA approval.

Airport operators that implement noise and access restrictions in violation of F.A.R. Part 161 are subject to termination of eligibility for airport grant funds and authority to impose and collect PFCs.

Air Traffic Control

The FAA is responsible for the control of navigable airspace and the operation of air traffic control systems at the nation's airports. Airport proprietors have no direct control over airspace management and air traffic control, although they can propose changes in procedures.

The FAA reviews any proposed changes in flight procedures, such as flight tracks or runway use programs, proposed for noise abatement on the basis of safety of flight operations, safe and efficient use of the navigable airspace, management and control of the national airspace and traffic control systems, effect on security and national defense, and compliance with applicable laws and regulations. Typically, FAA implements and regulates flight procedures pertaining to noise abatement through the local air traffic control manager.

TABLE 1A
Summary of F.A.R. Part 161 Studies

Airport	Year Started	Year Ended	Cost	Proposal, Status
Aspen-Pitkin County Airport, Aspen, Colorado	N.A.	N.A.	N.A.	The study has not yet been submitted to FAA.
Kahului Airport, Kahului, Maui, Hawaii	1991	1994	$50,000 (est.)	Proposed nighttime prohibition of Stage 2 aircraft pursuant to court stipulation. Cost-benefit and statewide impact analysis found to be deficient by FAA. Airport never submitted a complete Part 161 Study. Suspended consideration of restriction.
Minneapolis-St. Paul International Airport, Minneapolis, Minnesota	1992	1992	N.A.	Proposed nighttime prohibition of Stage 2 aircraft. Cost-benefit analysis was deficient. Never submitted complete Part 161 Study. Suspended consideration of restriction and entered into negotiations with carriers for voluntary cooperation.
Pease International Tradeport, Portsmouth, New Hampshire	1995	N.A.	N.A.	Have not yet submitted Part 161 Study for FAA review.
San Francisco International Airport, San Francisco, California	1998	1999	$200,000	Proposing extension of nighttime curfew on Stage 2 aircraft over 75,000 pounds. Started study in May 1998. Submitted to FAA in early 1999 and subsequently withdrawn.
San Jose International Airport, San Jose, California	1994	1997	Phase 1 - $400,000 Phase 2 - $5 to $10 million (est.)	Study undertaken as part of a legal settlement agreement. Studied a Stage 2 restriction. Suspended study after Phase 1 report showed costs to airlines at San Jose greater than benefits in San Jose. Never undertook Phase 2, systemwide analysis. Never submitted study for FAA review.
Burbank-Glendale-Pasadena Airport	2000	Ongoing	Phase 1 - $1 million (est.)	Proposed curfew restricting all aircraft operations from 10:00 p.m. to 7 a.m.

TABLE 1A (Continued)
Summary of F.A.R. Part 161 Studies

Airport	Year		Cost	Proposal, Status
	Started	Ended		
Naples Municipal Airport Naples, Florida	2000	2000	Currently $730,000 Expect an additional cost of $1.5 to $3.0 million in legal fees due to litigation.	Enactment of a total ban on Stage 2 general aviation jet aircraft under 75,000 pounds (the airport is currently restricted to aircraft under 75,000 pounds). Currently in litigation. Airport may have to repay all previous federal funding received for airport projects.

N.A. - Not available.

Sources: Telephone interviews with FAA officials and staffs of various airports.

STATE AND LOCAL

Control of land use in noise-impacted areas around airports is a key tool in limiting the number of citizens exposed to noise. The FAA encourages land use compatibility in the vicinity of airports, and F.A.R. Part 150 has guidelines relating to land use compatibility based on varying levels of noise exposure. Nevertheless, the federal government has no direct legal authority to regulate land use. That responsibility rests exclusively with state and local governments.

State

Although the State of Texas does not directly implement and administer general purpose land use regulations, it has vested cities and towns with that power through enabling legislation. Texas statutes do not mandate the establishment of planning commissions, agencies, or departments in municipalities; however, where such appointments are made, the municipality is permitted to prepare and adopt a long-range comprehensive general plan, and may regulate zoning, subdivision, and land development consistent with the plan. Texas statutes only allow county governments to administer subdivision regulations at this time (with the exception of the Cameron and Willacy Counties in southern Texas which are allowed to prepare and adopt comprehensive general plans and zoning ordinances to ensure the orderly development of the Padre Island area).

The State of Texas differs from many other states in that the state participates in the FAA sponsored State Block Grant Program, pursuant to 49

U.S.C. §47128. As part of this program, the state applies for, receives, and disperses federal AIP dollars. (In the case of F.A.R. Part 150 Studies, funding is distributed from the AIP noise set-aside monies.) To accomplish this, the Texas Department of Transportation (TxDOT) has established the Aviation Capital Improvements Program, which is essentially a plan for the development of general aviation. The plan contains a detailed list of projects within the state, based on the anticipated funding levels of the FAA's AIP. TxDOT determines the timing under which projects will proceed through the various planning and construction stages based on the plan.

Local Governments

A number of jurisdictions share the responsibility for land use regulation within the Addison Airport study area. These jurisdictions include Collin and Dallas Counties, and the cities and towns of Addison, Carrollton, Farmers Branch, and Dallas.

In Collin and Dallas Counties, four elected commissioners and an elected county judge make up the five-member Commissioners Court. These courts are the overall governing and management body for the counties. The Commissioners Court is responsible for all budgetary decisions and setting the tax rate each year. Among the duties of the Court is administration of all the business of the County, including the building and maintenance of county roads and bridges.

The Towns of Addison, Carrollton, and Farmers Branch, as well as the City of Dallas, operate under a Council-Manager form of government. The Council is comprised of a Mayor and council members who are elected in at-large elections. It is the Council's responsibility to enact local legislation, adopt budgets, determine policies, and appoint the Town/City Manager. The Town/City Manager serves as the chief administrator, ensuring the Council's policies are carried out.

In addition to regulating land use, local governments may also acquire property to mitigate or prevent airport noise impacts or may sponsor sound insulation programs for this purpose.

AIRPORT PROPRIETOR

Addison Airport is owned by the Town of Addison and managed and operated through a lease/management agreement with the Washington Staubach Addison Airport Venture. The Town Council is the overall governing body for the airport.

As airport proprietor, the Town has limited power to control what types of civil aircraft use its airport or to impose curfews or other use restrictions. This power is limited by the rules of F.A.R. Part 161 described earlier. Airport proprietors may not take actions that (1) impose an undue burden on interstate or foreign commerce, (2) unjustly discriminate between different categories of airport users, and/or (3) involve unilateral action in matters preempted by the federal government.

The Town of Addison may take steps to control on-airport noise by installing sound barriers and acoustical shielding and by controlling the times when aircraft engine maintenance run-up operations may take place. Within the limits of the law and financial feasibility, airport proprietors may mitigate noise, acquire land or partial interests in land, such as air rights, easements, and development rights, to assure the use of property for purposes which are compatible with airport operations.

AIRPORT SETTING

The 1998 National Plan of Integrated Airport Systems (NPIAS), as established by the FAA, identifies 3,344 airports that are important to national transportation. The NPIAS identifies Addison Airport as a reliever airport for Dallas/Fort Worth International Airport.

LOCALE

Addison Airport encompasses approximately 370 acres of land in the northwest portion of the Town of Addison as depicted on **Exhibit 1A**. The airport is bounded by the City of Carrollton to the north, Westgrove Drive and Addison Road to the east, Lindbergh Drive to the South, and Dooley and Wright Brothers Drives, along with the City of Carrollton to the west.

CLIMATE

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

The climate in Addison is subtropical humid with hot summers and mild winters. The normal daily minimum temperature ranges from 32.7 degrees Fahrenheit (F) in January to 74.1 degrees F in July, and the normal daily maximum temperature ranges from 54.1 degrees F in January to 96.5 degrees F in July. July is usually the hottest month with a mean maximum temperature of 96.0 degrees F. The region can expect approximately 33.70 inches of precipitation annually, with May being the wettest month with 4.88 inches of rain.

AIRPORT HISTORY

The origin of Addison Airport was conceptualized in 1954 through the vision of a group of flying enthusiasts. The airport was opened in 1957 and originally included a crosswind runway in addition to the current runway. The crosswind runway was later closed to allow for hangar development at the north end of the airport and to reduce the impact of aircraft on surrounding residential neighborhoods.

01MP15-1A-10/26/01

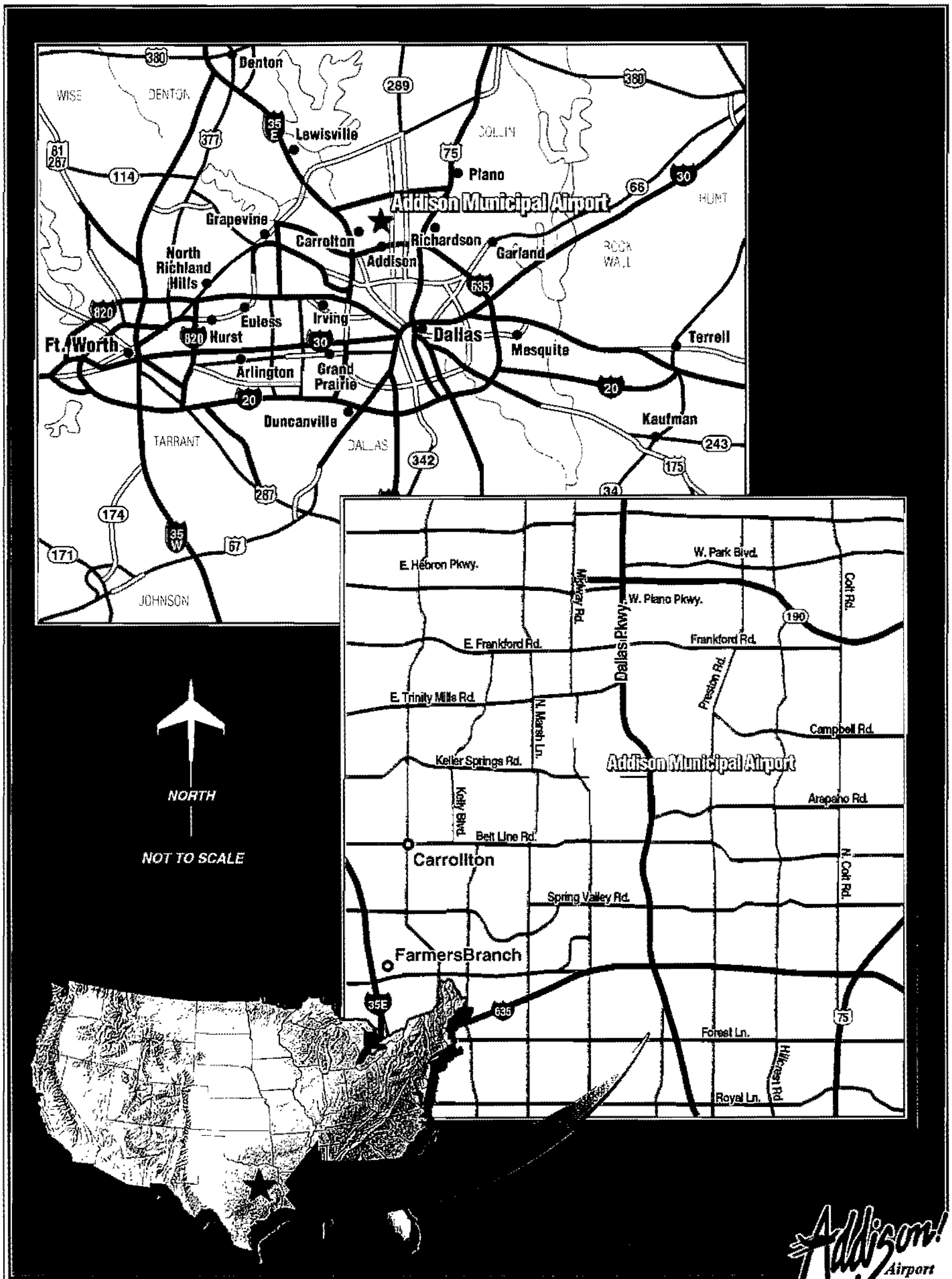


Exhibit 1A
LOCATION MAP

In the 1960s, an airport traffic control tower (ATCT) was constructed at the airport making it the first private airport to receive a fully-funded FAA-operated ATCT. During its first 20 years of operation, Addison Airport grew to become one of the busiest general aviation airports in the country. It is important to note that facility development in this period was achieved without any local, state, or federal funding other than the FAA ATCT.

As a private airport, Addison Airport was not eligible for federal funding assistance for airport improvements. In 1976, the airport owner approached the Town of Addison with an invitation to purchase the airport. An agreement was negotiated and signed in December 1976 that allowed the Town to apply for FAA funding assistance to acquire the airport. A new company, Addison Airport of Texas, Inc. (AATI), paid the Town's share of the purchase price. After the sale, AATI received a 20-year operating contract and long term lease to operate the airport. Two, two-year extensions were granted in the late 1970s and early 1980s, and the contract expired on December 30, 2000. The airport is currently operated by a private firm contracted by the Town of Addison and is still one of the busiest general aviation airports in the country.

AIRFIELD FACILITIES

Airfield facilities influence the utilization of airspace and are important to the noise compatibility planning process. These facilities include the runway and taxiway systems, and aircraft and terminal activity areas. Current airfield facilities are depicted on **Exhibit 1B.**

RUNWAYS

The existing airfield configuration at Addison Airport consists of one northwest-southeast oriented runway. Runway 15-33 is 7,202 feet long and 100 feet wide and is strength-rated at 80,000 pounds single wheel gear loading (SWL), 100,000 pounds dual wheel loading (DWL), and 160,000 pounds dual tandem wheel loading (DTWL). Single wheel loading refers to the design of the aircraft landing gear which has a single wheel on each main landing gear strut. Dual wheel loading refers to the design of certain aircraft landing gear which has two wheels on each main landing gear strut. Larger aircraft may also have a tandem dual wheel configuration which allows structural loads to be spread over a larger area, thus reducing the wear on airport pavements. It should be noted that Runway 15-33 is limited to a maximum gross weight of 120,000 pounds.

Both ends of Runway 15-33 have displaced thresholds. Obstructions, such as tall structures, roads, or lack of safety area limitations, can require runway landing threshold displacements. The displacement requires aircraft to land at a point beyond the physical end of the pavement. It is important to note that pavement behind the displacement can be used for take-off roll or even for landings in the opposite direction depending on the reason for displacement.

Runway 15 has a 979-foot displaced threshold to clear various obstructions, including a 25-foot tree, a 10-foot fence, and terrain that is six feet higher north of the runway. Runway 33 has a 771-foot displaced threshold to clear a 15-foot hangar, Lindbergh Road, and the railroad.

Specific information regarding Runway 15-33 is contained in **Table 1B.**

TABLE 1B
Runway Information

	Runway	
	15	**33**
Runway Length (feet) Runway Width (feet)	7,202 100	
Runway Surface Material	Grooved Asphalt	
Runway Load Bearing Strength (pounds) Single Wheel Loading Double Wheel Loading Dual-Tandem Wheel Loading	 80,000 100,000 160,000*	
Runway Displacement	979 feet	771 feet
Lighting REIL VASI MALSR ILS	 No Yes (VHR) Yes Yes	 Yes No No Yes
Traffic Pattern	Left	Left
Markings	Precision	
Lighting	MIRL	

Source: Airport Facility Directory, South Central United States, February 21, 2002

Notes:
ILS - Instrument Landing System
REIL - Runway End Identifier Lights
VASI - Visual Approach Slope Indicator
MIRL - Medium Intensity Runway Lighting
* Restricted to 120,000 pounds by the airport manager

01MP15-1B-7/9/02

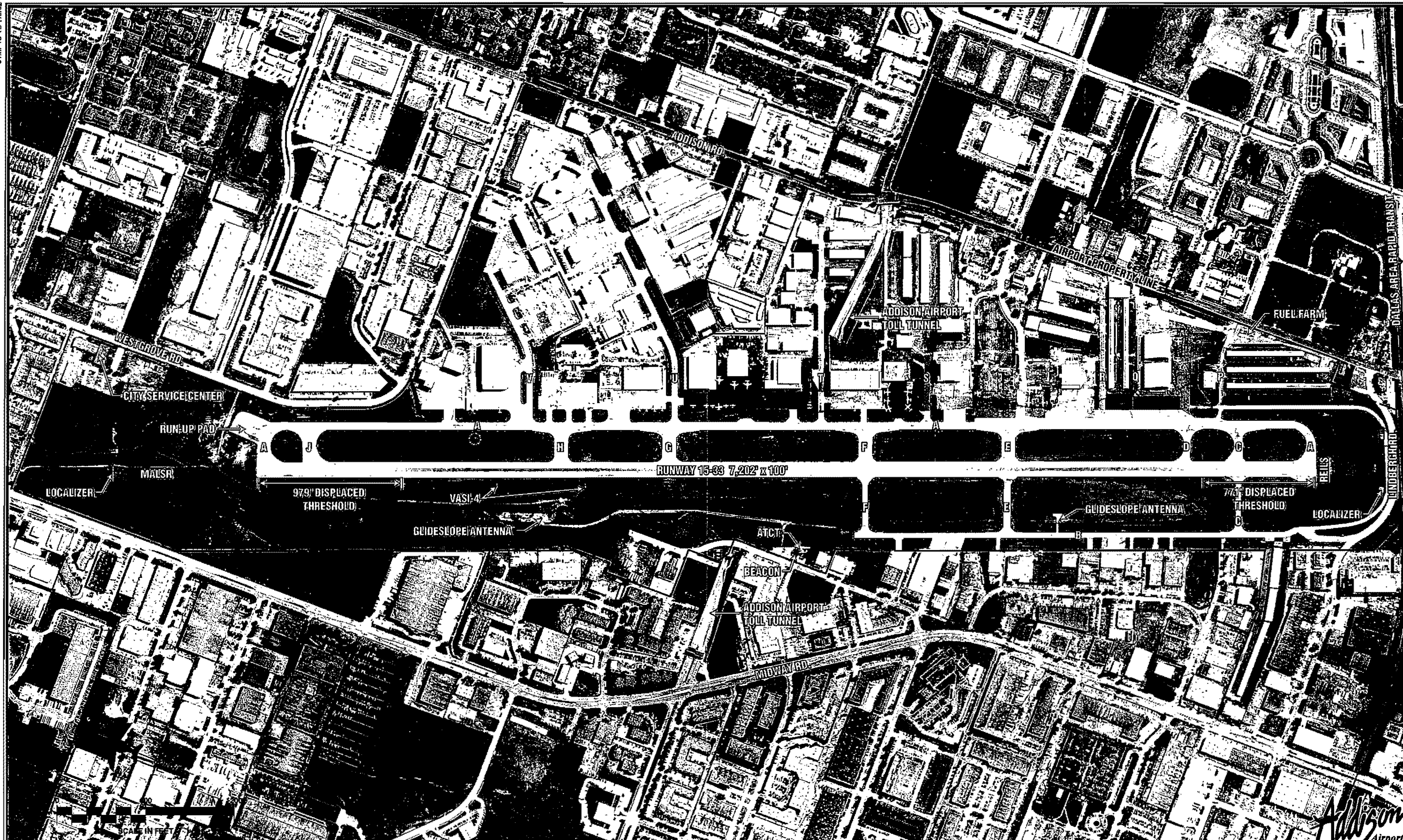


Exhibit 1B
EXISTING AIRFIELD FACILITIES

TAXIWAYS

Runway 15-33 is served by one full-length parallel taxiway, Taxiway A, and a partial taxiway, Taxiway B. The taxiway system consists of a series of connector and exit taxiways which connect the runways with the terminal and fixed base operator areas and provides for the safe movement of aircraft on and around the airport.

Taxiway A starts at the north end of Runway 15-33 and extends the entire length of the east side of the runway, passing the terminal and apron areas. Taxiway B, on the west side of the runway, begins at approximately the runway midpoint and approaches the southern end of the runway, passing various fixed base operators and hangar areas. Taxiways C, E, and F connect Taxiway B to the runway, Taxiway A, and the various services on the east and west sides of the airport. Taxiways K, J, H, G, and D connect the runway to Taxiway A. Taxiways P, Q, R, S, T, U, and V connect Taxiway A with the terminal area, hangars, and various fixed base operators located on the east side of the airport. The existing taxiway system is shown on **Exhibit 1B.**

AIRFIELD LIGHTING

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at the airport for this purpose. These lighting systems, categorized by function, are summarized as follows.

Identification Lighting: The location of an airport at night is universally indicated by a rotating beacon. A rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The rotating beacon is located on top of the ATCT.

Runway and Taxiway Lighting: Runway and taxiway lighting utilizes light fixtures placed near the pavement edge to define the lateral limits of the pavement. This lighting is essential for maintaining safe operations at night and/or during times of poor visibility in order to maintain safe and efficient access from the runway and aircraft parking areas. Medium intensity runway lighting (MIRL) is provided along the runway.

Lighting at the airport is available from dusk until dawn through either the ATCT or, when the ATCT is closed, lighting is pilot-controlled.

Approach Lighting: Aircraft transitioning from instrument to visual flight operations for landing are often aided by lighting systems directing the pilot to the runway. Addison Airport utilizes several configurations of approach lighting.

Runway 33 is equipped with a set of runway end identifier lights (REIL). These consist of a pair of flashing strobe lights situated at the end of a particular runway. A medium intensity lighting system with alignment indicator lights (MALSR) is installed on Runway 15. This system consists of constantly illuminated medium intensity lights located along the extended centerline of the runway. This system is enhanced by a series of sequencing strobe lights that aid the pilot in maintaining lateral alignment with the runway.

An additional type of approach lighting helps the pilot maintain the proper glide slope angle (typically 3.0 degrees) while on final approach. When interpreted by the pilot, they give him/her an indication of being either above, below, or on the designated glide slope. One such lighting aid is the four-box visual approach slope indicator (VASI-4R) which is located for use on Runway 15.

GENERAL AVIATION COMPLEX

General aviation amenities are situated at a number of different locations on the airfield (depicted on **Exhibit 1B**). These facilities offer a range of services including pilot's lounges, pilot supplies, flight planning rooms, flight training, fuel, parking, maintenance services, parking, and aircraft sales.

OTHER FACILITIES

A wide range of aviation facilities are available at Addison Airport. There are three cargo operators based at the airport: Cherry-Aire, Ameristar, and Ameriflight. A United States Customs office is also based at the airport. Other services available at the airport include aircraft fueling, aircraft towing, and charter flights.

AIRSPACE AND AIR TRAFFIC CONTROL

The FAA Act of 1958 established the FAA as the responsible agency for the control and use of navigable airspace within the United States.

The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including: air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; personnel and material. The system also includes components shared jointly with the military.

AIRSPACE STRUCTURE

Since the inception of aviation, nations have set up procedures within their territorial boundaries to regulate the use of airspace. Prior to 1993, airspace classifications in the United States were inconsistent with those in other countries. Since then, the FAA has reclassified all airspace within the United States to provide consistency with international standards. Although airspace classifications have changed, the basic premise of the use of airspace in the United States remains the same, and airspace is still broadly classified as either "controlled" or "uncontrolled."

The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air-communications, navigation and air traffic services, and weather conditions. **Exhibit 1C** shows the six designated airspace classifications and terminology. Airspace designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to varying requirements for positive air traffic control. Several types of controlled airspace exist in the Addison area:

- Class A airspace governs operations above 18,000 feet Mean Sea Level (MSL).
- Class B airspace is reserved for airports with the greatest traffic volume in terms of Instrument Flight Rule (IFR) operations and enplaned passengers, such as Dallas/Fort Worth International Airport (DFW) and Dallas Love Field.
- Class D airspace encompasses traffic areas for airports with ATCT (i.e. McKinney Airport).
- Class E airspace is for airports without ATCT.
- Class G airspace covers uncontrolled airspace.

Class C airspace is not present in the Addison area. Class C airspace surrounds towered airports served by radar approach control such as Austin-Bergstrom International Airport. The airspace for the study area is depicted on **Exhibit 1D.**

Class A Airspace

Class A airspace includes all airspace from 18,000 feet above MSL to Flight Level 600 (approximately 60,000 feet MSL). This airspace is designated in F.A.R. Part 71.193 for positive control of aircraft. The Positive Control Area (PCA) allows flights governed only under IFR operations. The aircraft must have special radio and navigation equipment and the pilot must obtain clearance from an Air Traffic Control (ATC) facility to enter Class A airspace. In addition, the pilot must possess an instrument rating.

Class B Airspace

Class B airspace has been established at 29 high density airports in the United States as a means of regulating air traffic activity in those areas. They are established on the basis of a combination of enplaned passengers and volume of operations.

Class B airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high performance, passenger-carrying aircraft at major airports. Class B airspace is the most restrictive, controlled airspace routinely encountered by pilots operating under Visual Flight Rules (VFR) in an uncontrolled environment.

In order to fly through Class B airspace, the aircraft must have special radio and navigation equipment and must obtain air traffic control clearance. In addition, to operate within Class B airspace, a pilot must have at least a private pilot's certificate or be a student pilot who has met the requirements of F.A.R. 61.95, requiring special ground and flight training for Class B airspace. Helicopters do not need special navigation equipment or a transponder if they operate at or below 1,000 feet MSL and have made prior arrangements in the form of a Letter of Agreement with the FAA controlling agency. Aircraft are also required to have and utilize a Mode C transponder within a 30 nautical mile (NM) range of the center of the Class B airspace.

Addison Airport is situated beneath the Dallas/Fort Worth International Airport and Love Field Class B airspace. The base of this airspace begins at 3,000 feet MSL above the airport, steps down to 2,000 feet MSL immediately southwest of the airport, and has a ceiling of 11,000 feet MSL. This configuration allows aircraft to utilize Addison Airport without entering Class B airspace.

Class D Airspace

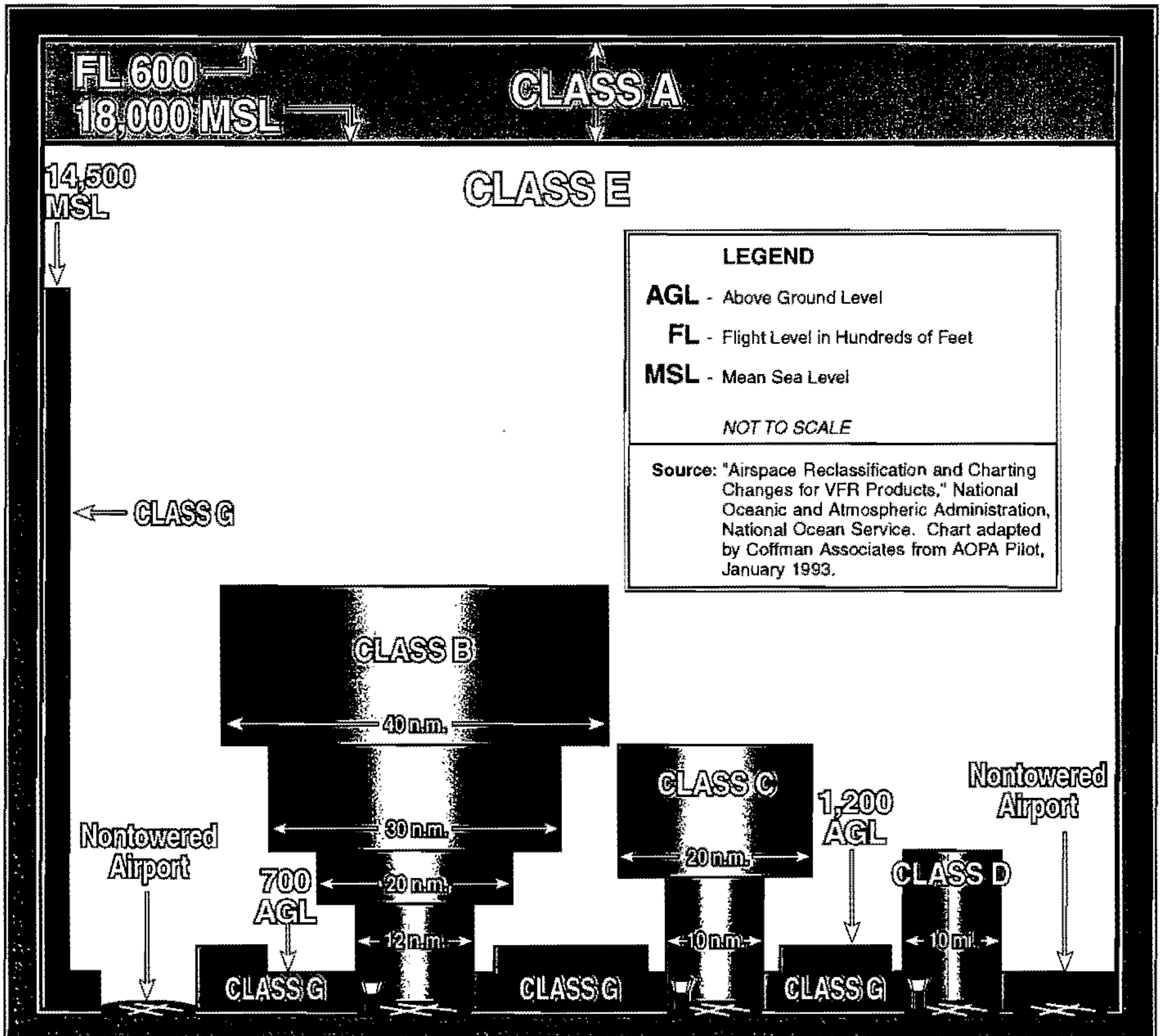
Class D airspace is controlled airspace surrounding airports with an ATCT. The Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nautical miles from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation. If an airport has an instrument approach or departure, the Class D airspace extends along the approach or departure path.

Addison Airport is located within Class D airspace. The Class D airspace extends outward from the airport to a radius of four nautical miles north and east, and from the surface to 3,000 feet MSL, the base of the Dallas/Fort Worth Class B airspace. To the south and west, the Class D airspace is irregular and is constrained by the Dallas/Fort Worth Class B airspace. Aircraft operating in this airspace are required to contact the Addison Airport ATCT prior to entering. When the ATCT is closed, this airspace reverts to Class E airspace.

Class E Airspace

Class E airspace consists of controlled airspace designed to contain IFR operations during portions of the terminal operation and while transitioning between the terminal and enroute environments. The airspace extends upward from 700 feet above the surface when established in conjunction with an airport which has an instrument approach procedure, or from 1,200 feet above the surface when established in conjunction with airway route structures or segments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with air traffic control when operating in Class E airspace. At Addison Airport, Class E airspace (from the surface to Class A and/or Class B airspace) extends outward from the designated

01SP07-1C-2/18/02

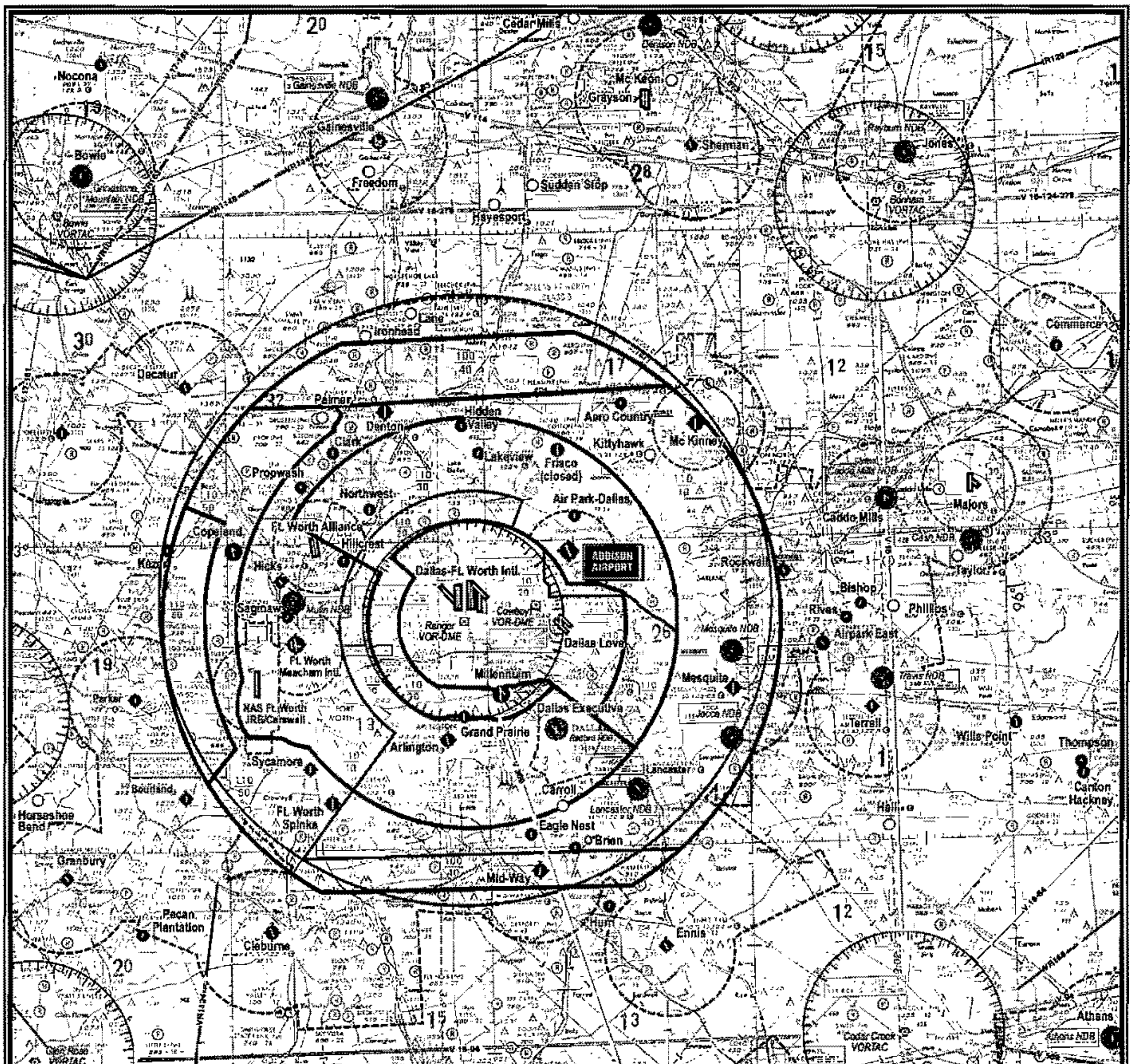


CLASSIFICATION	DEFINITION
CLASS A	Generally airspace above 18,000 feet MSL up to and including FL 600 .
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding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

Addison! Airport

Exhibit 1C
AIRSPACE CLASSIFICATION

01SP07-1D-10/30/01



LEGEND

- Airport with other than hard-surfaced runways
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- VOR
- VORTAC
- Non-Directional Radiobeacon (NDB)
- VOR-DME

- Compass Rose
- Class B Airspace
- Class D Airspace
- Class E Airspace with Floor 700 ft. or greater above surface
- Mode C
- Military Training Routes
- Victor Airways

Source: Dallas-Ft. Worth Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration October 4, 2001

Addison Airport

Exhibit 1D
AIRSPACE MAP

Class D airspace radius when the Addison ATCT is closed.

Class G Airspace

Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlaying Class E airspace (700 to 1,200 feet Above Ground Line (AGL)). Additional FAA rules regulate flight altitudes over congested residential areas, National Parks, and outdoor recreational areas, which are often located under Class G airspace. The overall amount of Class G airspace is continuing to decline due to the need for more coordinated air traffic activity.

Special Use Airspace

Special use airspace is defined as airspace where activities must be confined because of their nature or where limitations are imposed on aircraft not taking part in those activities. These areas are often reserved for military use and are designed to separate non-participating aircraft from military training operations. Locations surrounding wilderness areas and national wildlife refuges are also considered special use airspace. These fall under the definition of "National Park"; therefore, all aircraft are requested to maintain a minimum altitude of 2,000 feet above the surface of designated National Park areas, the definition of which includes wilderness areas. FAA Advisory Circular 91-36C defines the "surface" as the highest terrain within 2,000 feet laterally of the route of flight or the uppermost rim of a canyon or valley. The Hagerman National Wildlife Refuge, located approximately 37 miles north-northeast of Addison Airport, is the only special use airspace in the Addison area.

ENROUTE NAVIGATIONAL AIDS

Enroute navigational aids (NAVAIDS) are established for the purposes of accurate enroute air navigation. Various devices use ground-based transmission facilities and on-board receiving instruments. Enroute NAVAIDS often provide navigation to more than one airport as well as to aircraft traversing the area. Enroute NAVAIDS that operate in the area are discussed below and depicted on **Exhibit 1D**.

The VOR (Very High Frequency Omnidirectional Range) provides course guidance to aircraft by means of a Very High Frequency (VHF) radio frequency. TACAN (Tactical Air Navigation), primarily a military-oriented facility, is often collocated with a VOR station. TACAN provides both course guidance and line-of-sight distance measurement from an Ultra High Frequency (UHF) transmitter. A properly equipped aircraft translates the VORTAC signals into a visual display of both azimuth and distance. Distance measuring equipment (DME) is also sometimes collocated with VOR facilities. DME emits signals enabling pilots of properly equipped aircraft to determine their line-of-sight distance from the facility. There are two VOR/DME facilities (Cowboy [CVE] and Maverick [TTT]) and six VORTAC facilities Bonham (BYP), Bowie (UKW), Cedar Creek (CQY), Glen Rose (JEN), Millsap (MQP), and Ranger (FUZ) that offer navigational assistance in the region.

VORs define low-altitude (Victor) and high altitude (Jet Routes) airways through the area. Most aircraft enter the Addison area via one of these numerous federal airways. Aircraft assigned to altitudes above 18,000 feet MSL use the Jet Route system. Other aircraft use the low altitude airways. Radials off VORs define the centerline of these flight corridors.

As illustrated on **Exhibit 1D**, there are only three Victor Airways (V) within the vicinity of Addison Airport. These airways are V369, V15, and V16-278.

The non-directional beacon (NDB) transmits non-directional signals whereby the pilot of an aircraft equipped with a direction-finding instrument can determine a bearing to or from the radio beacon. The nearest NDB facility to Addison Airport is found south of the airport at Redbird Airport. Additional facilities include Caddo Mills, Lancaster, Mesquite, Jecca, Travis, Cash, and Mufin. Each NDB transmits a continuous three-letter identifier code in International Morse Code.

AREA AIRPORTS

There are nine public use airports, 21 private airports, and no military airports within 20 NM of Addison Airport. The following nine airports are open to the public.

Air Park-Dallas Airport (F69), located 3.3 NM north of Addison Airport, is served by one 3,080-foot asphalt runway. There are 54 based aircraft at the airport and only aircraft rental and maintenance services are available.

Dallas Love Field Airport (DAL) is located 7.3 NM south of Addison Airport and is served by three runways: Runway 13L-31R is made of concrete and is 7,753 feet in length; Runway 13R-31L is also made of concrete and is 8,800 feet in length; and finally, Runway 18-36 is made of asphalt and is 6,149 feet in length. There are 478 based aircraft at the airport and full services are available.

Dallas/Fort Worth International Airport (DFW) is located 11.0 NM west-southwest of Addison Airport and is served by seven runways. Runway 13L-31R is a 9,000-foot concrete runway; Runway 13R-31L is a 9,301-foot concrete runway; Runway 17L-35R is a 8,500-foot concrete runway; Runway 13R-35L is a 13,401-foot concrete runway; and Runways 17C-35C, 18L-36R, and 18R-36L are 11,388-foot concrete runways. Eighty-eight aircraft are based at the airport and full services are available.

Kittyhawk Airport (0T7), located 12.2 NM northeast of Addison Airport, is served by one 2,100-foot turf runway. Seventeen aircraft are based at the airport and no services are available.

Lakeview Airport (30F) is located 13.3 NM northwest of Addison Airport. The airport is currently served by a 2,815-foot asphalt runway and a 2,600-foot turf runway. There are 83 based aircraft at the airport and basic services are available.

Aero Country Airport (T31), located 15.2 NM north-northeast of Addison Airport, is served by one 2,950-foot asphalt runway. There are 175 aircraft based at this airport and basic services are available.

Dallas Executive Airport (DEA) is located 17.3 NM south of Addison Airport. This airport is served by two concrete runways, one 3,800-foot runway and one 6,451-foot runway. There are 173 based aircraft at the airport and full services are available.

McKinney Municipal Airport (TKI), located 17.6 NM northeast of Addison Airport, is served by one 7,001-foot asphalt runway. There are 144 based aircraft at the airport and full services are available.

Grand Prairie Municipal Airport (GPM) is located 19.4 NM south-southwest of Addison Airport. The airport is served by one 4,000-foot concrete runway. There are 287 aircraft based at the airport and basic services are available.

Exhibit 1D illustrates the location of these and other area airports.

INSTRUMENT APPROACHES

Instrument approaches are defined using electronic and visual navigational aids to assist pilots in landing when visibility is reduced below specified minimums. While these are especially helpful during poor weather, they are often used by commercial pilots when visibility is good. Instrument approaches are classified as precision and non-precision. Both provide runway alignment and course guidance, while precision approaches also provide glide slope information for the descent to the runway. Addison Airport has two precision approaches and three non-precision approaches.

Precision Approaches

Most precision approaches in use in the United States today are instrument landing systems (ILS). An ILS provides an approach path for exact alignment and descent of an aircraft on final approach to a runway. The system provides three functions: *guidance*, provided vertically by a glide slope (GS) antenna and horizontally by a localizer (LOC); *range*, furnished by marker beacons or distance measuring equipment (DME); and *visual alignment*, supplied by approach light systems and runway edge lights.

Addison Airport has two published precision approaches. Both Runways 15 and 33 are equipped with an ILS consisting of a localizer and marker beacons. These are depicted on **Exhibit 1E**.

Both runways' ILS utilize a standard 3.0 degree glide slope. The ILS approach to Runway 15 can be flown when cloud ceilings are 894 feet MSL or greater and visibility is one mile or greater. The ILS approach to Runway 33 can be flown when cloud ceilings are 1,240 feet MSL or greater and visibility is one mile or greater for Category A and B aircraft, one and one-half miles or greater for Category C aircraft, and one and three-quarter miles or greater for Category D aircraft.

Non-precision Approaches

A Global Positioning System (GPS) non-precision approach is available for the runway at Addison Airport. GPS circling approaches serve both runway ends. These approaches are defined by satellite signals establishing a series of waypoints at varying distances apart terminating at the end of the runway. Some of these GPS approaches can be flown when cloud ceilings are as low as 1,160 feet MSL or greater and visibility is one mile. In addition to the two GPS approaches, Addison Airport has one NDB approach on Runway 15.

The straight-in GPS approach for Runway 33 can be flown when cloud ceilings are 1,240 feet MSL and visibility is one mile for Category A and B aircraft, one and one-half miles visibility for Category C aircraft, and one and three-quarter miles for Category D aircraft.

The GPS and NDB approach for Runway 15 can be flown when cloud ceilings are 1,100 feet MSL and visibility is one mile for Categories A, B, and C aircraft, and one and one-quarter miles for Category D aircraft.

These approach categories are based on a speed of 1.3 times the stall speed of the aircraft in landing configuration at its maximum gross landing weight. Examples of Categories A and B aircraft include the Beechcraft Bonanza, the Beechcraft King Air, and the Cessna 441. Category C aircraft include the Cessna Citation, the Saab 340, the Gulfstream, and the Boeing 737.

Published arrival procedures for Addison Airport are shown on **Exhibit 1E**.

CUSTOMARY ATC AND FLIGHT PROCEDURES

Flights to and from Addison Airport are conducted using both IFR and VFR. IFR are those that govern the procedures for conducting instrument flight. VFR govern the procedures for conducting flight under visual conditions (good weather). Most air carrier, military, and general aviation jet operations are conducted under IFR regardless of the weather conditions.

Visual Flight Rule Procedures

Under VFR conditions, the pilot is responsible for collision avoidance and will typically announce on the radio, when approximately 10 miles from the airport, their intention to enter the traffic pattern.

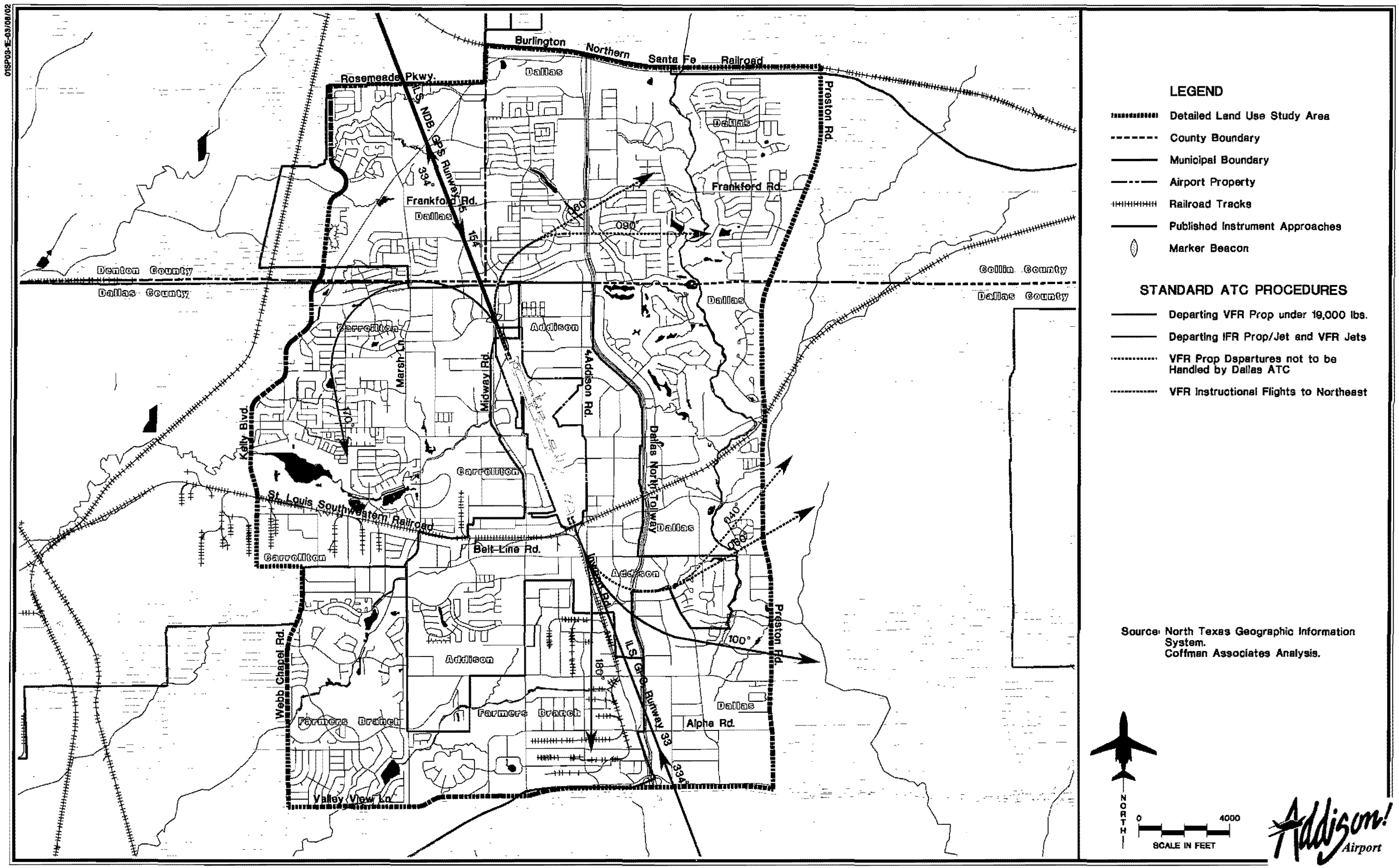


Exhibit 1E
STANDARD AIR TRAFFIC
CONTROL TOWER PROCEDURES

Typically, VFR general aviation traffic stays clear of the more congested airspace and follows recommended VFR flyways in the area. **Exhibit 1D** illustrates a view of the Addison Airport vicinity airspace with recommended VFR routes. It should be noted that VFR practice approaches, also referred to as "touch-and-go" operations, are not allowed at Addison Airport without prior approval from the airport manager.

At Addison Airport, a number of VFR procedures are in place to separate aircraft arriving to and departing from Addison Airport from aircraft approaching and departing Dallas/Fort Worth International Airport and Dallas Love Field.

- Propellor aircraft under 19,000 pounds, departing Runway 15, are directed to turn right to a heading of 180 degrees, while aircraft departing Runway 33 are directed to turn left to a heading of 170 degrees. Once established, these aircraft are transferred to Dallas ATC as a means to maintain appropriate aircraft separation.

- All propellor aircraft departing under VFR with destinations to the east and northeast, that are not expected to enter Dallas airspace, are handled in the following manners. Aircraft departing Runway 15 are directed to turn left to a heading of 040 degrees while aircraft departing Runway 33 are directed to turn right to a heading of 090 degrees. These aircraft are to maintain an altitude at or below 2,000 feet MSL unless otherwise directed.

- Instructional flights departing Addison Airport to the northeast under VFR, which request traffic advisories and flight following, are expected to utilize the "Preston Road Departure Procedure". This departure directs aircraft departing either runway to fly to a heading of 060 degrees and maintain an altitude at or below 2,000 feet MSL until leaving Addison Class D airspace.

- *(This procedure applies to both VFR and IFR traffic departing Addison Airport.)* Aircraft departing Runway 15 are directed to turn left to a heading of 100 degrees. Aircraft departing Runway 33 are directed to fly runway heading before turning on course or a heading designated by ATC. Voluntary noise abatement procedures have been developed for both Runway 15 and 33. Departures from Runway 15 are asked to fly runway heading until reaching 1.5 nautical miles from the Addison localizer (I-ADS), before turning on course or a heading designated by ATC. Departures from Runway 33 are asked to fly runway heading until reaching 2,000 feet MSL before turning on course or a heading designated by ATC.

Instrument Flight Rule Procedures

The Dallas/Fort Worth Terminal Radar Approach Control (TRACON) handles all IFR traffic to and from Addison Airport. IFR arrival traffic is transferred to the TRACON by the Air Route Traffic Control Center (ARTCC) as traffic enters TRACON airspace. Air traffic is turned over to the Addison

ATCT prior to the aircraft entering Addison Class D airspace.

Six published Standard Terminal Arrival Routes (STAR) can be used to direct pilots to the Addison area. A STAR is a planned IFR arrival procedure which provides transition from the enroute structure to an outer fix or an instrument approach fix in the terminal area. The STARs that may be used for arrival to Addison Airport include DUMPY TWO, FINGR THREE, GLEN ROSE FIVE, GREGS FIVE, JONEZ FOUR, and KNEAD FIVE.

The DUMPY TWO arrival directs pilots via a number of routes to the DUMPY intersection. Pilots arriving from the east, southeast, and south can utilize this arrival procedure.

Pilots arriving from the north, northeast, and east can utilize the FINGR THREE arrival procedure. This procedure directs pilots via a number of routes to the FINGR intersection.

The GLEN ROSE FIVE arrival procedure guides pilots arriving from the southwest. Pilots are guided to the GLEN ROSE intersection from a variety of routes.

The GREGS FIVE arrival procedure may be used by pilots arriving from the west, northwest, and north. Pilots are guided to the GREGS intersection from a multitude of locations.

Pilots arriving from the northeast may utilize the JONEZ FOUR arrival procedure. This procedure can be assigned by ATC only. The arrival directs pilots from the JONEZ intersection. From this intersection, pilots are guided to the TADDI intersection. From this point, pilots are given radar vectors to the final approach to the airport.

The KNEAD FIVE arrival procedure guides pilots arriving from the south, southwest, and west. Pilots are guided to the KNEAD intersection from a variety of routes.

STUDY AREA

The study area, as depicted in **Exhibit 1F**, is generally centered on the airport and consists of approximately 24.53 square miles. The study area defines the area within which detailed existing land use information will be presented. It is intended to contain the area expected to be impacted by present and future aircraft noise of 65 DNL or greater.

Modifications to the study area can be made later in the study if deemed necessary as the study area boundaries were established for statistical convenience. It should be emphasized that this area is for the presentation of detailed background data - it is not a definition of the noise impact area. Areas adversely affected by aircraft noise will be defined in later analyses.

The study area includes approximately 4.43 square miles of land under the jurisdiction of the Town of Addison, 4.50 square miles of land under the jurisdiction of the City of Carrollton, 11.43 square miles of land under the jurisdiction of the City of Dallas, and 4.17 square miles of land under the jurisdiction of the City of Farmers Branch.

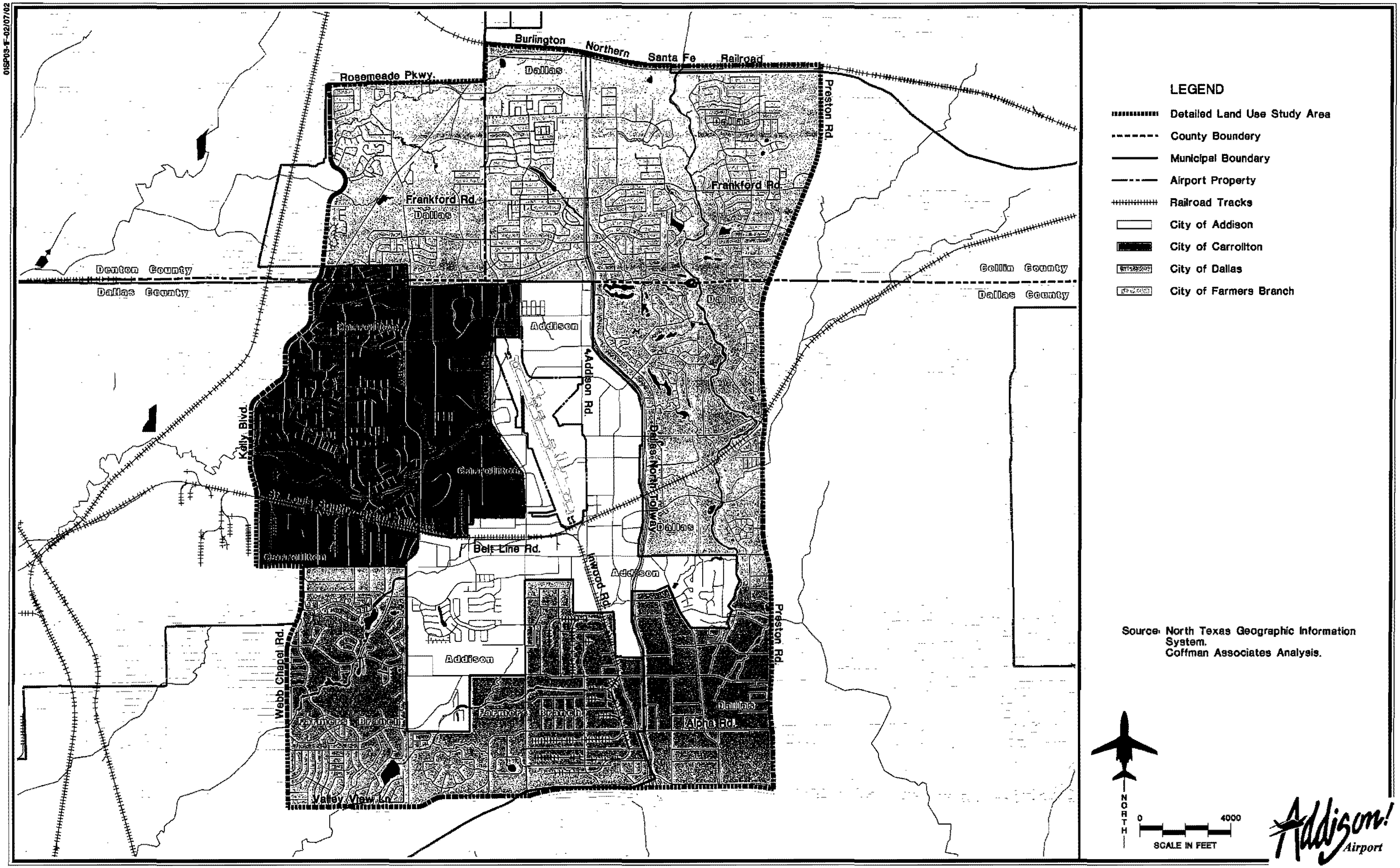


Exhibit 1F
STUDY AREA WITH
JURISDICTIONAL BOUNDARIES

Boundaries of the study area are Rosemead Parkway and the Burlington Northern/Santa Fe Railroad to the north, Preston Road to the east, the Lyndon B. Johnson Freeway (Interstate 635) and Valley View Lane to the south, and Webb Chapel Road and Kelly Boulevard to the west.

EXISTING LAND USE

Exhibit 1G shows existing land use in the study area. The map was developed from data provided by the North Texas Geographic Information System and verified by the Consultant through field investigations conducted during the week of January 20, 2002. Other sources which were consulted include existing land use maps compiled by local jurisdictions, U.S. Geological Survey maps, aerial photos, and published street maps. The land use categories shown on the map were selected to conveniently fit the requirements of noise and land use compatibility planning. **Table 1C** lists the land use categories shown on the existing land use map.

Virtually the entire study area is developed. Areas immediately northwest of the airport, and south of East Trinity Mills Road, consist of compatible park, commercial, and industrial uses. North of East Trinity Mills Road, land uses are primarily residential with tracts of commercial development along the major roads.

Areas to the northeast of the airport are a mixture of compatible commercial and industrial development and noncompatible residential and other noise-sensitive development. East of the airport, between the airport and Addison Road, development primarily consists of commercial and industrial uses; however, beyond these land uses, east of Addison Road, single and multi-family development exists.

To the west of the airport are large industrial developments which are compatible with the operations of the airport. Beyond these compatible land uses to the west are large residential developments with parcels of small commercial development. South of the airport are large commercial and industrial developments. Undeveloped areas and parks/open space are found throughout the study area.

Noise-sensitive institutions, including 13 schools, four churches, and two daycare facilities, are found scattered throughout the study area. Parks and open spaces are found throughout the entire study area.

SCHOOLS

There are three school districts within the study area: the Dallas, the Carrollton-Farmers Branch, and the Plano Independent School Districts. These districts operate approximately nine schools within the Addison Airport Part 150 study area.

Additional learning centers within the study area include Brookhaven College and three private schools: Trinity Christian Academy, Greenhill School, and Walden Preparatory School.

HISTORIC RESOURCES

The Texas Historical Sites Atlas (contained on the website of the Texas Historical Commission) was consulted regarding the presence of historical resources within the study area. It was determined that no state-listed historical sites nor sites listed on the National Register of Historic Places are present within the study area.

TABLE 1C
Land Use Categories Shown on Existing Land Use Map

Category	Land Uses Included
Single-family Residential	Single-family Homes
Multi-family Residential	Duplexes Triplexes Townhouses Apartment and condominium buildings
Parks and Open Space	Parks Golf courses Cemeteries Ponds Nature preserves
Public	Airports
Commercial	Businesses Offices Government offices
Hotels	Hotels, Motels, Resorts
Industrial	Manufacturing Light Industry Heavy Industry Warehousing
Mixed-Use	Mixture of various residential and commercial land uses
Undeveloped	Vacant lots Open parcels of land
Noise-Sensitive Institutions	Places of worship Schools Nursing homes Residential group quarters Hospitals Community centers Child care centers

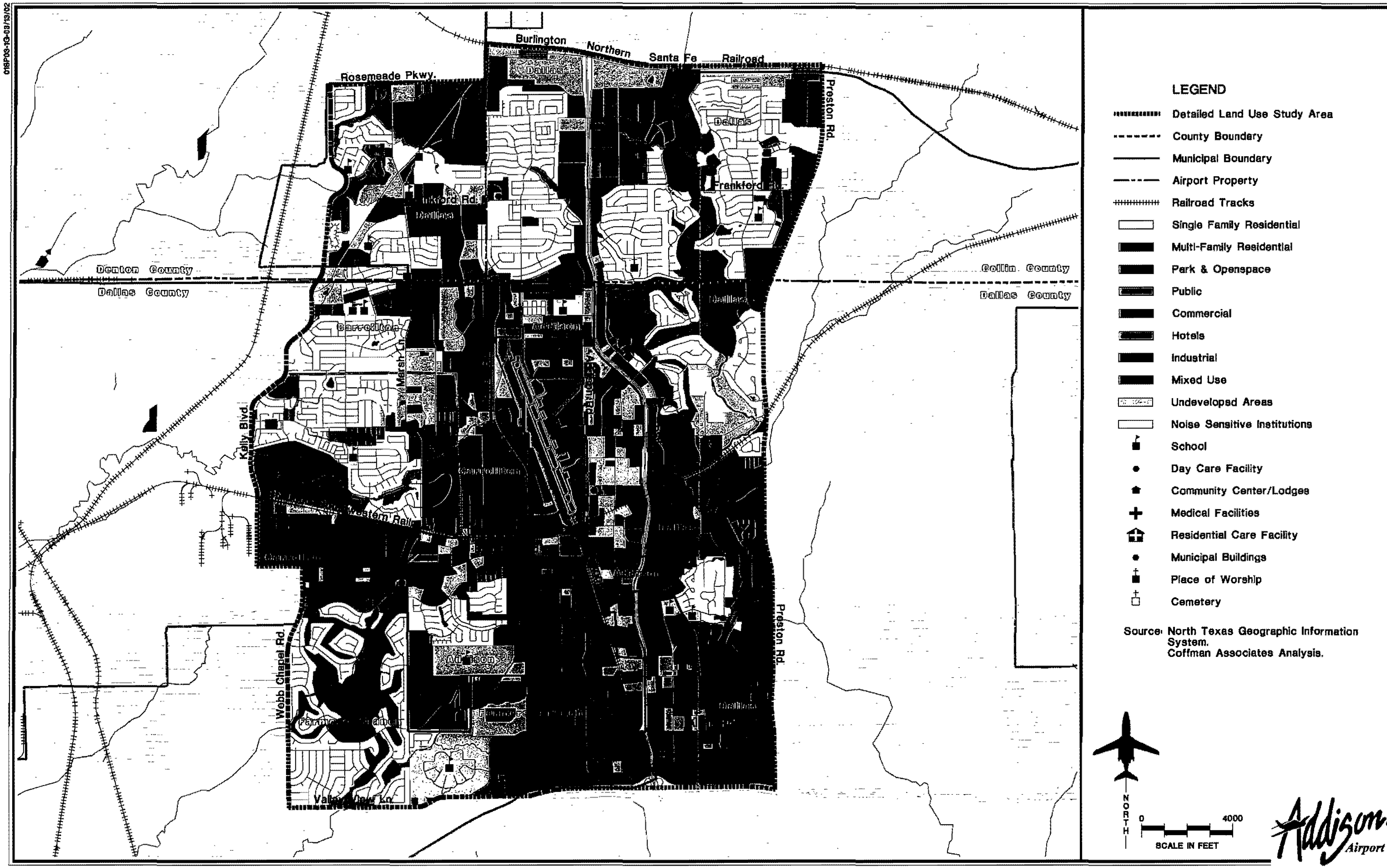


Exhibit 1G
GENERALIZED EXISTING LAND USE MAP

LAND USE PLANNING POLICIES AND REGULATIONS

In most cities and counties, land use planning occurs through both regulatory and non-regulatory means. Regulatory tools for directing land use include: the zoning ordinance, which limits the type, size, and density of uses allowed in various locations; subdivision regulations, which regulate the platting and dividing of land; and building codes, which establish precise requirements for building. Non-regulatory means of land use planning include the general plan, which is also referred to as the master or comprehensive plan, and the local capital improvements program. The general plan provides the basis for the zoning ordinance and sets forth guidelines for future development. The capital improvements program is typically a short-term schedule for constructing and improving public facilities such as streets, sewer, and water lines.

The following paragraphs provide descriptions of the various land use planning tools currently in place within the study area. From these descriptions, one can begin to gain an understanding of the regulations impacting the study area.

REGULATORY FRAMEWORK

Texas state law permits municipalities to prepare, adopt, and implement comprehensive land use plans for the long range development of the city. Where a comprehensive plan has been prepared, state law also dictates that zoning regulations be adopted in accordance with the comprehensive plan (*Section 211.004 of Title 7, Subtitle A, Chapter 211).* In addition to comprehensive plans and zoning ordinances, state law also permits the adoption of subdivision regulations. The purpose of these regulations is to encourage quality development by establishing standards to ensure that the community's human and natural resources are protected.

County level governments are allowed to only implement subdivision regulations. At this time, Texas state law does not allow counties to adopt comprehensive land use plans or zoning ordinances.

As shown in **Exhibit 1F,** the Addison Airport study area is within the city limits of the Town of Addison and the Cities of Carrollton, Farmers Branch, and Dallas. As permitted by state law, the Town of Addison and the Cities of Carrollton and Farmers Branch have adopted comprehensive plans and zoning ordinances, and the City of Dallas has adopted a zoning ordinance. The following sections discuss these various planning and development tools in place in the Addison Airport study area.

COMPREHENSIVE AND GENERAL PLANS

A community's comprehensive plan sets the standards and guidelines for future development and provides the legal basis for the zoning ordinance. The plan represents a generalized guideline, as opposed to a precise blueprint, for locating future development. During the preparation of a plan, existing land uses are evaluated, and based on the evaluation, future land uses and facilities are determined. By illustrating preferred land use patterns, a general plan can be used by community decision-makers and staff, developers, investors, and citizens to assist them in evaluating future development opportunities. The future land use prescribed in the various comprehensive plans is depicted on **Exhibit 1H**.

Town of Addison Comprehensive Plan

The *Town of Addison Comprehensive Plan* was adopted in May 1991. The purpose of the plan is to direct the growth and development of the town in a manner that will benefit current and future residents. The plan contains four components:

- Existing Condition
- Economic/Demographic and Market Overview
- Community Goals and Objectives
- Future Land Use Plan

Within the Existing Condition component, Addison Airport is recognized as having a significant impact upon the development of the community for two reasons: one, the noise that is produced by airport users; and two, the economic impact of the airport. Noise contours, prepared as part of the 1991 Part 150 Study, have been incorporated into the Community Goals and Objectives portion of the plan. The contours are depicted on the Housing Opportunities exhibit with the recommendation that residential uses not be permitted where noise exposures exceed 65 Ldn.

(Note: Ldn is now commonly referred to as DNL. The FAA has established DNL as the standard for Part 150 studies in most states.)

City of Carrollton Comprehensive Plan

The *City of Carrollton Comprehensive Plan*, adopted on April 16, 1991, was prepared to serve as a long-range policy guide for the development of the community. The plan is divided into six sections:

- Future Land Use Plan
- Urban Design Plan
- Future Community Facilities Plan
- Future Transportation Plan
- Fiscal Impact Analysis
- Implementation Strategies

While Addison Airport is not physically located within the City of Carrollton, mention is still made of the airport within the City's comprehensive plan. Within the Future Land Use Plan portion of the plan, reference is made to the noise contours created by the airport. Specifically, the plan states "Noise exposure contours 'C' and 'D' (areas within the 65 DNL noise contour) are not appropriate for residential uses or other development which has a low tolerance for noise. Future land uses in this area should be planned with sensitivity toward the long-term existence and impact of airport operations." Furthermore, **Policy**

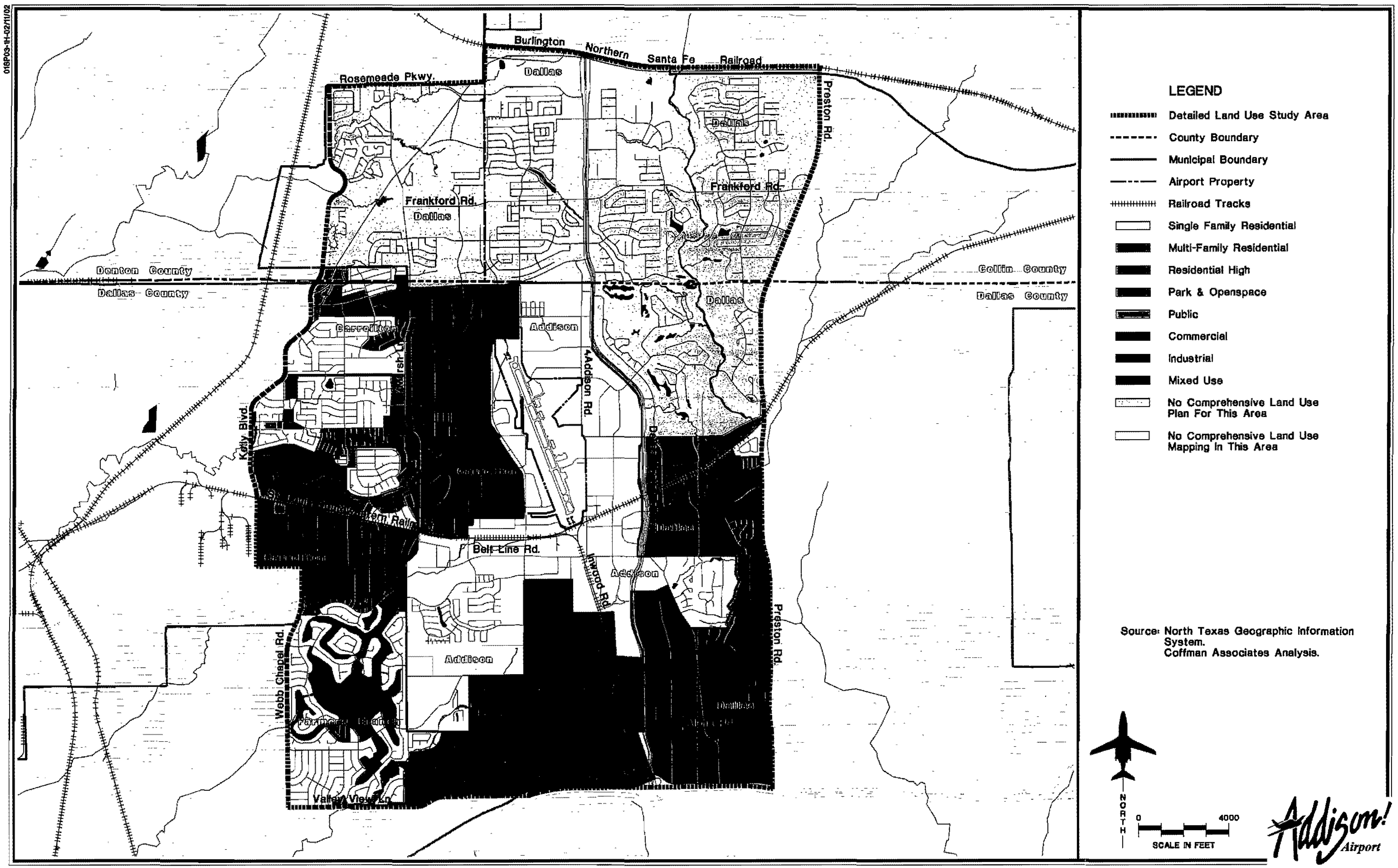


Exhibit 1H
GENERALIZED COMPREHENSIVE
LAND USE PLAN MAP

RD1.34 states that new residential development should be discouraged within the 65 Ldn noise exposure contour of Addison Airport.

Farmers Branch Comprehensive Plan

The *City of Farmers Branch Comprehensive Plan* was adopted in August 1986. The purpose of this plan is to guide zoning decisions and serve as a basis for the City's capital improvements program. The plan consists of a set of community goals followed by four elements:

- Land Use Element
- Public Services and Utilities Element
- City Design Element
- Implementation Element

Future land use recommendations and design guidelines are outlined within the various elements. No specific guidelines regarding noise or the Addison Airport are included within these elements.

Greater Far North Dallas Area Land Use and Transportation Plan

The City of Dallas has not undertaken the preparation of a citywide comprehensive plan; however, as the need arises, smaller area-specific land use plans are prepared to guide development. Within the study area, the *Greater Far North Dallas Area Land Use and Transportation Plan* was prepared in 1995. The plan has not been adopted or implemented in the area. The purpose of the plan is to assist with the approval or denial of zoning change requests and development approvals. No specific guidelines regarding noise or the Addison Airport are included within this plan.

In addition to the above mentioned plan, three additional studies have been completed within the study area - the Parkway Center Study (1991), the Dallas/Richardson Improvement Strategy Study (1994), and the Coit/Spring Valley Neighborhood Improvement Study (1991). The plans resulting from these studies have not been adopted or implemented.

ZONING

While general land use plans are intended to establish policies to guide development and land use, cities and counties actually control land use through zoning ordinances.

The purpose of this section is to summarize the zoning ordinances within the airport study area. This information will be used in subsequent chapters to identify zoning districts which provide a compatible land use buffer and those that allow encroachment by noise-sensitive land uses. For zoning districts which permit noise-sensitive land uses, this information will provide insights into how the district regulations may be amended to promote noise-compatible development.

Town of Addison

The zoning ordinance for the Town of Addison was originally adopted on

October 13, 1964. The zoning administrator has the responsibility of administrating and enforcing the ordinance which provides for 16 zoning districts including five residential districts, three commercial districts, three industrial districts, and five mixed-use districts. Noise-sensitive uses allowed in each zoning district are presented in Table C1 contained in **Appendix C**.

City of Carrollton

The City of Carrollton zoning ordinance was originally adopted on May 23, 1962. The ordinance provides for 35 zoning districts including: 17 residential districts; 16 office, commercial, and industrial districts; one planned development district; two overlay districts; and one holding district. Noise-sensitive uses allowed in each zoning district are presented in Table C2 contained in **Appendix C.**

In addition to the zoning districts described in Table C2, the zoning ordinance contains an Airport Hazards section which contains provisions for three zones - air approach zones, airport turning zones, and airport transition zones. These zones were established based on the F.A.R. Part 77 horizontal surfaces. The purpose of the zones is to regulate the height of buildings and structures that are placed near the airport.

City of Farmers Branch

The zoning ordinance for the City of Farmers Branch was originally adopted on September 23, 1957. The ordinance provides for 20 zoning districts including 12 residential districts, five office and commercial districts, two industrial districts, and one planned development district. Noise-sensitive uses allowed in each zoning district are presented in Table C3 in **Appendix C.**

City of Dallas

The *City of Dallas Zoning Ordinance* was originally adopted on September 11, 1929. The ordinance provides for 42 zoning districts including 18 residential districts and 24 non-residential districts. Noise-sensitive uses allowed in each zoning district are presented in Table C4 contained in **Appendix C.**

Summary of Zoning Classifications

The various zoning districts of each jurisdiction have been combined into generalized zoning categories. The generalized zoning patterns within the study area are shown in **Exhibit 1J** and summarized in **Table 1H.**

- ***Residential Categories***

The "Low Density Residential" category applies to districts with densities of 6.0 dwelling units or less per acre. The "Medium Density Residential" category applies to districts with densities of 6.1 to 12.0 dwelling units per acre. The "High Density Residential" category applies to single-family and multi-family zones with densities greater than 12 dwelling units per acre. The density of units allowed in the "Manufactured Housing", "Planned Development", and "Mixed-Use" categories is determined

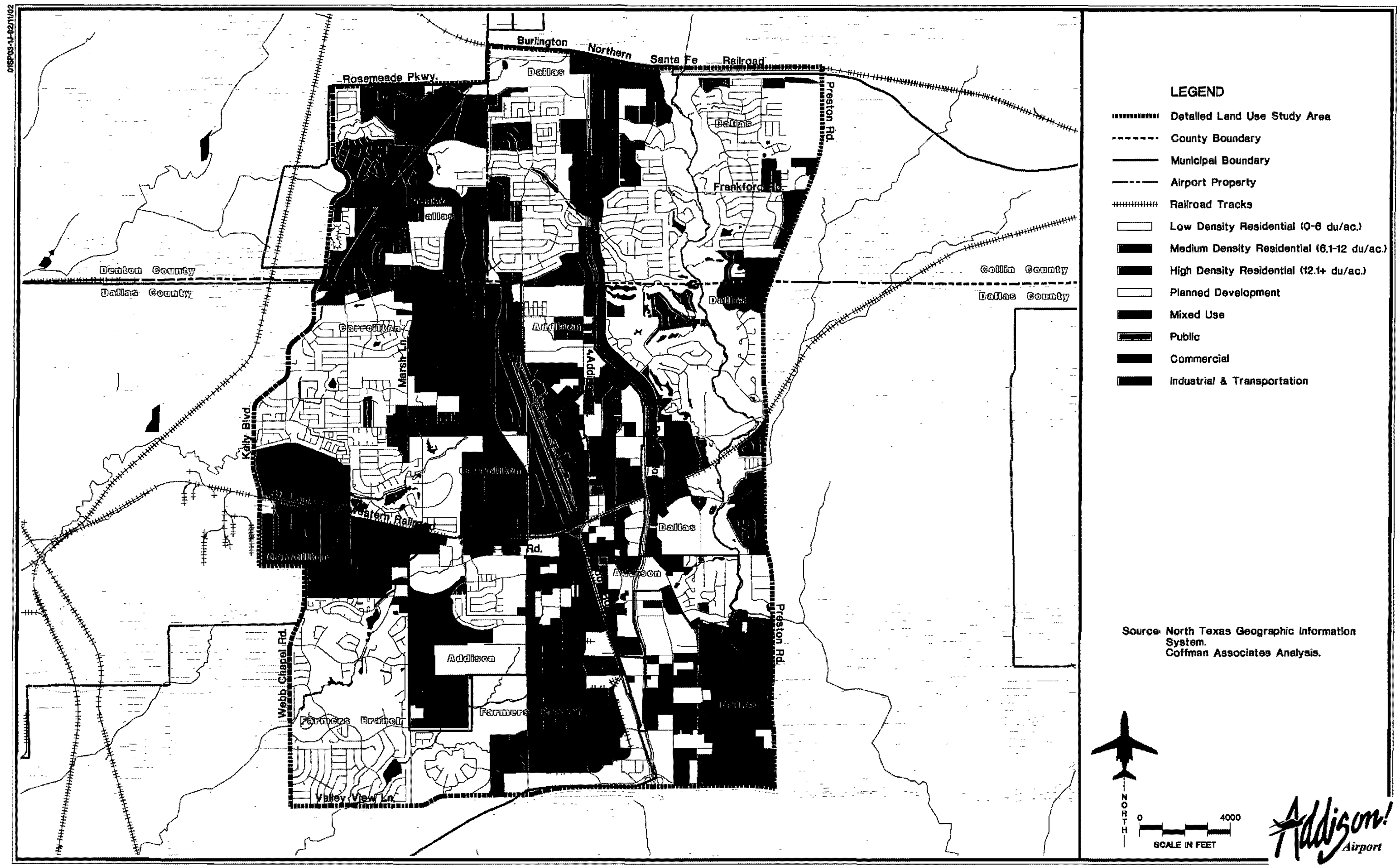


Exhibit 1J
GENERALIZED ZONING MAP

during the plan approval and/or permitting process.

- ***Non-residential Categories***

The "Commercial" and "Industrial" categories include office, manufacturing, and service districts. "Overlay" districts include specific uses deemed appropriate only to certain areas usually because of a particular characteristic of the surrounding environment, such as high levels of airport-related noise or the preservation of a historic area.

TABLE 1H
Classification of Zoning Districts

Generalized Zoning Category	Town of Addison	City of Carrollton	City of Farmers Branch	City of Dallas
Low Density Residential (0-6 du/ac)	R-1, R-2, R-3, R-16, MXR (low-density subdistrict)	IH, SF-12/20, SF-10/18, SF-8.4/18, SF-8.4/16	R-1, R-, R-3, R-4, R-5, R-6	A, R-1ac, R-1/2ac, R-16, R-13, R-10, R-7.5, TH-1
Medium Density Residential (6.1-12 du/ac)	MXR (medium-density subdistrict)	SF-7/16, SF-7/14, SF-6.5/12, SF-PH, SF-A, D,		R-5, D(A), TH-2(A), TH-3(A)
High Density Residential (12.1+ du/ac.)	A, MXR (high-density subdistrict)	SF-TH, T, F, MF-12, MF-15, MF-18	D-1, D-2, MF-1, MF-2, MF-3, MF-4	CH, MF-1(A), MF-2(A), MF-3(A), MF-4(A)
Manufactured Housing		MHP		MH(A)
Planned Development	PD, PDTC, PDCC	PD	PD	
Mixed-Use	UC			CA-1(A), CA-2(A), MU-1, MU-2, MU-3
Commercial	LR, C-1, C-2	O-1, O-2, O-3, O-4, NS, LR-1, LR-2, LC, HC, C/W, FWY, ODC, CC	O, LR-1, LR-2, C, I-RU	NO(A), LO-1, LO-2, LO-3, MO-1, MO-2, GO(A), NS(A), CR, RR, CS, MC-1, MC-2, MC-3, MC-4, P(A)
Industrial and Transportation	I-1, I-2, I-3	IP, LI, HI	LI, HI	LI, IR, IM
Overlay		I-35E, GWY		

PLANNED UNIT DEVELOPMENTS

A number of planned urban development (PUDs) are present within each of the jurisdictions contained inside the study area. PUDs are beneficial to developers as they allow for more flexible development practices versus traditional zoning. Essentially, PUD zoning permits a developer to meet overall community density and land use goals without being bound by rigid requirements such as minimum lot standards and land use categories.

Determining the land use allowed within each of the PUDs is important as it allows for further analysis regarding non-compatible land uses. **Exhibit 1K** depicts the underlying land uses planned for each of the PUDs as well as the undeveloped parcels within the study area.

SUBDIVISION REGULATIONS

Subdivision regulations apply in cases where a parcel of land is proposed to be divided into lots or tracts. They are established to ensure the proper arrangement of streets, adequate and convenient open space, efficient movement of traffic, adequate and properly-located utilities, access for fire-fighting apparatus, avoidance of congestion, and the orderly and efficient layout and use of the land.

Subdivision regulations can be used to enhance noise-compatible land development by requiring developers to plat and develop land so as to minimize noise impacts or reduce the noise sensitivity of new development. The regulations can also be used to protect the airport proprietor from litigation for noise impacts at a later date. The most common requirement is the dedication of a noise or avigation easement to the airport proprietor by the land subdivider as a condition of development approval. The easement authorizes overflights of the property, with noise levels attendant to such operations. It also requires the developer to provide noise insulation in the construction of buildings.

Subdivision regulations are in place only within the Town of Addison and the Cities of Carrollton and Farmers Branch. While these municipalities regulate the subdivision of land, none of them have established special development considerations in the vicinity of Addison Airport within their subdivision regulations.

BUILDING CODES

Building codes regulate the construction of buildings, ensuring that they are constructed to safe standards. Building codes may be used to require sound insulation in new residential, office, and institutional buildings when warranted by existing or potential high aircraft noise levels. The Town of Addison and the Cities of Carrollton, Farmers Branch, and Dallas have adopted versions of the Uniform Building Code. Additional regulations related to noise in the vicinity of Addison Airport have not been adopted.

CAPITAL IMPROVEMENT PROGRAMS

Capital improvement programs (CIP) are multi-year plans, typically covering five or six years, which let major capital improvements planned to be undertaken by a particular jurisdiction. The CIP does not include facility improvements that are proposed to be funded entirely by developers.

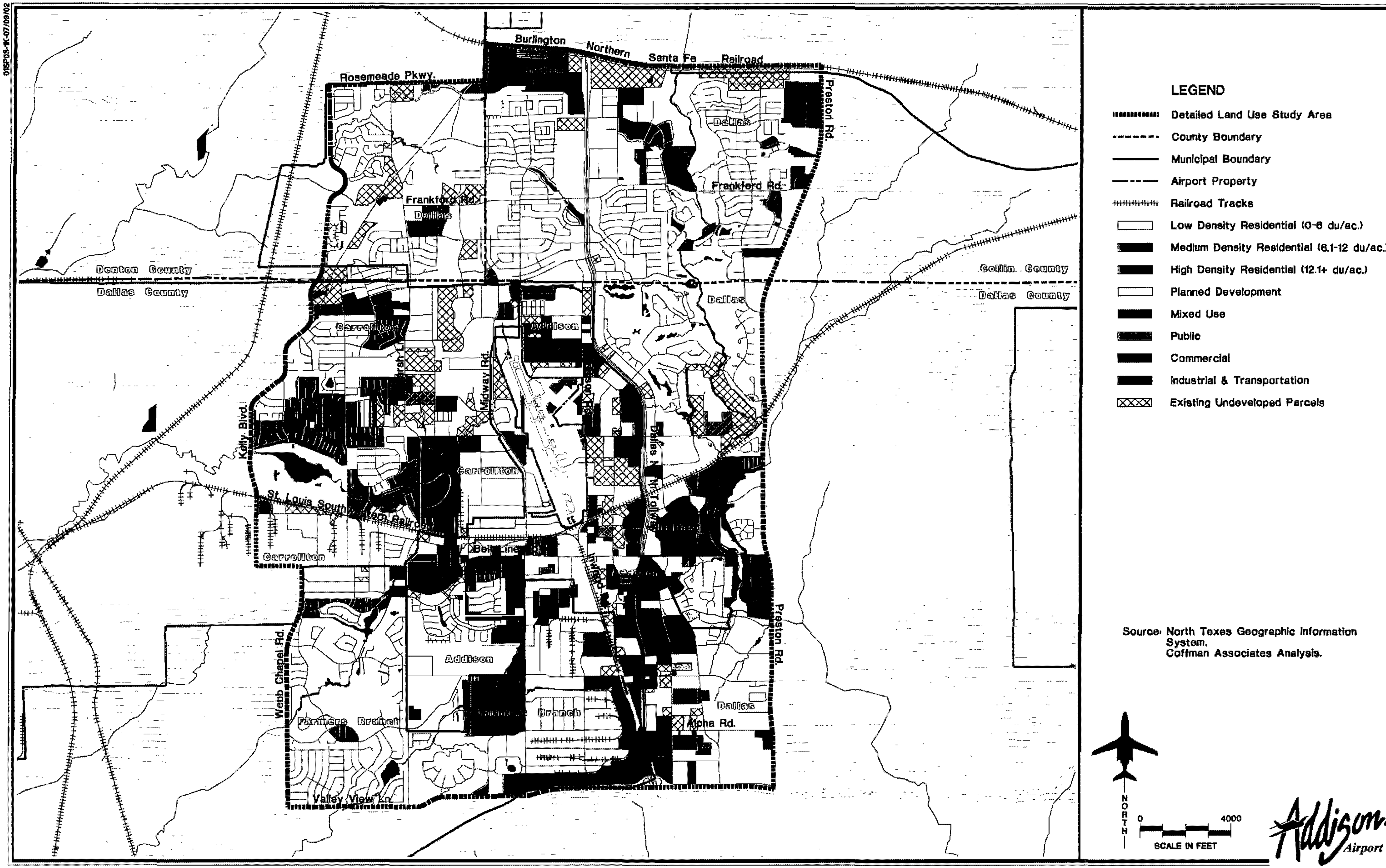


Exhibit 1K
PLANNED AREA DEVELOPMENTS

Most capital improvements have no direct bearing on noise compatibility as few municipal developments are noise-sensitive. The obvious exceptions to this are schools and, in certain circumstances, libraries, medical facilities, and cultural/recreational facilities. The noise compatibility planning process includes a review of planned facilities of these types as a matter of course.

Some capital improvements, however, may have an indirect, but more profound, relationship to noise compatibility. For instance, sewer and water facilities may open up large vacant areas for private development of noise-sensitive residential uses. In contrast, the same types of facilities, sized for industrial users, could permit industrial development in the same noise impacted area that might otherwise be attractive for residential development on septic tanks.

A number of CIP projects are planned within the immediate vicinity of Addison Airport. These projects include various road and intersection improvements to the east and south of the airport, a new airport terminal building and ATCT, development of Phase IIC of the Addison Circle Project, and design of the proposed arts and events district.

SUMMARY

The information presented in this chapter provides a foundation upon which the remaining elements of the planning process will be constructed. Information on current airport facilities and utilization serve as a basis for the development of the aircraft noise analyses during the next phase of the study. This information will, in turn, provide guidance to the assessment of potential changes to aviation facilities or procedures necessary to meet the goals of the planning process.

Chapter Two
AVIATION DEMAND FORECASTS

AVIATION DEMAND FORECASTS

The purpose of this chapter is to examine the existing and potential demand for aviation activity at Addison Airport (ADS). This should begin with a definition of the demand that may occur over a specified period. The projected demand levels can then be analyzed to determine future noise exposure and impacts in the vicinity of Addison Airport.

Air transportation is a unique industry that has experienced wide fluctuations in growth and decline. For this reason, it is important for airports to evaluate their current position and examine future demand potential on a regular basis. This holds especially true today given limited public funding mechanisms and increased needs of the aviation community.

The primary objective of this planning effort is to define the magnitude of change that can be expected over time. Because of the cyclical nature of the economy, it is virtually impossible to predict with certainty year-to-year fluctuations in activity when looking as far as ten years into the future. However, a trend can be established which delineates long-term growth potential. While a single line is often used to express the anticipated growth, actual growth may fluctuate above and below this line. It is important to understand that forecasts serve primarily as guidelines, as aviation activity is affected by many external influences, especially by the types of aircraft used and the nature of available facilities.

The forecasts for Addison Airport were prepared subsequent to the events of September 11, 2001. Immediately following the events that day, the national airspace system was closed and

all commercial and general aviation flights were grounded. Following the resumption of flights, commercial airline traffic was down, which led to schedule reductions and layoffs by many of the commercial airlines.

General aviation airports and businesses also experienced significant losses due to FAA's decision to restrict visual flight rules (VFR) flight operations at general aviation airports in Class B airspace (surrounding major airports such as Dallas/Fort Worth International Airport and Love Field).

While the commercial airline industry experienced sharp decreases in passenger traffic over the next few months, charter operators and fractional ownership companies were experiencing a significant increase. Media reports indicated that some charter companies experienced a 50 percent increase in business, and fractional ownership companies gained new ownership as well.

There is no comparative period in recent history to draw conclusions or trends to gauge the full effects of these events. In 1991, the commercial airlines experienced a decline in passengers and profits due to the Persian Gulf War and a simultaneous economic recession. General aviation was already in an extended period of decline, however, primarily due to product liability factors. The industry did not begin to recover until 1994 with the passage of the General Aviation Revitalization Act. Commercial airline traffic rebounded from the 1991 decline by growing each subsequent year through 2000.

The total impact the events of September 11, 2001 will have on commercial and general aviation can only be determined over time. Commercial airline recovery will be a factor of air traveler confidence and acceptance in new security measures and the recovery of the U.S. economy, which was slowed in 2001. General aviation recovery will be dependent upon economic recovery, fuel prices, and the type and extent of any new regulatory controls over flight training and operations.

The long term aviation trends used in these forecasts for Addison Airport are expected to remain relevant and applicable to intermediate and long term growth. While there may be a short-lived decline in commercial airline activity, a decline over many years is not expected. A similar decline in general aviation is not expected because of the events. In fact, post September 11^{th} data for general aviation indicates an increase in many general aviation activity segments.

GENERAL AVIATION TRENDS

Each year the Federal Aviation Administration (FAA) publishes its national aviation forecast. Included in this publication are forecasts for air carriers, regional air carriers, general aviation, and military activity. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was written was FAA *Aviation Forecasts - Fiscal Years 2002-2013*. These forecasts use the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. Long term FAA forecasts through the year 2025 are provided in the FAA *Long Range Aerospace Forecasts* document.

By most statistical measures, general aviation recorded its sixth consecutive year of growth in 2000. Following more than a decade of decline, the general aviation industry was stimulated with the passage of the General Aviation Revitalization Act in 1994 (federal legislation which limits the liability on general aviation aircraft to 18 years from the date of manufacture).

The positive effects the Act has had on the general aviation industry since its passage are reflected in general aviation activity statistics. General aviation manufacturers' shipments were up for a seventh consecutive year in 2000, growing from 928 in 1994 to 2,816 in 2000. Piston-engine aircraft production more than tripled between 1994 and 2000, growing from 499 to 1,913. The production of turbine-powered aircraft was in its eighth consecutive year of growth in 2000, up from 348 in 1992 to 903 in 2000.

According to the *2001 Annual Industry Review* produced by the General Aviation Manufacturers Association (GAMA) 2001 was not as strong as 2000 for aircraft shipments. Although industry billings were up in 2001, shipments of general aviation airplanes actually decreased slightly. Total shipments for airplanes produced in the United States slipped 6.6 percent, from 2,816 units in 2000 to 2,634 units in 2001.

GAMA indicated that for the fourth year in a row the industry set a new record for business jet shipments in 2001. Total shipments of business jets increased 3.6 percent between 2000 and 2001. During that same period, shipments of U.S. produced business jets increased two percent, from 588 to 600. Because the dollar value of business jets is higher than other categories of general aviation airplanes, the jet shipments have a disproportionate impact on total industry billings.

Shipments of turboprops increased slightly in 2001. Total turboprop shipments were up 1.4 percent from 415 units in 2000 to 421 units in 2001. U.S. produced turboprops slipped 2.9 percent from 315 planes in 2000 to 306 planes in 2001.

Total piston shipments were down in 2001, falling 8.9 percent for planes produced worldwide and 9.8 percent for planes produced domestically. Breaking down the piston numbers even further, we see that total shipments of multi-engine piston aircraft increased 42.7 percent. Total shipments of single-engine pistons fell 11.7 percent while shipments of U.S. produced single-engine pistons fell 12.8 percent.

Exports of domestically produced general aviation airplanes reflect the overall statistics in that billings are up 21.6 percent but shipments are down

11.2 percent. For U.S. manufacturers, the export market accounted for 27.5 percent of total billings and 19.2 percent of total shipments.

Manufacturer and industry programs and initiatives also continue to revitalize the general aviation industry. Notable initiatives include the "No Plane, No Gain" campaign sponsored by GAMA and the National Business Aviation Association (NBAA), "Project Pilot" sponsored by the Aircraft Owners and Pilots Association (AOPA), the "Learn to Fly" campaign sponsored by the National Air Transportation Association (NATA), and "Be a Pilot" sponsored by numerous aviation companies and organizations. The "No Plane, No Gain" campaign is a program promoting the cost-effectiveness of using general aviation aircraft for business and corporate uses. "Project Pilot," "Learn to Fly," and "Be a Pilot" are all programs promoting the training of new pilots.

The general aviation industry is also launching new programs to make aircraft ownership easier and more affordable. The New Piper Aircraft Company has created Piper Financial Services (PFS) to offer competitive interest rates and/or leasing of Piper aircraft. The Experimental Aircraft Association (EAA) offers financing for kit-built airplanes through a private lending institution.

On February 5, 2002, the FAA published a notice of proposed rulemaking (NPRM), titled *Certification of Aircraft and Airmen for the Operation of Light-Sport Aircraft*. The rule-making would establish new light-sport aircraft categories and allow aircraft manufacturers to build and sell completed aircraft without obtaining type and production certificates. Instead, aircraft manufacturers would build to industry consensus standards. This reduces development costs and subsequent aircraft acquisition costs.

This new category places specific conditions on the design of the aircraft to limit them to low performance aircraft. New pilot training times are reduced and offer more flexibility in the type of aircraft which the pilot would be allowed to operate.

Viewed by many within the general aviation industry as a revolutionary change in the regulation of recreational aircraft, this new rule-making is anticipated to significantly increase access to general aviation by reducing the time and costs to earn a pilot's license and owning and operating an aircraft.

A particularly important component of the general aviation industry is business and corporate use of general aviation aircraft, particularly turbine-powered aircraft. Business and corporate uses represent 23 percent of all general aviation activity. Growth in these categories is driven by the continued expansion of fractional ownership programs and corporate flight departments.

According to statistics provided by AvData Inc. reported in GAMA's *2001 Industry Review*, the total number of corporate operators worldwide increased four percent in 2001. In the United States, the total number of corporate operators increased by almost five percent. There are approximately

13,371 worldwide operators utilizing 21,584 aircraft. In the U.S. alone, there are approximately 9,709 operators utilizing a fleet of 14,837 aircraft.

Fractional ownership programs allow businesses or individuals to purchase a fractional interest in an aircraft, then pay for only the time they use the aircraft. These programs offer greater flexibility to users who otherwise would not generate sufficient activity to support aircraft ownership. In 2000, there were nearly 2,000 entities involved in fractional ownership of over 530 aircraft. In 1993, only two dozen aircraft were involved in fractional ownership.

According to preliminary data provided by AvData Inc. reported by GAMA, the number of individuals and companies in the United States that own a fractional share of an airplane increased by 22.3 percent in 2001, from 2,793 to 3,415. The number of airplanes in fractional programs grew 19.3 percent in 2001, from 560 to 668. GAMA member companies are reporting that approximately 17 percent of their total turbine deliveries last year went to fractional programs.

According to the Air Charter Guide reported by GAMA, charter activity was up a remarkable 26 percent in 2001. Part of that increased charter activity came from regular customers flying more. But there was also an increase in the number of persons and companies who chartered for the first time. A survey by the Air Charter Guide, found that 30 percent of the inquiries received by charter operators last year came from new customers.

The NBAA estimates the corporate aircraft fleet has grown at 5.4 percent annually and the number of flight departments has grown at 4.5 percent annually since 1993. This signifies that existing corporate flight departments are expanding and new ones are being added. The success of fractional ownership programs is believed to have driven the expansion of corporate flight departments as businesses which have become reliant on the access and time savings of corporate flying find it more cost-effective to establish a flight department rather than purchase a larger share in a fractional ownership program.

Exhibit 2A depicts the FAA forecast for active general aviation aircraft in the United States through 2013. The FAA forecasts general aviation aircraft to increase at an average annual rate of 0.3 percent through 2013, with turbine-powered aircraft projected to grow at 2.1 percent annually to 2013. General aviation hours flown are forecast to increase at 0.5 percent annually through 2013, however, by 1.5 percent over the last ten years of the forecast period.

It should be noted that the FAA's *Aerospace Forecasts 2002-2013* call for slower growth than the previous years forecasts. For example, FAA's active aircraft forecasts for 2012 are approximately ten percent lower than those forecasts prepared the previous year. FAA believes that September 11th impacts, coupled with a slowing economy, will cause short term decreases in some general aviation segments.

SOCIOECONOMIC PROJECTIONS

POPULATION

Population, employment, and per capita income projections provide an indication of the potential for sustaining growth in aviation activity over the planning period. Forecasts for the Town of Addison and other local municipalities, as well as area county population, have been collected for this analysis. Historical population information was obtained from the U.S. Census Bureau, while population forecasts were obtained from the *North Central Texas 2025 Demographic Forecast* prepared in November 2000 by the North Central Texas Council of Governments (NCTCOG). **Table 2A** summarizes historical and forecast population numbers for these areas.

TABLE 2A
Historical and Forecast Population

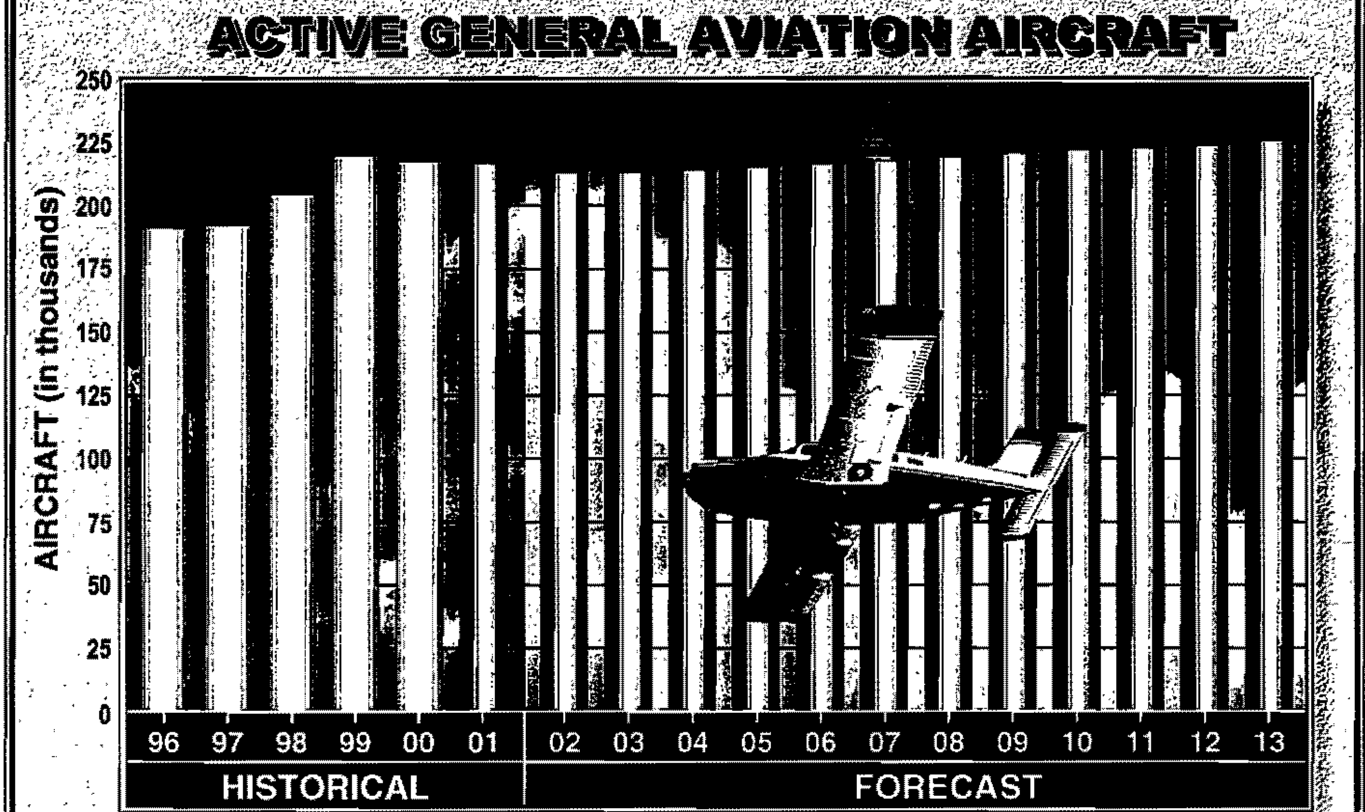
	HISTORICAL			FORECAST		
	1980	1990	2000	2007	2022	Growth Rate 2000-2022
City/Town Populations						
Addison	5,553	8,783	14,166	16,250	21,154	1.8%
Carrollton	40,595	82,169	109,576	115,484	126,397	0.7%
Dallas	904,078	1,007,618	1,188,580	1,215,725	1,256,444	0.3%
Farmer's Branch	24,863	24,250	27,508	28,008	29,246	0.3%
Plano	72,331	127,885	222,030	245,495	300,380	1.4%
County Populations						
Dallas	1,556,419	1,852,810	2,218,899	2,324,670	2,537,091	0.6%
Collin	144,576	264,036	491,675	601,439	866,309	2.6%
Denton	143,126	273,525	432,976	521,965	740,385	2.5%

Sources: Historical - U.S. Census Bureau; Forecasts - Interpolated from *North Central Texas 2025 Demographic Forecast* by NTCOG.

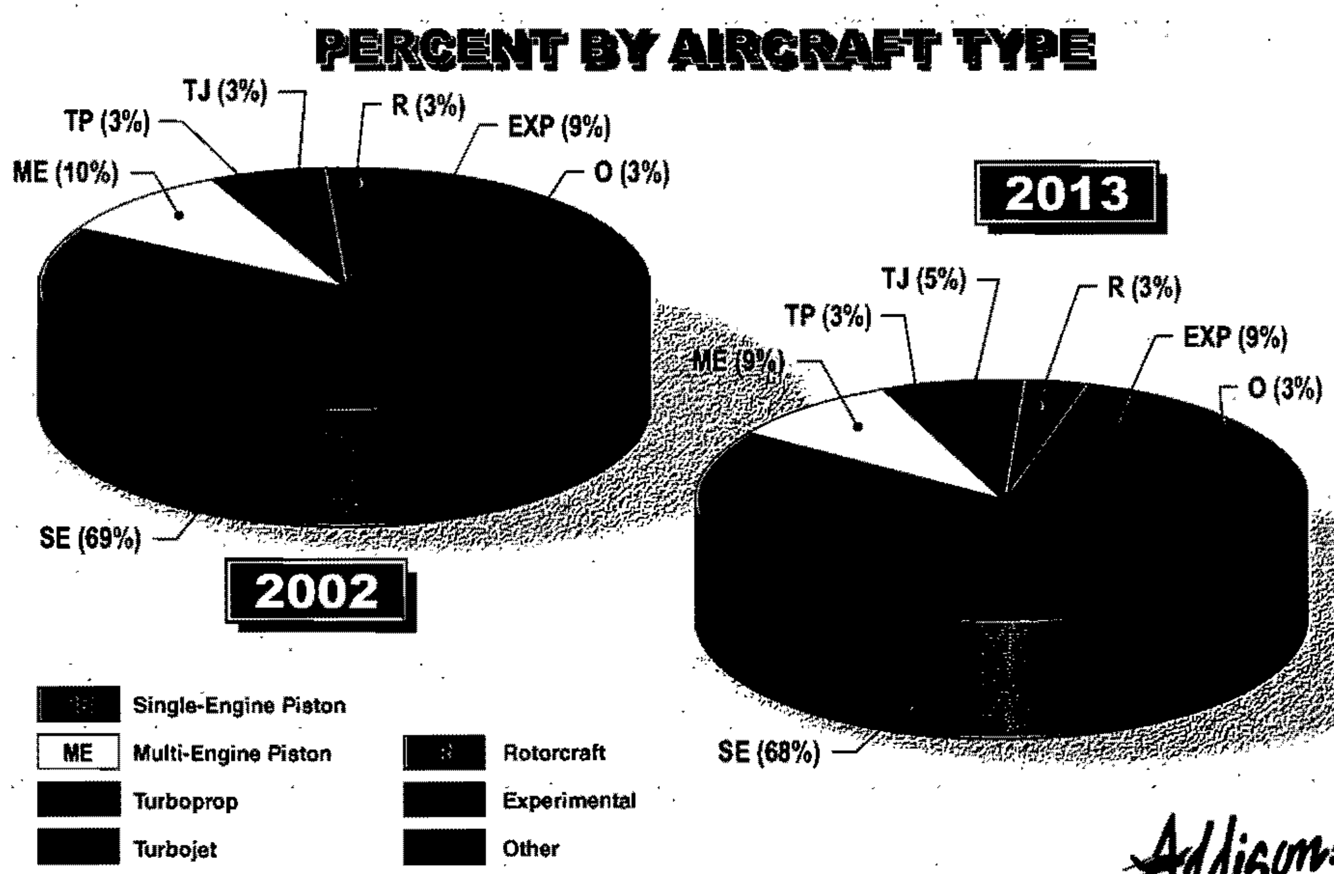
As presented in the table, the Town of Addison has experienced significant population growth since 1980 with population nearly tripling. This growth equates to an average annual increase of 4.79 percent. Plano experienced the largest growth increasing by 149,699 residents, increasing at an average annual growth rate of 5.77 percent. Carrollton population more than doubled, increasing at an average annual rate of 5.09 percent.

Collin, Dallas, and Denton Counties have also experienced strong population growth. As indicated in the table, Dallas County experienced the largest resident growth, increasing by 662,480 residents which equates to an average annual growth rate of 1.79 percent.

01MP15-2A-3/3/02



Source: FAA Aerospace Forecasts, FY 2002-2013



Addison! Airport

Exhibit 2A
U.S. ACTIVE GENERAL AVIATION
AIRCRAFT FORECASTS

Collin County experienced the largest average annual resident growth rate, increasing by 6.31 percent annually, more than tripling resident population over the period.

Population forecasts presented by the NCTCOG indicate a slower growth over the next 20 years. The Town of Addison is expected to grow the quickest of the area municipalities at an average annual rate of 1.8 percent, reaching 21,154 residents by 2022. Collin County resident population is projected to outpace Dallas and Denton Counties on an average annual basis. It is expected to grow at 2.6 percent annually, reaching 866,309 residents by 2022.

EMPLOYMENT

Historical and forecast employment data for the four area counties, the State of Texas, and the United States is presented in **Table 2B**. Employment information was obtained from Woods and Poole Complete Economic and Demographic Data Source (CEDDS) 2001. CEDDS utilizes U.S. Department of Commerce data in preparing its annual forecasts for every county in every state in the country.

Similar to its significant population increase, Collin County experienced the area's largest annual average employment increase. Collin County employment in 2000 was more than five times higher than 1980, increasing at an average rate of 8.71 percent annually over the period. Dallas County experienced the largest total growth, increasing by 788,030 which equates to an average annual rate of 2.72 percent. All of the area counties experienced a higher average annual growth rate than both the State of Texas (2.45 percent) and the United States (1.9 percent). This statistic displays the strength and diversity of the economy in the Metroplex region.

Employment forecasts consider a slowed growth for all area entities. Employment for Dallas County is projected to grow by 34 percent by 2022 equating to an average annual rate of 1.35 percent. Collin County is expected to continue to outpace employment growth of all other counties in the region, with projections of an average annual growth rate of 2.69 percent. The slower growth rates can be attributed to the recent economic recession. Trends do, however, indicate that the recession may be short-lived with indicators pointing to moderate growth within the next year.

Employment growth will be instrumental in aviation growth at Addison Airport. The airport is utilized by hundreds of area businesses in the transport of their employees and clientele. As employment and other business trends indicate the strength of the economy, the economy has historically typified the strength of the general aviation industry.

TABLE 2B Total Employment						
	HISTORICAL			FORECAST		
Area	**1980**	**1990**	**2000**	**2007**	**2022**	**Annual Growth**
COUNTIES						
Dallas	1,106,780	1,456,960	1,894,810	2,104,208	2,543,840	1.35%
Collin	39,130	117,370	207,920	254,222	373,060	2.69%
Denton	51,300	99,360	161,590	189,048	255,846	2.11%
STATE AND COUNTRY (in thousands)						
Texas	7,510.66	9,306.98	12,192.37	13,692.71	17,016.03	1.53%
U.S.	114,231.18	139,426.9	166,323.45	181,503.95	214,935.72	1.17%
Source: Interpolated from Woods and Poole, CEDDS (2001).						

PER CAPITA PERSONAL INCOME (PCPI)

Table 2C compares per capita personal income (adjusted to 1996 dollars) for the area counties, the State of Texas, and the United States. In 2000, Collin County had the highest adjusted PCPI of the region at $38,440. Collin County's growth between 1980 and 2000 was also the highest, increasing at an average annual rate of 3.17 percent. Dallas County had the next highest PCPI at $33,975, growing at an average annual rate of 2.17 percent over the same period. Dallas County PCPI was 134 percent and 124 percent of the PCPI of Texas and the United States, respectively.

PCPI forecasts are for a more moderate growth over the next 20 years. Dallas County PCPI is expected to outpace the growth of the other counties, the state, and the nation with projections of average annual growth of 1.29 percent. Collin County PCPI is only expected to increase at an average annual rate of 0.82 percent through 2022. By 2022, it is expected that Dallas County will nearly match the PCPI of Collin County. Both county's PCPI is projected to exceed the other compared entities by at least $10,000 in 2022.

AIRPORT USER SURVEYS/ SERVICE AREA

The local airport service area is defined by the proximity of other airports and the facilities that they are able to provide to general aviation aircraft. General aviation service areas are very closely defined as the result of nearby airports providing similar aircraft tiedown, fuel, and hangar services.

Chapter One - Inventory detailed all public-use airports within 20 nautical miles (nm) of the airport. These airports provide a wide range of tiedown, fuel, hangar, and general aviation services. Considering that the services at each airport vary according to local conditions (hangar, fuel, tiedown rates, hangar availability, etc.), the service area for Addison Airport is not considered to exactly follow the boundaries of any jurisdictional unit, and is affected by many of the factors detailed above. The availability and cost of aircraft storage facilities is an important factor in determining based aircraft demand.

TABLE 2C
Per Capita Personal Income (1996$)

	HISTORICAL			FORECAST		
Area	**1980**	**1990**	**2000**	**2007**	**2022**	**Annual Growth**
Dallas County	$22,129	$26,522	$33,975	$37,581	$45,060	1.29%
Collin County	$20,584	$28,270	$38,440	$40,042	$46,046	0.82%
Denton County	$19,613	$22,094	$26,812	$28,049	$31,513	0.74%
Tarrant County	$19,849	$22,870	$27,297	$29,342	$34,344	1.05%
State of Texas	$18,036	$20,388	$25,328	$27,569	$32,596	1.15%
United States	$18,444	$22,871	$27,323	$29,824	$35,494	1.20%

Source: Woods and Poole, CEDDS (2001), Forecasts are interpolated.

The airport service area is an area where there is a potential market for airport services. Access to general aviation airports, commercial air service, and transportation networks enters into the equation that determines the size of a service area, as well the quality of aviation facilities, distance, and other subjective criteria.

As in any business enterprise, the more attractive the facility is in services and capabilities, the more competitive it will be in the market. As the level of attractiveness expands, so will the service area. If an airport's attractiveness increases in relation to nearby airports, so will the size of the service area. If facilities are adequate and rates and fees are competitive at Addison Airport, some level of general aviation activity might be attracted to the airport from surrounding areas.

In order to aid in developing an understanding of Addison Airport's service area, a survey was sent to aircraft owners within a 30 nautical mile radius of the airport. Approximately 1,200 surveys were sent. Due to technical problems with software producing the mailing labels, approximately 400 surveys were returned undeliverable. Approximately 400 surveys were then sent to on-airport tenants and 50 surveys were mailed to off-airport (through-the-fence operators) tenants. Some tenants which did not receive a survey through direct mailing submitted their responses from copied or internet posted surveys. Thus, survey analysis considered 1,300 surveys.

The intent of the survey is to glean an understanding of where based aircraft owners live (or work), develop an understanding of local activity, and the airport service area.

USER SURVEYS

In order to obtain a profile of local general aviation users and their facility preferences, a general aviation user survey was conducted with the results presented in **Table 2D**. As of the writing of this chapter, 237 aircraft owner surveys were returned and analyzed. Of the responses, a total of 172 survey responders indicated that they base at least one aircraft at Addison Airport. These aircraft owners represented 239 based aircraft at Addison Airport. Considering a total of 1,300 surveys, the survey response rate equates to 18.2 percent.

Responses from the surveys represented 14 based jets at Addison Airport. Of the 64 respondents indicating a desire to upgrade or replace their aircraft, five indicated that they would be acquiring a jet aircraft, two acquiring a higher performance/larger aircraft, and three acquiring turboprop aircraft. **Table 2D** presents a summary of survey information. This information is useful in judging intuitively the future aircraft fleet mix at Addison Airport.

TABLE 2D
Pilot Survey Results

Total Surveys Sent – Approximately 1,300 (which includes 400 returned undeliverable)

Total Survey Responses - 237

Response Rate = 18.2%

Respondents Based @ Addison Airport - 172

Total Based Aircraft of Respondents - 239

Respondents Considering Upgrade or Purchase of Another Aircraft in Next Five Years - 64

Primary Use of Aircraft and Operation Estimates

Business	Pleasure	Flight Instruct	Other
33.4	60.4	4.9	1.3

Monthly Operations at Addison by These Aircraft = 2,867

Average Operations for Each Aircraft per Month = 17

Percentage Touch-and-Go Operations per Aircraft per Month = 10.4

Primary Reasons for Basing at Addison Airport (Priority with 1 being highest)

Convenience	Aircraft Hangar Facilities	FBO/Terminal Services	Lower Aircraft Storage Costs	Runway Length	Navigational Aids
1.5	4.3	5.2	5.9	5.2	4.1

SERVICE AREA

As previously mentioned, an airport's service area does not usually fall neatly within any jurisdictional or geographical boundaries. This holds especially true at Addison Airport. Addison Airport is home to a full array of general aviation operators and services ranging from the smallest general aviation aircraft operator to corporate flight departments and cargo operators.

As a part of the survey, respondents were requested to indicate the zip code in which they reside or operate their business from (if utilizing corporate aircraft). This information can generalize the areas from which based aircraft operators come from, thus, identifying the airport's generalized service area. **Exhibit 2B** depicts the generalized service area for Addison Airport based upon survey respondents' zip codes. The exhibit depicts the number of survey respondents for each zip code. **Exhibit 2B** also presents a summary listing of municipalities associated with the indicated zip code residences of the respondents.

As presented in the table, the majority of based aircraft owners who responded to the survey live within either Dallas (70), Addison (40), Plano (25), Carrollton (12), Richardson (7), or Dallas/Farmers Branch (5).

For planning purposes, Addison Airport's primary service area will consider the northern half of Dallas County and the southern halves of Collin and Denton Counties. Demand from Addison Airport's secondary service areas will vary based upon aircraft owner needs and competing airports.

Located in one of the busiest aviation environments in the country, Addison Airport has significant competition from other area airports. Chapter One detailed the competing airports within 20 nautical miles. This includes Dallas/Fort Worth International (DFW), Love Field, and ten other public-use general aviation airports of which three are reliever airports. Dallas County has four other reliever general aviation airports, while Collin and Denton each have one reliever airport. Most of these airports, however, are located outside of the primary service area of Addison Airport.

Given the vast array of aviation activity at Addison Airport, it would be difficult to point to one or two airports which provide direct competition. Addison Airport does not compete with DFW or Love Field for commercial passengers.

Love Field, however, has a significant general aviation element. In fact, Love Field is home to 478 based aircraft including 384 jets and a division of the aircraft manufacturer Gulfstream. Addison and Love Field also compete for some cargo operators. Love Field could be considered significant competition. For other general aviation activity, airports such as McKinney Municipal, Denton Municipal, Dallas Executive, Mesquite Metro, and Arlington Municipal will also compete for the secondary service area aviation operators.

While it is entirely possible that the competing airports could attract some of Addison's market area, their influence will not likely sustain any measurable losses. Addison Airport is located in the heart of one of the largest growth areas in the Metroplex. Any losses in activity will likely be filled immediately given the airport's hangar waiting list which exceeds 100.

The competing airports may have a slight influence on Addison Airport's long term growth. It is likely, however, that this influence will serve to keep Addison Airport from reaching the upper limits of its planning envelope. The competition may serve to simply moderate growth at Addison Airport. Addison Airport will continue to compete and will likely attract aircraft from outside its primary service area (Addison, Plano, Farmers Branch, and northern Dallas). The extent of the successes or failures in attracting aircraft from the secondary service area will be largely dependent upon the airport's facilities and services available.

COMPARATIVE FORECASTS

For planning and programming purposes, the FAA maintains their own forecasts for key airports such as Addison Airport. The *Terminal Area Forecast (TAF)* is updated annually based upon recent trends.

The current (February 2002) FAA TAF forecasts for Addison Airport are summarized in **Table 2E**. The TAF uses a base year of 2000 and the TAF forecasts for Addison Airport were prepared prior to September 11th, 2001. The TAF projects based aircraft to increase at 1.38 percent annually and annual operations to grow at 0.96 percent annually though 2015. Both forecast levels will be compared to forecasts prepared for this master plan later in this report.

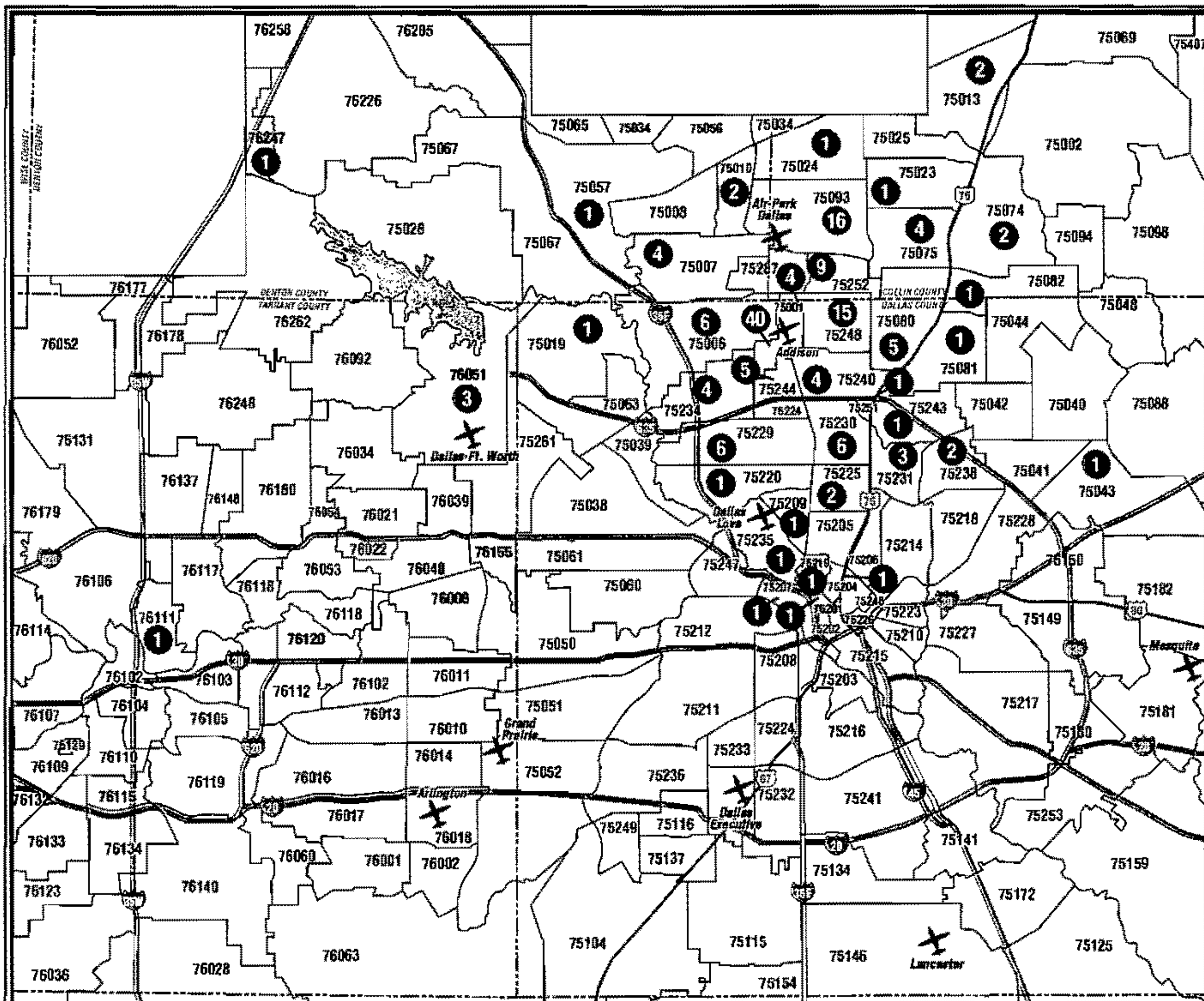
FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships are tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and their assessment of the local situation, is important in the final determination of the preferred forecast.

The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line projections, correlation/regression analysis, and market share analysis.

Trend line projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical demand data, then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past.

01MP15-2B-3/18/02



AIRCRAFT BASED AT ADDISON BY ASSOCIATED CITY:

Addison	- 40	Grapevine	- 3
Allen	- 2	Justin	- 1
Carrollton	- 12	Lewisville	- 1
Coppell	- 1	Plano	- 24
Dallas	- 74	Richardson	- 7
Ft. Worth	- 1	No Zip Code (Outside of Region)	- 3
Garland	- 1		

NORTH

NOT TO SCALE

Addison! Airport

Exhibit 2B
SERVICE AREA

As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

TABLE 2E
FAA Terminal Area Forecasts (TAF) for Addison Airport

	2005	2007	2010	2015
Based Aircraft	***782***	***804***	***837***	***894***
Itinerant Operations				
Air Carrier	74	74	74	74
Air Taxi	10,583	10,583	10,583	10,583
General Aviation	149,131	153,279	159,501	169,872
Military	300	300	300	300
Total Itinerant	160,088	164,236	170,458	180,829
Local Operations				
General Aviation	14,757	14,941	15,217	15,678
Military	29	29	29	29
Total Local	14,786	14,970	15,246	15,707
Total Operations	***174,874***	***179,206***	***185,704***	***196,536***

Source: 2001-2015 FAA Terminal Area Forecasts.

Correlation analysis provides a measure of direct relationship between two separate sets of historic data. Should there be a reasonable correlation between the data sets, further evaluation using regression analysis may be employed.

In regression analysis, values for the aviation demand in question (i.e. based aircraft), the dependent variable, are projected on the basis of one or more indicators, the independent variable. Historical values for all variables are analyzed to determine the relationship between the independent and dependent variables. These relationships may then be used, with projected values of the independent variable, to project corresponding values of the dependent variable.

Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections, but can provide a useful check on the validity of other forecasting techniques.

A wide range of factors are known to influence the aviation industry and can have significant impacts on the extent and nature of air service provided in both the local and national markets. Technological advances in aviation have historically altered, and will continue to change, the growth rates in aviation demand over time. The most obvious example is the impact of jet aircraft on the aviation industry, which resulted in a growth rate that far exceeded expectations. Such changes are difficult, if not impossible to predict, and there is simply no mathematical way to estimate their impacts. Using a broad spectrum of local, regional and national socioeconomic and aviation information, and analyzing the most current aviation trends, forecasts are presented in the following sections.

To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of the activity must be forecasted. Indicators of general aviation demand include:

- Based Aircraft
- Based Aircraft Fleet Mix
- Annual Operations
- Peak Activity

The remainder of this chapter will examine historical trends with regard to these areas of general aviation activity and project future demand for these segments of general aviation activity at the airport.

BASED AIRCRAFT

The number of aircraft based at an airport is, to a large degree, dependent upon the nature and magnitude of aircraft ownership in the local service area. In addition, Addison Airport is one of several airports serving the general aviation needs of the Dallas/Fort Worth Metroplex.

As detailed earlier, the Addison Airport service area consists of the northern half of Dallas County and the southern halves of Collin and Denton Counties. Dallas County is served by five reliever airports (including Addison Airport), Love Field, and other private airports. Denton and Collin Counties are served by one reliever airport each and several other general aviation and private airports.

In order to project based aircraft at Addison Airport, it is important to first identify the market conditions from which those aircraft are derived. As previously mentioned, Collin, Dallas, and Denton Counties serve as the primary service area for Addison Airport. It is important, then, that the process of developing forecasts of based aircraft for Addison Airport begin with a review of historical aircraft registrations in the Tri-County region.

REGISTERED AIRCRAFT FORECASTS

Historical records of aircraft ownership in the Tri-County region since 1985 were obtained from records of FAA's *U.S. Census of Civil Aircraft* and are presented on **Table 2F**.

TABLE 2F
Registered Aircraft in Tri-County Region

Year	Dallas County	Denton County	Collin County	Tri-County Total
1985	2,569	426	349	3,344
1986	2,749	435	389	3,573
1987	2,509	432	374	3,315
1988	2,459	429	350	3,238
1989	2,373	440	356	3,169
1990	2,378	497	392	3,267
1991	2,377	506	390	3,273
1992	2,385	517	411	3,313
1993	2,277	526	406	3,209
1994	2,246	583	434	3,263
1995	2,481	626	469	3,576
1996	2,436	640	496	3,572
1997	2,524	642	509	3,675
1998	2,602	688	549	3,839
1999	2,634	730	636	4,000
2000	2,873	772	661	4,306
2001	2,775	811	697	4,283
2002	2,783	833	710	4,326
Annual Average Growth	0.47%	4.02%	4.27%	1.53%

Aircraft registered in the Tri-County region has generally increased over the last 17 years. Over this period, the Tri-County region's registered aircraft increased from 3,344 in 1985 to 4,326 in 2002. This growth equates to an average annual increase of 1.53 percent.

Collin County aircraft registrations have increased at an average annual rate of 4.27 percent, the highest in the region over the period. Denton County experienced similar aircraft registration growth increasing at 4.02 percent on an average annual basis. The region's average annual growth over the period has been tempered by slower growth in Dallas County, as its aircraft registrations increased by only 0.47 percent annually. It should be noted, however, that the majority of the Tri-County region's aircraft registrations are in Dallas County.

The strong growth of aircraft ownership in the region is not surprising given the relatively warm weather, dense population, and strong economic conditions. The Metroplex is home to one of the busiest aviation centers in the country. Future aircraft ownership will be largely dependent upon continued growth in the region's economy and populations.

The first projection of future Tri-County aircraft registrations was developed utilizing trend line analysis. The generally increasing aircraft registrations in the region yielded an r^2 value of 0.87. The correlation coefficient **(Pearson's "r")** measures the association between changes in the dependent variable (aircraft registrations) and the independent variable(s) (calendar years). An r greater than 0.95 indicates good predictive reliability. A value below 0.95 may be used with the understanding that the predictive reliability is lower. Utilizing this projection, the region could expect 6,053 registered aircraft by 2022.

Next, a series of statistical regressions were completed which paired the Tri-County registered aircraft with regional demographics. Regression analysis considering the Tri-County population and employment provided r^2 values of 0.90 and 0.89, respectively. These projections yield 5,107 and 5,180 aircraft registrations, respectively, for the Tri-County region by 2022. A final regression analysis considered the combination of population and employment for the region versus aircraft registrations. This projection yields a correlation coefficient of 0.91 and 5,085 aircraft registrations by 2022.

Another useful tool in projecting the region's registered aircraft considers the region's market share of U.S. active aircraft. This market share analysis compares the region's aircraft ownership trends versus national aircraft ownership trends. **Table 2G** depicts the Tri-County region's share of U.S. active aircraft since 1990.

As presented in the table, the Tri-County registered aircraft share of U.S. active aircraft has been generally increasing. In 1990, the region's share was 1.65 percent which increased to 2.018 percent in 2002. It should be noted that the 2002 figure of U.S. active aircraft is an estimate by the FAA.

Two projections of regional aircraft registrations were performed considering market share of U.S. active aircraft as presented in **Table 2G**. First, a constant share forecast was developed which considers regional aircraft registrations growing at the same rate as U.S. active aircraft. This projection yields 4,670 registered aircraft by 2022. Considering historic trends, however, the registered aircraft in the Tri-County region could continue to follow an increasing trend. An increasing market share projection reaching 2.5 percent of U.S. active aircraft yields 5,785 registered aircraft by 2022.

TABLE 2G Tri-County Share of U.S. Active Aircraft			
Year	**U.S. Active Aircraft**	**Tri-County Aircraft**	**% of U.S. Active**
HISTORICAL			
1990	198,000	3,267	1.650%
1991	196,874	3,273	1.662%
1992	185,650	3,313	1.785%
1993	177,120	3,209	1.812%
1994	172,935	3,263	1.887%
1995	188,089	3,576	1.901%
1996	191,129	3,572	1.869%
1997	192,414	3,675	1.910%
1998	204,710	3,839	1.875%
1999	219,464	4,000	1.823%
2000	217,533	4,306	1.979%
2001	216,150	4,283	1.981%
2002	214,350	4,326	2.018%
FORECASTS			
Constant Market Share			
2007	218,250	4,404	2.018%
2022	231,416	4,670	2.018%
Increasing Market Share			
2007	218,250	4,583	2.100%
2022	231,416	5,785	2.500%

Source: Tri-County Registrations from FAA U.S. Census of Civil Aircraft; U.S. active aircraft from FAA Aerospace Forecasts 2002-2013 and previous editions.

A similar market share projection has been developed which considers aircraft ownership per 1,000 residents. In many cases, the ratio of aircraft ownership per 1,000 residents will decrease as population of the area increases. For highly active aviation centers such as the Dallas/Fort Worth Metroplex, however, this trend can be increasing. **Table 2H** depicts historic and forecast aircraft registrations per 1,000 residents of the Tri-County region.

TABLE 2H Registered Aircraft vs. Population of the Tri-County Region			
Year	Tri-County Registered Aircraft	Tri-County Population	Aircraft per 1,000 Residents
1980	3,049	1,844,121	1.653
1985	3,344	2,176,126	1.537
1990	3,267	2,390,371	1.367
1995	3,576	2,644,284	1.352
2000	4,306	3,143,550	1.370
Decreasing Share Projection			
2007	4,655	3,448,074	1.35
2022	5,304	4,143,785	1.28
Constant Share Projection			
2007	4,724	3,448,074	1.37
2022	5,677	4,143,785	1.37
Increasing Share Projection			
2007	4,758	3,448,074	1.38
2022	6,008	4,143,785	1.45

Sources: Population from U.S. Census Bureau and NCTCOG; Aircraft Registrations from U.S. Census of Civil Aircraft.

Since 1980, the registered aircraft in the Tri-County region has generally grown at a slower pace than the population of the area. In 1980, the region had 3,049 registered aircraft per 1,000 residents. By 1995, registered aircraft in the Tri-County region fell to 1.352 per 1,000 residents. For 2000, however, registered aircraft per 1,000 Tri-County residents increased slightly to 1.37.

As noted earlier, population for the area is expected to continue to increase but at a slower rate than the previous 20 years. Much of this growth is expected to occur in Collin County. Forecasts should then consider the potential for a continued decreasing trend, while a constant and increasing share is possible given the slowing population growth projections.

A projection considering a continued decreasing ratio falling to 1.28 registered aircraft per 1,000 Tri-County residents yields 5,304 registered aircraft by 2022. A constant share ratio projects 5,677 aircraft by 2022. A projection which considers aircraft ownership in the region growing faster than population in the future yields 6,008 registered aircraft by 2022. These projections are detailed in **Table 2H**.

A final projection of the Tri-County aircraft ownership considers extending the historical growth rate of 1.53

percent for the next 20 years. This projection yields 5,861 aircraft for the Tri-County region by 2022.

The projections developed above serve as a planning envelope of future registered aircraft. These projections are summarized in **Table 2J** and depicted on **Exhibit 2C**.

TABLE 2J
Based Aircraft Projection Summary Addison Airport

Projection Description	**2007**	**2022**
Trend Line (r^2 = 0.87)	4,702	6,053
Regression Analysis		
vs. Tri-County Population (r^2 = 0.90)	4,454	5,107
vs. Tri-County Employment (r^2 = 0.89)	4,458	5,180
vs. Population & Employment (r^2 = 0.91)	4,450	5,085
Tri-County Market Share of U.S. Active Aircraft		
Constant Share	4,404	4,670
Increasing Share	4,583	5,785
Based Aircraft per 1,000 Tri-County County Residents		
Decreasing Share	4,655	5,304
Constant Share	4,724	5,677
Increasing Share	4,758	6,008
Other Forecast		
1.53 percent Annual Growth	4,667	5,861
SELECTED FORECAST	***4,600***	***5,600***

The trend line analysis and an increasing market share of aircraft per 1,000 residents establish the high end of the planning envelope exceeding 6,000 registered aircraft by 2022. The low end of the planning envelope is established by the constant share of U.S. active aircraft projection (4,670).

Given the slowed economy and evidence of slowing aircraft ownership nationwide, aircraft ownership in the Tri-County region may also experience slower growth over the next five years. For the next 15 years, however, a more moderate growth can be expected. For this reason, a forecast of 4,600 by 2007, 4,900 by 2012, and 5,600 by 2022 has been selected. The selected forecast nearly matches the projection of a constant share of registered aircraft per 1,000 Tri-County residents. The projection will provide a useful tool in considering the future market from which based aircraft at Addison Airport will be drawn.

BASED AIRCRAFT FORECAST

The number of based aircraft is the most basic indicator of general aviation demand at an airport. By first developing a forecast of based aircraft, the growth of other factors can be projected. **Table 2K** presents historical based aircraft at Addison Airport since 1980.

Based aircraft totals at Addison Airport have fluctuated over the last 22 years. In 1980, there were 760 based aircraft at Addison Airport. Over the next four years, the airport experienced growth, reaching a high of 862 aircraft. By 1990, based aircraft declined to 725. Since 1990, based aircraft have fluctuated between a 22 year high of 876 in 1991 and a low of 728 reported for 1997 through 2000. Based aircraft reached 750 in 2001 and 768 in 2002.

The first step in developing forecasts of based aircraft involved the use of trend line and regression analyses. Several time-series analyses were conducted considering differing periods since 1980. Due to the wide variance in based aircraft totals, however, the trend line analyses did not provide a suitable correlation coefficient.

A series of regression analyses were performed using historical population, employment, and PCPI presented earlier. Similar to the trend line analysis, the regression analysis yielded correlation coefficients well below what is required for forecast reliability. None of these forecasts were carried forward in the study as they were not considered statistically reliable enough for forecasting purposes.

TABLE 2K
Based Aircraft Addison Airport

Year	Total
1980	760
1981	812
1982	862
1983	862
1984	862
1985	853
1986	830
1987	745
1988	715
1989	730
1990	725
1991	876
1992	771
1993	771
1994	771
1995	777
1996	807
1997	728
1998	728
1999	728
2000	728
2001	750
2002	768

Sources: TAF, Airport Records.

Market share analysis was considered next. **Table 2L** compares historical based aircraft at Addison Airport and the Tri-County registered aircraft since 1990.

As shown in the table, the ratio of aircraft based at Addison Airport versus the Tri-County region's registered

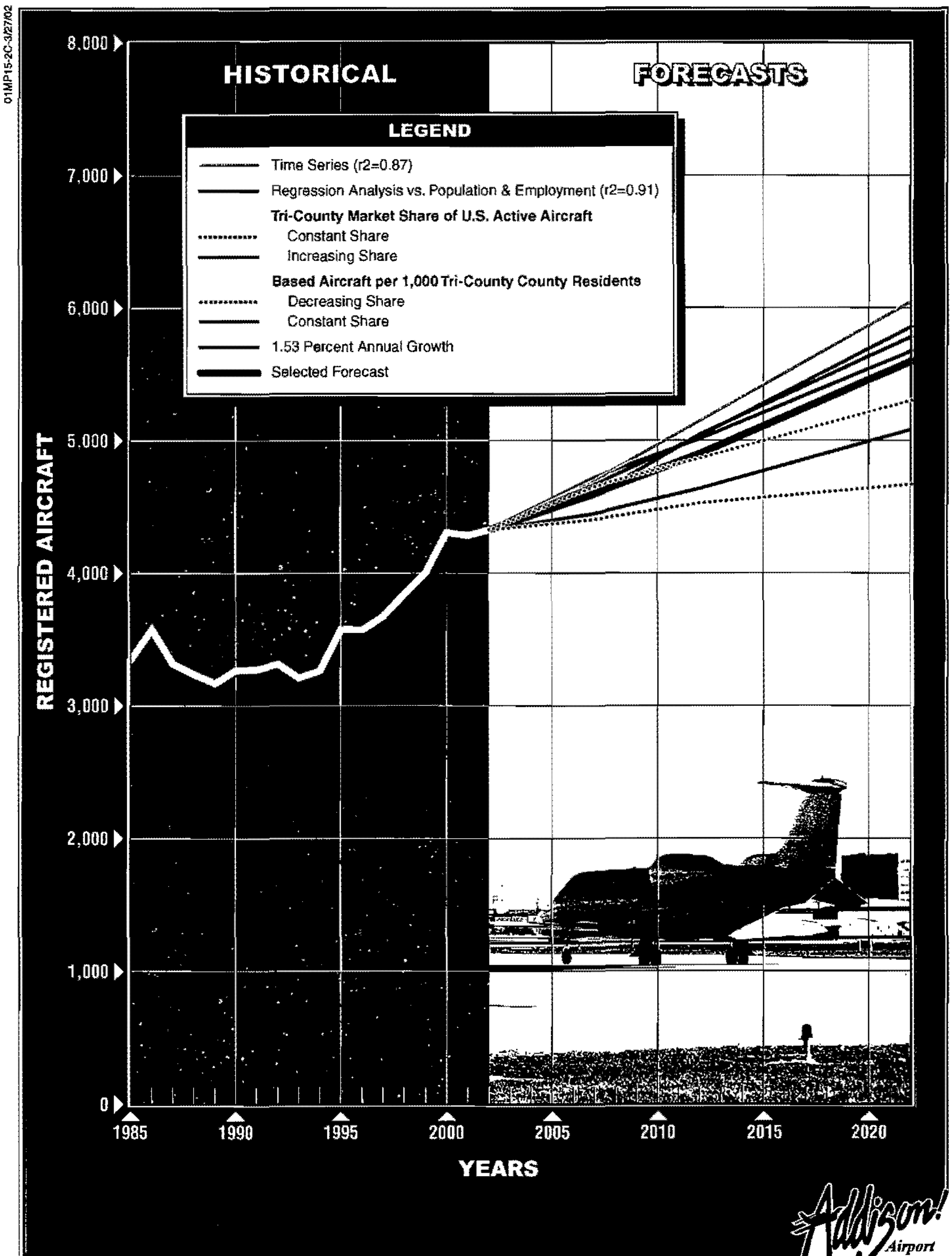


Exhibit 2C
TRI-COUNTY REGISTERED
AIRCRAFT PROJECTIONS

aircraft has generally decreased since 1990. In 1990, Addison Airport based aircraft accounted for 22.19 percent of the Tri-County registered aircraft. The market share generally decreased over the next 12 years, declining to 17.75 percent by 2002.

TABLE 2L
Addison Airport Share of Tri-County Registered Aircraft

Year	Tri-County Registered	Addison Based Aircraft	Market Share
HISTORICAL			
1985	3,344	853	25.51%
1986	3,573	830	23.23%
1987	3,315	745	22.47%
1988	3,238	715	22.08%
1989	3,169	730	23.04%
1990	3,267	725	22.19%
1991	3,273	876	26.76%
1992	3,313	771	23.27%
1993	3,209	771	24.03%
1994	3,263	771	23.63%
1995	3,576	777	21.73%
1996	3,572	807	22.59%
1997	3,675	728	19.81%
1998	3,839	728	18.96%
1999	4,000	728	18.20%
2000	4,306	728	16.91%
2001	4,283	750	17.51%
2002	4,326	768	17.75%
FORECASTS			
Decreasing Market Share			
2007	4,600	793	17.25%
2022	5,600	840	15.00%
Constant Market Share			
2007	4,600	817	17.75%
2022	5,600	994	17.75%

Source: 1990-2001data from FAA TAF, 2002 data provided by Town of Addison; Historical registered aircraft from FAA, forecasts by Coffman Associates.

It should be noted that the based aircraft figures for Addison Airport for 1990-1999 were obtained from the FAA TAF. The TAF utilizes information obtained from periodic site visits by a FAA/TxDOT inspector. The inspection typically occurs annually, however, in some cases they do not. The inspector is given a general estimate of based aircraft by airport management or airport businesses. This may explain the static level of based aircraft between 1992 and 1995 as well as between 1997 and 2000. It is fair to assume that the actual based aircraft for these years were higher or lower, but were likely representative of the airport's total.

To gain an understanding of future based aircraft at Addison Airport, two market share forecasts considering regional aircraft growth have been prepared.

The decreasing share forecast considers that based aircraft at the airport will continue to grow at a slower rate than the Tri-County registered aircraft. As presented in **Table 2L**, the decreasing share forecast is based upon projecting Addison Airport's share of the region's registered aircraft to decrease to 15 percent by 2022. This forecast yields 840 aircraft by 2022.

The constant share forecast assumes that based aircraft will continue to grow at the same rate as the Tri-County registered aircraft for the next 20 years. The 2002 Addison Airport market share of 17.75 percent was applied to projected Tri-County registered aircraft prepared earlier. As shown in the table, this forecast yields 994 based aircraft by 2022.

Another forecast useful in projecting based aircraft compares the based aircraft at the airport versus local resident population. **Table 2M** presents historic and forecast Addison Airport based aircraft versus 1,000 Town of Addison residents.

For the years 2000 and 2001, Addison Airport had 51 based aircraft per 1,000 Town of Addison residents. As depicted, this total represents the lowest since 1980. Based aircraft in 1990 registered the highest market share over the period at 137 aircraft per 1,000 Addison residents. This decreasing trend is not uncommon, as resident population can typically outpace aircraft growth, especially in high growth areas. This trend may not hold in the future, however, as the Town of Addison has limited areas left to develop additional residential communities. Thus, three projections of based aircraft per 1,000 Town of Addison residents as presented in **Table 2M**: decreasing share, constant share, and increasing share.

Considering a continuance in a decreasing aircraft ownership per 1,000 residents, reaching 45 by 2022, yields 782 aircraft. This projection would represent a slight increase reaching 782 by 2022.

As shown in **Table 2M**, assuming a constant ratio of 52 aircraft per 1,000 residents yields 904 aircraft by 2022. This results in based aircraft growing at the same rate as the local population.

A projection assuming the ratio of based aircraft to 1,000 Town of Addison residents increasing gradually throughout the planning period yields 956 based aircraft at Addison Airport by 2022.

A final forecast projected based aircraft growing at an annual rate of 0.48 percent through 2022. This growth rate represents the historical growth rate at Addison Airport from 1990 to 2002. This projection resulted in based aircraft growing to 845 by 2022. Another resource used for comparative purposes includes the *2000 FAA TAF* which was presented in **Table 2E**.

TABLE 2M
Addison Airport Based Aircraft vs. Population Projections

Year	Addison Based	Addison Population	Aircraft per 1,000
1980	760	5,553	137
1990	725	8,783	83
1995	777	10,200	76
2000	728	14,166	51
2001	750	14,623	51
Decreasing Share Projection			
2007	747	14,945	50
2022	782	17,377	45
Constant Share Projection			
2007	777	14,945	52
2022	904	17,377	52
Increasing Share Projection			
2007	792	14,945	53
2022	956	17,377	55

Sources: Historic Population from U.S. Census Bureau and NCTCOG; Population Forecast from NTCOG.

Based Aircraft Forecast Summary

A summary of all forecasts for based aircraft at Addison Airport and the selected planning forecast is presented in **Table 2N** and on **Exhibit 2D**. As shown on the exhibit, the combination of forecasts represents a forecast envelope.

The forecast envelope represents the area in which future based aircraft at Addison Airport should be found. The decreasing aircraft per 1,000 Town of Addison residents represents the lower end of the planning envelope. The constant share of Tri-County registered aircraft forecast represents the upper end of the forecast envelope. The FAA TAF forecast is also near the top of the envelope.

TABLE 2N Based Aircraft Projection Summary Addison Airport		
Projection Description	**2007**	**2022**
Market Share of Tri-County Region		
Decreasing Share	793	840
Constant Share	817	994
Based Aircraft per 1,000 Addison Residents		
Decreasing Share	747	782
Constant Share	777	904
Increasing Share	792	956
Other Forecasts		
0.48 percent Annual Growth	787	845
TAF	804	978
SELECTED FORECAST	800	900

The decreasing aircraft per 1,000 resident projection would yield a short term loss of nearly 20 aircraft while increasing by 14 aircraft by 2022. Although the airport is somewhat constrained due to a single runway configuration and high itinerant aircraft operations, it is highly unlikely that a facility with as much to offer would experience such a stagnation. The only likely scenario which could produce such a condition would be a deepening recession and shift downward in general aviation. This forecast appears at this time to be unreasonably low.

The constant share of Tri-County registered aircraft and TAF projections, however, may overstate growth potential. These forecasts project 226 and 210 new based aircraft by 2022, respectively. Review of the last 20 years based aircraft indicates a history of more moderate growth. Even considering the last ten years, growth has not exceeded one percent annually. Another factor to consider is the increased delays and inefficiencies which will occur as the airport acquires more aircraft. The single runway configuration can at times become congested during peak periods. Some operators may elect not to base at Addison Airport due to high traffic volumes and congestion.

The airport has experienced some growth over the last two years which can be expected to continue. The degree to which this growth will continue will depend largely upon several factors such as facilities available, congestion/ delay, and local/regional economic strength.

It is reasonable to assume that aircraft growth at Addison Airport will continue to be reasonably strong until later in the planning period. As more aircraft owners choose to base at Addison and aircraft operations increase, this growth

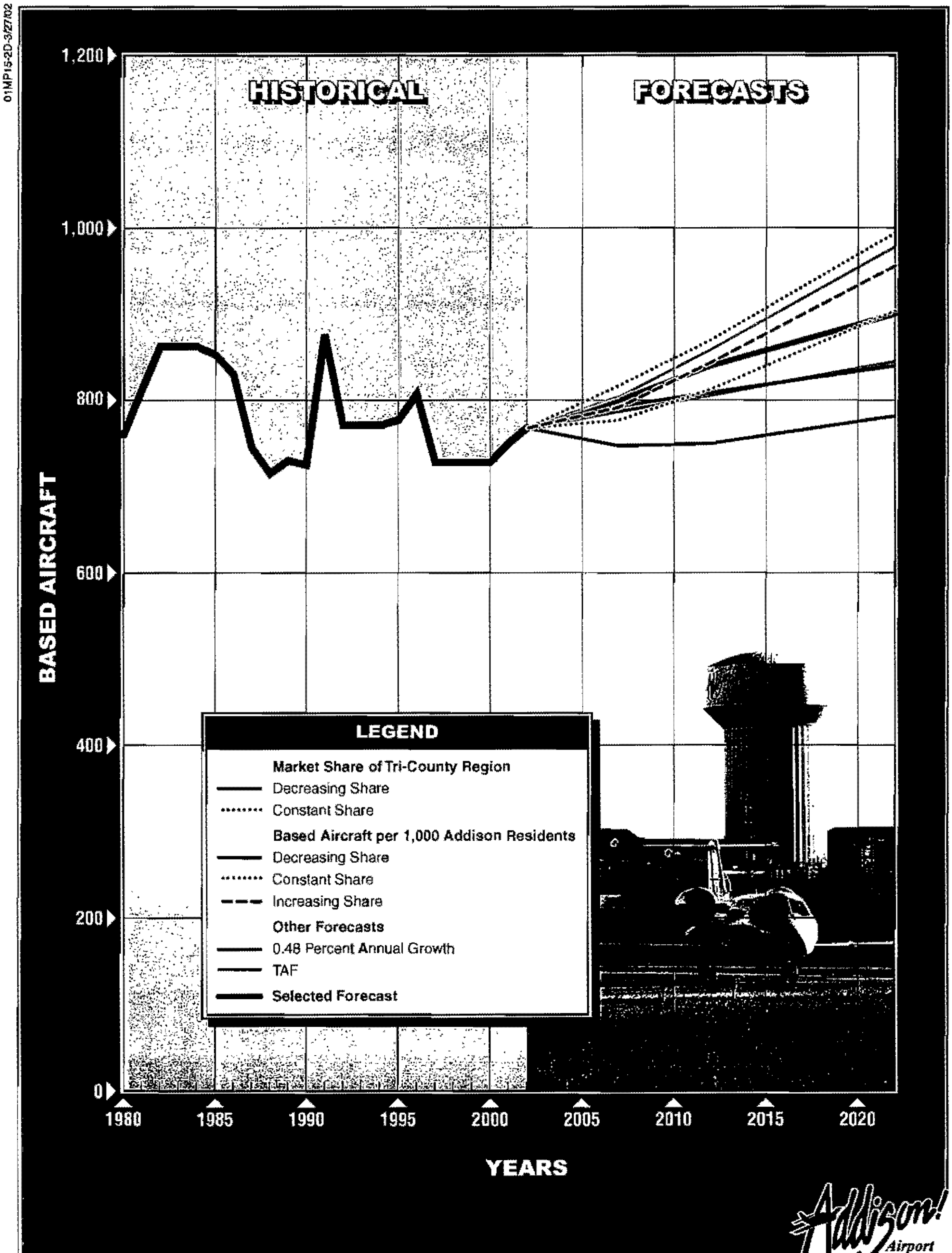


Exhibit 2D
BASED AIRCRAFT PROJECTIONS

will likely slow as the airport nears its operational capacity. Thus, a selected forecast of 800 aircraft for 2007 and 900 aircraft for 2022 has been developed. The planning forecast projects based aircraft growing at 0.8 percent annually through 2022. This forecast will provide the Town of Addison a realistic target to plan for facility needs.

BASED AIRCRAFT FLEET MIX PROJECTION

Knowing the aircraft fleet mix expected to utilize the airport is necessary to properly plan facilities that will best serve the level of activity and the type of activities occurring at the airport. The existing standard general aviation based aircraft fleet mix is comprised of single-engine piston aircraft, multi-engine piston aircraft, turboprop, turbojet, and helicopters.

Projections for the standard general aviation based aircraft fleet mix considers national trends. As previously mentioned, the FAA anticipates strong growth in active single engine and turbine-powered aircraft, especially jet aircraft. Recent trends illustrate the movement in the general aviation community towards more sophisticated, higher-performing, and more demanding aircraft for business purposes.

The FAA projects growth in turbine-powered aircraft to outpace growth in all other components of the active aircraft fleet. Turbine-powered aircraft are expected to grow at an average annual rate of 2.1 percent through 2013.

The projected trend of based aircraft at Addison Airport includes a growing number of single engine piston aircraft and multi-engine piston aircraft at the airport; however, the single-engine segment is projected to remain static as a percentage of total aircraft while the multi-engine piston percentage of total based aircraft is expected to decrease. Although single engine aircraft will remain static as a percentage, total single engine based aircraft is projected to increase from 379 in 2002 to 445 in 2022. The multi-engine aircraft percentage of total based aircraft is expected to decrease, however, the number of based multi-engine piston aircraft is expected to remain relatively constant by 2022.

Turbine-powered aircraft are expected to increase in number and as a percentage of total based aircraft through the planning period. It is expected that jet aircraft will continue to account for 24 percent of the airport's total reaching 216 by 2022. Turboprop aircraft are expected to increase in percentage and totals reaching nine percent of the based aircraft total and 81 aircraft by 2022.

Helicopters are expected to also remain static as a percentage of total based aircraft while increasing in total numbers by 2022. The based aircraft fleet mix projection for Addison Airport is summarized in **Table 2P**.

TABLE 2P Based Aircraft Fleet Mix Addison Airport						
	Existing		FORECAST			
Type	2002	%	2007	%	2022	%
Single Engine	379	49.35%	396	49.50%	445	49.50%
Multi-Engine	126	16.41%	128	16.00%	131	14.50%
Turboprop	55	7.16%	60	7.50%	81	9.00%
Jet	186	24.22%	192	24.00%	216	24.00%
Helicopter	22	2.86%	24	3.00%	27	3.00%
Totals	768	100.00%	800	100.00%	900	100.00%

ANNUAL OPERATIONS

The ATCT located on the airport collects information regarding aircraft operations (takeoffs and landings). Aircraft operations are reported in four general categories: air carrier, air taxi, general aviation, and military. Air carrier operations are certified under Federal Aviation Regulations (F.A.R.) Part 121. Air taxi operations consist of the use of general aviation aircraft for the "on-demand" commercial transport of persons and property in accordance with F.A.R Part 135. General aviation operations include a wide range of activity from personal to business and corporate uses. Military operations include those operations conducted by various branches of the U.S. military.

Aircraft operations are further classified as local and itinerant. A local operation is a takeoff or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and commercial use since business aircraft are used primarily to carry people from one location to another.

Table 2Q summarizes historical operations at Addison Airport since 1990. As is evident in the table, the airport's total operations have varied with a low of 153,781 in 1990 to a high of 176,032 in 1992. Total operations in 2001 were down only 1.86 percent over 2000, however, the September operations for 2001 were 39.1 percent lower than September, 2000 (obviously impacted by the events of September 11th). Since the completion of the previous master plan (1997), total operations are down six percent. Itinerant general aviation operations were 135,780 in 2001, the lowest total over the period. Air taxi and local general aviation operations, however, reached 10,932 and 13,863, respectively, in 2001, the highest totals over the period.

TABLE 2Q
Historic Operations Addison Airport

	Itinerant Operations					Local Operations			
Year	Air Carrier	Air Taxi	General Aviation	Military	Total Itinerant	General Aviation	Military	Total Local	Total Operations
1990	0	699	146,801	109	147,609	6,124	48	6,172	153,781
1991	0	539	151,865	68	152,472	8,966	8	8,974	161,446
1992	0	364	163,280	65	163,709	12,315	8	12,323	176,032
1993	0	195	157,601	102	157,898	9,629	10	9,639	167,537
1994	0	507	160,713	109	161,329	6,728	8	6,736	168,065
1995	0	585	150,572	102	151,259	6,895	12	6,907	158,166
1996	104	777	151,081	106	152,068	6,617	28	6,645	158,713
1997	1	1,938	161,499	76	163,514	7,758	10	7,768	171,282
1998	0	3,379	161,958	43	165,380	9,872	52	9,924	175,304
1999	2	6,702	158,438	91	165,233	7,254	0	7,254	172,487
2000	50	10,596	142,835	224	153,705	10,225	14	10,239	163,944
2001	73	10,932	135,780	217	147,002	13,863	30	13,893	160,895

Source: 1990-1996 FAA TAF, 1997-2001 Data from ATCT

Over the last five years, several trends have developed. First, air taxi operations have increased significantly. This could be directly attributed to the cargo and life flight operators on the airport, as well as other transient charter operators (corporate flight departments and fractional ownership programs). Another trend over the period is that itinerant general aviation operations have been declining while local general aviation operations (training) have grown. Air carrier operations have been typically under 100 for each year since 1990 (with the exception of 1996). Military operations have fluctuated between a low of 73 to a high of 247.

GENERAL AVIATION OPERATIONS

General aviation operations constitute the largest share of operations at Addison Airport. Moreover, itinerant operations generally account for more than 90 percent of total general aviation operations. This can be at least partially attributed to the airport's restriction on weekday local operation restrictions. The majority of local operations at Addison Airport occur on the weekends. Over the last 12 years, itinerant general aviation operations have averaged 94.5 percent of total general aviation operations. **Table 2R** presents general aviation operations at Addison since 1990.

TABLE 2R
General Aviation Operations Forecast
Addison Airport

Year	Itinerant	Local	Total	Operations per Based Aircraft Itinerant	Operations per Based Aircraft Local
1990	146,801	6,124	152,925	202.48	8.45
1991	151,865	8,966	160,831	173.36	10.24
1992	163,280	12,315	175,595	211.78	15.97
1993	157,601	9,629	167,230	204.41	12.49
1994	160,713	6,728	167,441	208.45	8.73
1995	150,572	6,895	157,467	193.79	8.87
1996	151,081	6,617	157,698	187.21	8.20
1997	161,499	7,758	169,257	221.84	10.66
1998	161,958	9,872	171,830	222.47	13.56
1999	158,438	7,254	165,692	217.63	9.96
2000	142,835	10,225	153,060	196.20	14.05
2001	135,780	13,863	149,673	181.04	18.48
FORECAST					
2007	144,000	8,800	152,800	180	11
2022	162,000	9,900	171,900	180	11

Source: Historic operations and Based Aircraft from FAA TAF and Addison ATCT.

The decrease in itinerant general aviation activity for 2001 can be directly attributed to the September 11th aftermath. Located in DFW and Love Field Class B airspace, Addison Airport was restricted to instrument flight rule (IFR) operations. This attributed to a 39 percent decrease in September 2001 operations compared to September 2000 operations. Itinerant operations in September 2001 were 7,509 compared to 13,190 in September 2000.

Itinerant general aviation operations for the first eight months of 2001 were only slightly lower than the first eight months of 2000 (96,581 in 2001 versus 98,581 in 2000). Also, total general aviation operations for the first eight months of 2001 were higher than the first eight months of 2000 (113,881 in 2001 versus 111,615 in 2000). This resulted from local general aviation operations 4,164 higher in the first eight months of 2001 than the previous year.

With the weekday local restrictions, flight instructors at Addison Airport conduct their training operations at other regional airports. Summit Aviation, a helicopter training facility, utilizes Taxiway B for its training operations as allowed by the ATCT.

Projections of annual operations have been developed by examining the number of operations per based aircraft. These forecasts considered itinerant and local operations per based aircraft as presented in **Table 2R**. Generally, airports such as Addison Airport can expect up to 500 operations per based aircraft (300 for itinerant and 200 for local) per a study done by the Texas Department of Transportation - Aviation Division (TxDOT). Reaching 500 operations per based aircraft, however, typically is accomplished with high amounts of training activity based at the airport. This is not the case at Addison Airport. Airports, such as Addison Airport, that experience a high level of itinerant traffic will typically exhibit a lower operations per based aircraft number.

As presented in the table, itinerant operations per based aircraft have ranged between a high of 222 in 1998 and a low of 173 in 1991. Local operations per based aircraft have also varied between a low of 8.5 in 1990 to a high of 18.5 in 2001. One trend which is evident from the figures is that transient operations per based aircraft are typically lower for years with higher based aircraft totals.

Future general aviation operations have been projected utilizing a constant share of operations per based aircraft individually for itinerant and local operations. As presented in **Table 2R**, itinerant operations per based aircraft were projected utilizing a constant ratio of 180. This is considered reasonable, given the growth of based aircraft. Local operations were projected utilizing a constant ratio of 11 operations per based aircraft. This ratio represents the average over the last 12 years and will serve as a reasonable level for future planning.

Previous forecasts have been examined for comparative purposes. The 2000 FAA TAF projects annual general aviation operations growing to 169,872 by 2015. Extending the TAF's annual growth rate out to 2022 would yield 195,602 by 2022. Comparing the TAF projection and the one presented in **Table 2R** yields a difference of nearly 24,000 operations. As previously mentioned, however, the TAF forecast was prepared prior to the events of September 11th, 2001 and are under review. These forecasts will likely be revised downward.

AIR CARRIER AND AIR TAXI OPERATIONS

Air carrier operations are takeoffs or landings by an operator holding a Certificate of Public Convenience and Necessity issued by the Department of Transportation to conduct scheduled services over specified routes and to conduct a limited amount of non-scheduled operations. Generally, the ATCT count scheduled and charter passenger operations by aircraft with 30 or more seats, or cargo as air carrier.

Air taxi activity operations are takeoffs and landings by operators which: (1) perform at least five round trips per week between two or more points and publish flight schedules which specify times, days of the week, and places between which such flights are performed; or (2) transport mail by air pursuant to a current contract with the U.S. Postal Service. The airport traffic control tower counts all cargo operations as well as scheduled and charter passenger operations by aircraft with less than 30 seats as air taxi.

As shown on **Table 2S,** air carrier operations at Addison Airport are infrequent, ranging between none and 104 operations annually over the last 12 years. While there is no scheduled service, there are occasional charter operations by commercial jet aircraft. For Addison Airport, air carrier operations are generally associated with the 737 and/or DC-9 cargo aircraft operations. This is anticipated to continue in the future holding constant at 100 annual operations as shown on **Table 2S**.

Air taxi operations are more prevalent at Addison Airport with 10,932 operations in 2001. As shown on **Table 2S,** air taxi operations have grown significantly annually since 1996. This suggests an increase in locally-based air taxi activity such as cargo couriers. There are several couriers presently operating from Addison Airport. This also suggests that some corporate flight departments and/or fractional owners are operating as air taxi.

Air taxi operations were projected to increase at a constant rate, which assimilates the FAA's forecast for air taxi operations at towered airports in the United States. **Table 2S** indicates these forecasts as well as Addison Airport's market share of air taxi operations.

TABLE 2S
Air Carrier/Air Taxi Operations Forecast
Addison Airport

Year	Air Carrier	Air Taxi	US Towered Airport Air Taxi Ops (thousands)	ADS % Market Share
1990	0	699	8,900.0	0.0079%
1991	0	539	9,000.0	0.0060%
1992	0	364	9,462.0	0.0038%
1993	0	195	9,831.9	0.0020%
1994	0	507	10,175.5	0.0050%
1995	0	585	10,234.2	0.0057%
1996	104	777	10,170.4	0.0087%
1997	1	1,938	10,052.7	0.0193%
1998	0	3,379	10,172.2	0.0332%
1999	2	6,702	10,576.0	0.0634%
2000	50	10,596	10,763.3	0.0989%
2001	73	10,932	10,881.7	0.1011%
FORECAST				
2007	100	12,900	12,739.3	0.1011%
2022	100	18,700	18,454.8	0.1011%

Source: Historical Addison Operations from ATCT and TAF; Historical and Forecast US Towered Operations from FAA Aerospace Forecasts Fiscal Years 2002-2013.

MILITARY OPERATIONS

Military use of Addison Airport consists primarily of jet, transient turboprop, or helicopter activity. As shown in **Table 2Q**, military activity at the airport has fluctuated annually, but has been a statistically insignificant portion of the total airport activity. The highest military activity in the past decade occurred in 2001 with 247 itinerant and local operations. The low year was 1992 with 73 operations.

Consistent with standard planning practices, military operations are forecast at static levels through the planning period since it is difficult to predict the pattern of military operations due to the ever-changing missions of military forces. For planning purposes, military operations are forecast at 400 annual operations through the planning period with 300 attributable to transient operations and 100 attributable to local operations. The military operations forecast is included on the summary exhibit at the end of this chapter.

NIGHTTIME OPERATIONS

An input into the integrated noise model (INM) utilized to output the airport's annualized noise contour is the amount and type of operations conducted between 10:00 p.m. and 7:00 a.m. During these times, ambient noise levels (eg. traffic, industry, and other activities generate noise) are lower than during the day time. The ATCT at Addison Airport is closed for this period, except for spring through summer when the tower remains open until midnight. Thus, the ATCT counted operations presented above do not represent the actual annual operations at Addison Airport.

In order to estimate operations during 10:00 p.m. and 7:00 a.m., a week-long count was conducted between February 25th and March 3rd, 2002. These counts are presented in **Table 2T**. The count included a recording of the operation time, aircraft type, tail number (in some cases), operation type (arrival versus departure), and runway utilized. No local operations occurred during the count.

The counts were then compared against daytime operations for these days. For the period, nighttime operations averaged 6.5 percent of the daytime itinerant operations registered by the ATCT. This percentage was utilized to estimate 2001 nighttime operations. Future nighttime operations will likely decrease as a percentage as nighttime operations are generally sporadic and conducted by specific operators. Thus, future nighttime operations have been forecast to decrease to six percent of daytime operations by 2022. At this level, the airport would experience approximately 1,500 more nighttime operations annually by 2022.

The count also illustrated that the majority of nighttime operations were conducted by turbine aircraft. Approximately 75 percent of the total counted operations were performed by turbine aircraft. Approximately 45 percent of these operations were by jet-powered aircraft and 30 percent by turboprop aircraft. These percentages were applied to current and future nighttime operational forecasts as presented in **Table 2T.**

TABLE 2T
Nighttime Counts (Feb. 25th - March 3rd, 2002)
Addison Airport

PISTON	#	TURBOPROP	#	JETS	#
Aerocommander	1	Rotor		B737	1
Barron	1	Careflight	2	DC9	4
Cessna Caravan	6	Police	2	Beechjet 400	3
Cessna 150	2	Conquest	1	Citation	1
Cessna 172	4	KingAir C-90	7	Challenger 600	3
Cessna 210	1	KingAir 200	1	Falcon 20	5
Cessna	1	Merlin Metroliner	15	Falcon 50	1
Cessna 206	1	Piper 31	2	Falcon	1
Cessna 340	2	TOTAL	30	G-III	1
Cessna Cardinal	1			G-IV	2
Cessna RG	1		**Summary**	Hawker	1
Cessna SP	1	***Total Operations***	***101***	Jetstar	1
Cherokee	1	***Arrivals***	***63***	Lear	2
Debonair	1	***Departures***	***38***	Lear 20	14
Travelair	1	***Runway 15***	***46***	Lear 45	1
TOTAL	25	***Runway 33***	***55***	Lear 60	5
				TOTAL	46

Night Time Operations Forecasts

		Annualized		
Aircraft Type	**Count Total**	**2001**	**2007**	**2022**
Single Engine	25	2,360	2,490	2,720
Turboprop	30	2,830	2,990	3,260
Jet	46	4,340	4,580	5,000
Total	101	9,530	10,060	10,980

FLEET MIX OPERATIONS

In order to discern the airport's fleet mix operations, interviews were conducted with airport officials, tower staff, fixed base operators, specialty operators, and fractional ownership operators. These interviews aided in providing a realistic understanding of current fleet mix operations. Future fleet mix operations were projected utilizing aircraft ownership trends, aircraft retirement possibilities, and aircraft operator inputs (including information obtained from the aircraft owner survey).

Based on this information, 51 percent of itinerant airport operations were estimated to be made by single engine aircraft. Multi-engine piston aircraft were estimated to be 15 percent of itinerant traffic, while turboprop aircraft was estimated to be 14 percent of itinerant traffic. Jet operations were estimated to account for 19 percent of total itinerant operations, equating to an average of approximately 77 jet operations per day. Itinerant helicopter operations were estimated at one percent, or 1,472 operations in 2001. Local operations were estimated at 80 percent for single engine aircraft, 10 percent for multi-engine piston, and ten percent for helicopter (Summit Aviation) for 2001. **Table 2U** presents fleet mix estimates and projections for Addison Airport.

Future itinerant operations are projected to remain 50 percent single engine and one percent for helicopter aircraft. Multi-engine piston aircraft operations were projected to decrease as a percentage; however, they were to remain relatively constant in number. Turboprop and jet aircraft operations were projected to increase in percentage and number.

Current jet operations are dominated by the Cessna Citation and Lear aircraft families. This is not uncommon as these two aircraft families represent the largest percentage of business jets on the market today. This is expected to continue, however, other business jets such as the Boeing Business Jet (BBJ), Challenger 600, and Gulfstream family of aircraft are also expected to increase in percentage and number in the future.

Table 2U presents operational fleet mix forecasts for Addison Airport through 2022. It is important to note that the year 2002 is being utilized as a base year. It was assumed that 2001 operational counts are representative of 2002, thus, will be utilized for preparation of the current airport noise exposure contours.

SUMMARY

This chapter has provided forecasts for each sector of aviation demand anticipated over the planning period. **Exhibit 2E** presents a summary of the aviation forecasts developed for Addison Airport. Addison Airport is expected to experience increases in total based aircraft, annual operations, and turbine-powered aircraft use of the airport through the planning period, consistent with regional and national projections.

TABLE 2U
Operational Fleet Mix Estimates

	2002		2007		2022	
Type	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
ITINERANT OPERATIONS						
Single Engine Piston Aircraft						
Light – Fixed Prop	37,485	1,180	39,325	1,245	45,275	1,360
Light – Variable Prop	37,485	1,180	39,325	1,245	45,275	1,360
Subtotal	*74,970*	*2,360*	*78,650*	*2,490*	*90,550*	*2,720*
Twin Engine Piston and Turboprop Aircraft						
Beech Baron/Piper 31	22,050	284	22,020	300	22,640	327
King Air	17,640	757	20,450	800	25,350	872
Merlin Metroliner	2,940	1,419	3,150	1,500	1,810	1,636
Subtotal	*42,630*	*2,460*	*45,620*	*2,600*	*49,800*	*2,835*
Jet Aircraft						
Large Jet (<90,000 lbs.)						
Boeing 737-200C	440	93	470	97	180	38
DC-9	590	373	630	390	360	223
Gulfstream V	440	47	1,105	49	1,810	80
Boeing Business Jet	0	0	155	49	905	300
Medium Jets (30,0000-90,000 lbs.)						
Challenger 600/Falcon 2000	3,380	280	4,405	292	6,340	319
Gulfstream III	735	93	785	97	455	60
Gulfstream IV	735	187	785	195	2,260	259
Falcon 50	295	93	315	97	360	106
Small Jets (>30,000 lbs.)						
Citation I, II, V	4,410	47	4,720	49	5,435	202
Citation III, VI, VII	4,410	47	4,720	49	5,435	202
Falcon 20	1,470	560	1,580	585	905	340
Lear 25	2,940	1,587	3,145	1,657	1,810	980
Lear 35/45/55/60 Hawker 800/1000	8,085	933	8,650	974	12,685	1,891
Subtotal	*27,930*	*4,340*	*31,465*	*4,580*	*38,940*	*5,000*
Helicopter						
Small (R-22 & H500)	892	0	945	0	1,090	0
Medium (Bell 206 & BO 105)	290	185	310	195	360	212
Large (Bell 222 & BK117)	290	185	310	195	360	213
Subtotal	*1,472*	*370*	*1,565*	*390*	*1,810*	*425*
Total Itinerant	***147,002***	***9,530***	***157,300***	***10,060***	***181,100***	***10,980***
LOCAL OPERATIONS						
Type	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
Light – Fixed	5,557	0	3,560	0	4,000	0
Light – Variable	5,557	0	3,560	0	4,000	0
Beech Baron	1,390	0	890	0	1,000	0
Small (R-22 & H500)	1,389	0	890	0	1,000	0
Total Local	***13,893***	***0***	***8,900***	***0***	***10,000***	***0***
Total Annual	**160,895**	**9,530**	**166,200**	**10,060**	**191,100**	**10,980**

01SP07-2D-8/19/02

FORECAST SUMMARY

	HISTORICAL	FORECASTS	
CATEGORY	**2002**	**2007**	**2022**
Operations			
Itinerant			
Air Carrier/Air Taxi	11,005	13,000	18,800
General Aviation	135,780	144,000	162,000
Military	217	300	300
Total Itinerant	***147,002***	***157,300***	***181,100***
Local			
General Aviation	13,863	8,800	9,900
Military	30	100	100
Total Local	***13,893***	***8,900***	***10,000***
Night Time Operations	9,530	10,060	10,980
Total Operations	***170,425***	***176,260***	***202,080***
Based Aircraft			
Single Engine	379	396	445
Multi-Engine	126	128	131
Turboprop	55	60	81
Jet	186	192	216
Helicopter	22	24	27
Total Based Aircraft	***768***	***800***	***900***

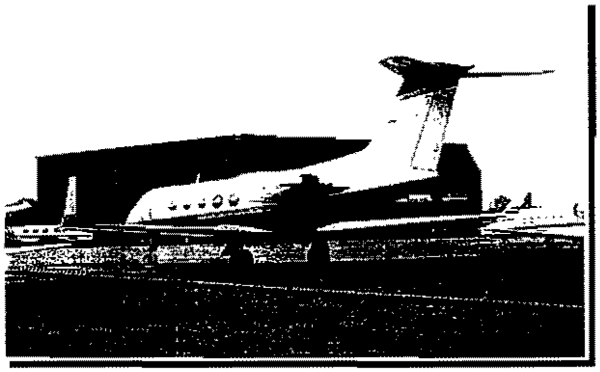
*Note: Operations based on calendar year2001;
Night time operations are estimated

Addison! Airport

Exhibit 2E
FORECAST SUMMARY

Chapter Three
AVIATION NOISE

Aviation Noise



This chapter describes the noise exposure maps (NEM) for Addison Airport (ADS). Noise contour maps are presented for three study years: 2002, 2007, and 2022. The 2002 noise contour map shows the current noise levels based on operations for the latest twelve months of activity. The 2007 map is based on levels from the operation forecast outlined in Chapter Two. The 2002 and 2007 maps are the basis for the official "Noise Exposure Maps" required under Federal Aviation Regulation (F.A.R.) Part 150.

The 2022 noise contour map was developed to present a long term view of potential future noise exposure at Addison Airport. Based on forecasts developed in Chapter Two for the year 2022, these maps can be helpful in providing guidance for long term land use planning which is discussed at a later point in the Part 150 Study process.

These noise contour maps are considered baseline analyses. They assume operations based on the existing procedures at Addison Airport. No additional noise abatement procedures have been assumed in these analyses. The noise contour maps will serve as baselines against which potential noise abatement procedures will be compared at a later point in the study.

The noise analysis presented in this chapter relies on complex analytical methods and uses numerous technical terms. A **Technical Information Paper (T.I.P.)** included in the last section of this document, **The Measurement and Analysis of Sound**, presents helpful background

information on noise measurement and analysis.

AIRCRAFT NOISE MEASUREMENT PROGRAM

Noise monitoring may be utilized by for data acquisition and data refinement, but is not required under F.A.R. Part 150, for the development of noise exposure maps or noise compatibility programs. The field measurement program, conducted over a five-day period from January 20, 2002 through January 24, 2002, for Addison Airport was undertaken to provide real data for comparison with the computer-predicted values. These comparisons provide insight into the actual noise conditions around the airport and can used to validate the assumptions developed for computer modeling.

It must be recognized that field measurements made over a 24-hour period are applicable only to that period of time and may not -- in fact, in many cases, do not -- reflect the average conditions present at the site over a much longer period of time. The relationship between field measurements and computer-generated noise exposure forecasts is analogous to the relationship between weather and climate. While an area may be characterized as having a cool climate, many individual days of high temperatures may occur. In other words, the modeling process derives overall average annual conditions (climate), while field measurements reflect daily fluctuations (weather).

Information collected during the noise monitoring program included 24-hour measurements for comparison with computer-generated DNL values. DNL -- day-night sound level -- is a measure of cumulative sound energy during a 24-hour period. All noise occurring from 10:00 p.m. to 7:00 a.m. is assigned a 10 decibel (dB) penalty because of the greater annoyance typically caused by nighttime noise. Use of the DNL noise metric in airport noise compatibility studies is required by F.A.R. Part 150. Additional information collected on single event measurements is used as an indicator of typical dB and Sound Exposure Levels (SEL) within the study area as well as comparative ambient noise measurements in areas affected by aircraft noise. All procedures and equipment involved in the aircraft noise measurement program were performed to pursuant guidelines set forth by F.A.R. Part 150, Section A150.3.

ACOUSTICAL MEASUREMENTS

This section provides a technical description of the acoustical measurements which were performed for the Addison Airport F.A.R. Part 150 Noise Compatibility Study. Described here are the instrumentation, calibration procedures, general measurement set ups, and related data collection items.

Instrumentation

Four sets of acoustical instrumentation, the components of which are listed in **Table 3A**, were used to measure noise.

Each set consisted of a high quality microphone connected to a 24-hour environmental noise monitor unit. Each unit was calibrated to assure consistency between measurements at different locations. A calibrator, with an accuracy of 0.5 decibels, was used for all measurements. At the completion of each field measurement, the calibration was rechecked, the accumulated output data was downloaded to a portable computer, and the data memories were cleared before the unit was placed at a new site. The equipment listed in the table was supplemented by accessory cabling, windscreens, tripods, security devices, etc., as appropriate to each measurement site.

TABLE 3A
Acoustical Measurement Instrumentation

4	Larson Davis 820 Portable Noise Monitors and Preamplifiers
4	Larson Davis Model 2559 - 2" Microphones
1	Model CA250 Sound Level Calibrator
1	Portable Computer

Measurement Procedures

Two methods were used to attempt to minimize the potential for non-aircraft noise sources to unduly influence the results of the measurements. First, for single-event analysis, minimum noise thresholds of 5 to 10 decibels (dB) greater than ambient levels were programmed into the monitor. This procedure resulted in the requirement that a single noise event exceed a threshold of 60 dB at each site. Second, a minimum event duration, longer than the time associated with ambient single events above the threshold (for example, road traffic), was set (generally at five seconds). The combination of these two factors limited the single events analyzed in detail to those which exceeded the preset threshold for longer than the preset duration. In spite of these efforts, contamination of single event data is always possible.

Although only selected single events were specially retained and analyzed, the monitors do, however, cumulatively consider all noise present at the site, regardless of its level, and provide hourly summations of Equivalent Noise Levels (Leq). Additionally, the equipment optionally provides information on the hourly maximum decibel level, SEL values for each event which exceeds the preset threshold and duration, and distributions of decibel levels throughout the measurement period.

Weather Information

The noise measurements taken during this study were obtained during a period of above-average, warm winter weather for the Addison area. On most days, weather conditions were generally considered to be adequate for aircraft using visual flight rules (VFR) which call for cloud ceilings greater than 3,000 feet above ground level (AGL) and visibility greater than five miles. Occasionally, weather conditions deteriorated to a point where flight under VFR was not allowed and only specifically-equipped aircraft with properly trained pilots could fly. Winds were generally from the south-southeast at about 10 knots with occasional gusts up to 20 knots. Daily temperatures ranged from highs in the upper 60s to lows in the upper 30s.

Aircraft Noise Measurement Sites

Noise measurement sites are shown on **Exhibit 3A**. They were selected on the basis of background information, local observations during the field effort, and suggestions from airport management based on noise complaint history. Specific selection criteria include the following.

- Emphasis on areas of marginal or greater than marginal aircraft noise exposure according to earlier evaluations.
- Screening of each site for local noise sources or unusual terrain characteristics which could affect measurements.
- Location in or near areas from which a substantial number of complaints about aircraft noise were received, or where there are concentrations of people exposed to significant aircraft overflights.

While there is no end to the number of locations available for monitoring, the selected sites fulfill the above criteria and provide a representative sampling of the varying noise conditions in the airport vicinity. Two sites were measured for 120 hours (Sites 1 and 2) and four sites (Sites 3, 4, 5, and 6) for 48-hour periods.

Site 1 is located on airport property approximately 1,200 feet south-southeast of the Runway 15 pavement edge. The location is situated slightly east of the extended centerline of Runway 15-33 and was selected due to the likelihood that this area would receive regular arrival and departure traffic.

The monitor was placed in a large undeveloped area along a drainage ditch inside the airport outer access road. This location created a distance buffer between Lindbergh Road and the monitor. During the equipment set-up, while no aircraft overflights were observed, a Cessna Caravan and Cessna Citation Jet were performing runup operations on Taxiway C.

The 24-hour Leq for the first day at Site 1 was 72.8, 69.4 for the second day, 70.1 for the third day, and 71.8 for the fourth day. The DNL level for this site was computed to be 73.1 for the first day, 70.3 for the second day, 75.7 for the third day, and 73.7 for the fourth day.

Site 2 is located at the north end of the airport property approximately 2,300 feet from the displaced threshold of Runway 15. The location is approximately 250 feet from Midway Road and areas of commercial and light industrial located both north and west of the airport property. The site is in an area that would likely receive regular arrival and departure overflight noise from the airport.

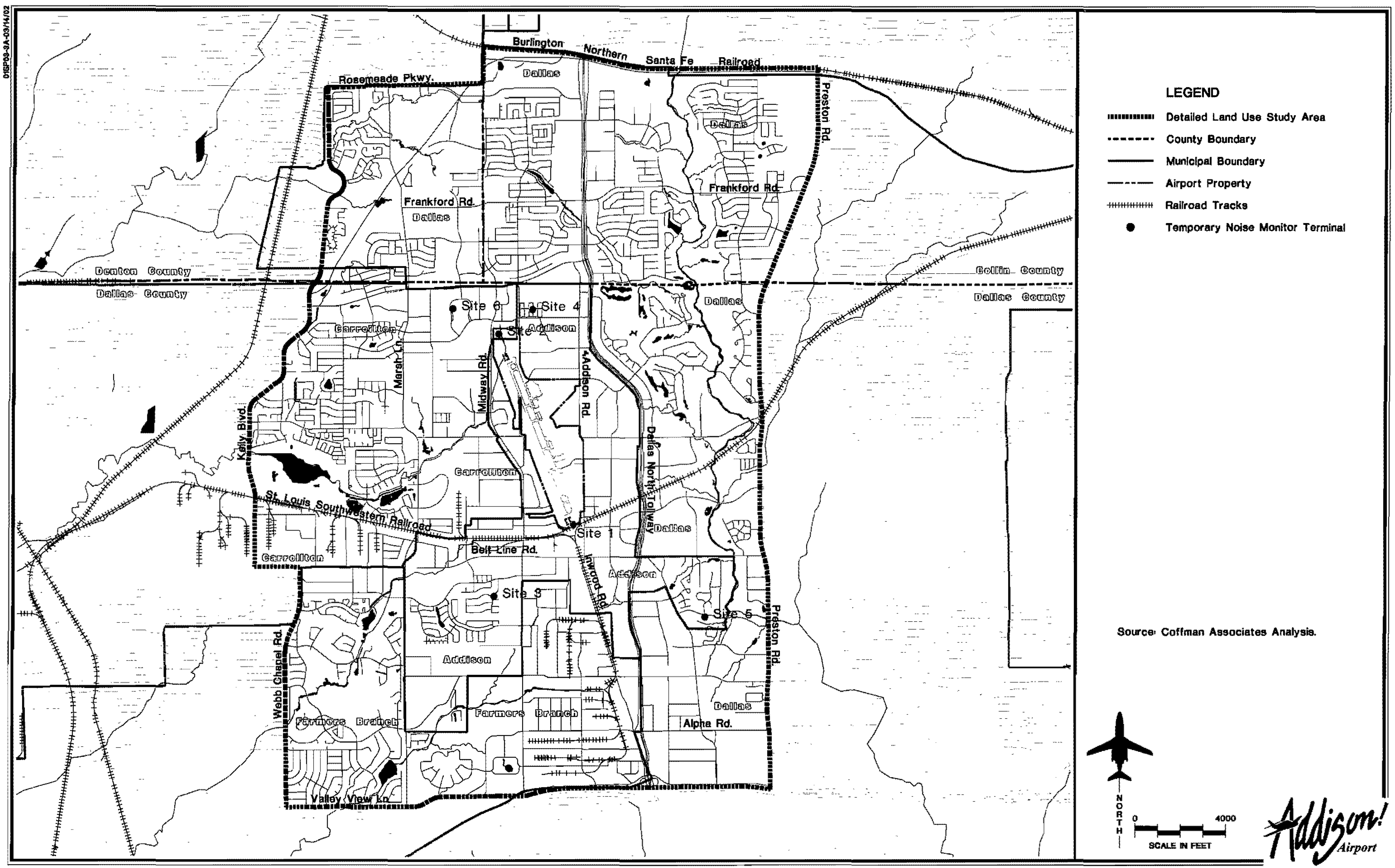


Exhibit 3A
NOISE MONITORING LOCATIONS

The equipment was set up in a large open area next to a pole elevating a portion of the airport's MALSR (medium intensity approach lighting system with runway alignment indicator lights). The 24-hour Leq for the first day at Site 2 was 63.6, 65.9 for the second day, 67.9 for the third day, and 69.9 for the fourth day. The DNL level for this site was computed for the first day at 65.2, 67.9 for the second day, 73.3 for the third day, and 71.8 for the fourth day.

Site 3 is located between 14802 and 14800 Le Grande Drive. This location is approximately 4,500 feet southwest of the airport. The area is an established single-family residential subdivision of homes on medium-sized lots.

The equipment was set up in the side yard between the two houses approximately 75 feet from a paved road. Several automobiles passed by during the monitor set-up. In addition, several commercial turbo-prop and jet aircraft overflights were observed entering a final approach to Dallas Love Field during both monitor set-up and removal.

The 24-hour Leq for the first day at Site 3 was 48.9 and 47.1 for the second day. The DNL level for this site was computed for the first day at 53.3 and 50.1 for the second day.

Site 4 is located at Addison Place Condominium Pool and Clubhouse. This complex is approximately 2,200 feet northeast of the airport. The area is a densely compacted complex of adjoining condominium units. The pool area is located near the center of the complex and is adjacent to parking facilities.

The equipment was set up inside the gated pool area approximately 25 feet from a paved driveway and parking lot. There were several automobile operations during both monitor set-up and removal. No aircraft overflights were observed.

The 24-hour Leq for the first day at Site 4 was 56.4 and 58.7 for the second day. The DNL level for this site was computed for the first day at 55.0 and 63.4 for the second day.

Site 5 is located at the City of Addison Water Pumping Station situated along Celestial Road, approximately 8,000 feet southeast of the airport. The site is a single-family residential area of large homes. A portion of the pumping station is adjacent to an area of green-space. The site is in an area that would likely receive regular departure overflight noise from the airport.

The equipment was set up in a grassy open area approximately 200 feet from a paved road and entry drive. Several business jet overflights were observed during monitor set-up. The pumping facility operations produced no detectable noise.

The 24-hour Leq for the first day at Site 5 was 55.0 and 50.9 for the second day. The DNL level for this site was computed for the first day at 57.2 and 52.4 for the second day.

Site 6 is located at the Golden Bear Golf Course approximately 2,100 feet north-northwest of the airport. The area is a conglomerate of light industrial, commercial, a golf course, and vacant lots.

The equipment was set up along the side of the golf course near the driving range, approximately 40 feet from a paved road. Several passing automobiles and a leaf blower were being operated during the equipment set-up. No aircraft overflights were observed during the monitor set-up.

The 24-hour Leq for the first day at Site 6 was 55.8 and 64.5 for the second day. The DNL level for this site was computed for the first day at 61.9 and 65.2 for the second day.

MEASUREMENT RESULTS SUMMARY

The noise data collected during the measurement period is presented in **Table 3B.** The information includes the average 24-hour Leq for each site. The Leq metric is derived by accumulating all noise during a given period and logarithmically averaging it. It is similar to the DNL metric except that no extra weight is attached to nighttime noise. The DNL (24) value represents the DNL from all noise sources.

TABLE 3B
Measurement Results Summary
Addison Airport

	Site 1				Site 2				Site3		Site 4		Site 5		Site 6	
	Day 1	Day 2	Day 3	Day 4	Day 1	Day 2	Day 3	Day 4	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
Measurement Dates	1/20 to 1/21	1/21 to 1/22	1/22 to 1/23	1/23 to 1/24	1/20 to 1/21	1/21 to 1/22	1/22 to 1/23	1/23 to 1/24	1/20 to 1/21	1/21 to 1/22	1/20 to 1/21	1/21 to 1/22	1/22 to 1/23	1/23 to 1/24	1/22 to 1/23	1/23 to 1/24
Cumulative Data																
LEQ(24)	72.8	69.4	70.1	71.8	63.6	65.9	67.9	69.9	48.9	47.1	56.4	58.7	55.0	50.9	55.8	64.5
DNL(24)	73.1	70.3	75.7	73.7	65.2	67.9	73.3	71.8	53.3	50.1	55.0	63.4	57.2	52.4	61.9	65.2
L(50)	52.6	55.2	55.2	55.2	55.6	55.6	55.6	55.6	46.3	46.3	49.1	49.1	50.8	50.8	52.3	52.3
Single Event Data																
L(max)	114.1	108.3	104.9	107.1	101.1	101.6	105.5	112.8	83.2	80.7	89.8	89.1	92.1	79.0	95.2	101.6
SEL(max)	120.1	112.5	111.4	115.7	102.4	104.8	102.7	116.9	88.8	85.2	98.0	100.5	103.0	88.0	98.0	105.2
Max Duration (sec)	385	765	641	2,719	2,527	300	662	1,473	55	54	63	197	115	58	55	59
Number of Single Events above 60 dB (Lmax)	1,528	712	756	538	692	646	738	981	133	99	152	306	137	159	387	437
Number of Single Events Above																
SEL 70 dB	959	378	419	278	325	314	357	441	80	68	87	168	82	102	225	245
SEL 80 dB	467	119	115	135	107	155	158	353	20	35	32	49	21	26	83	66
SEL 90 dB	62	40	40	45	38	70	77	79	14	1	5	11	4	3	6	11
SEL100 dB	13	13	13	26	8	12	23	14	0	0	0	2	1	0	2	1

Source: Coffman Associates Analysis

In addition, L(50) values for each site are presented. These values represent sound levels above which 50 percent of the samples were recorded.

The table also presents data on other measures of noise that may be useful for comparisons. These include:

- Maximum recorded noise level in dB (Lmax);
- Maximum recorded sound exposure level (SELmax);
- Longest single-event duration in seconds (Max Duration); and
- Number of single events above SEL 60, 70, 80, 90, and 100.

For comparative purposes, normal conversation is generally at a sound level of 60 decibels while a busy street is approximately 70 decibels along the adjacent sidewalk.

The program resulted in a total of two 120-hour periods and four 48-hour periods from six sites around the airport. A total of 8,230 single events were recorded during the program and 384 average hourly sound levels were calculated and recorded.

AIRCRAFT NOISE ANALYSIS METHODOLOGY

The standard methodology for analyzing the prevailing noise conditions at airports involves the use of a computer simulation model. The Federal Aviation Administration (FAA) has approved the Integrated Noise Model (INM) for use in F.A.R. Part 150 Noise Compatibility Studies. The latest versions of the INM are quite sophisticated in predicting noise levels at a given location, accounting for such variables as airfield elevation, temperature, headwinds, and local topography. INM Version 6.0c was used to prepare noise exposure maps for the Addison noise analyses.

Inputs to the INM include runway configuration, flight track locations, aircraft fleet mix, stage length (trip length) for departures, and numbers of daytime and nighttime operations by aircraft type. The INM provides a database for general aviation aircraft which commonly operate at Addison Airport. **Exhibit 3B** depicts the INM input assumptions.

The INM computes typical flight profiles for aircraft operating at the assumed airport location, based upon the field elevation, temperature, and flight procedure data provided by aircraft manufacturers. The INM will also accept user-provided input, although the FAA reserves the right to accept or deny the use of such data depending upon its statistical validity.

The INM predicts noise levels at a set of grid points surrounding an airport. The numbers and locations of grid points are established during the INM run to determine noise levels in the areas where operations are concentrated, depending upon the tolerance and level of refinement specified by the user. The noise level values at the grid points are used to prepare noise contours, which connect points of equal noise exposure. INM will also calculate the noise levels at a user-specified location, such as noise monitoring sites.

INM INPUT

AIRPORT AND STUDY AREA DESCRIPTION

The runways were input into the INM in terms of latitude and longitude, as well as elevation. As previously mentioned, the INM computes typical flight profiles for aircraft operating at the airport location, based upon the field elevation, temperature, and flight procedure data provided by aircraft manufacturers. The Addison Airport's field elevation is 644 feet above mean sea level (MSL) and its average annual temperature is 65.4 degrees.

It is also possible to incorporate a topographic database into the INM, which allows the INM to account for the changes in distances from aircraft in flight to elevated receiver locations. Topographic data from the U.S. Geographical Survey was used in the development of the noise exposure contours for Addison Airport.

ACTIVITY DATA

Noise evaluations made for the current year (2002) are based on operational counts during 2001 from the Addison ATCT and supplemental data acquired during times when the tower is closed. Short-term (2007) and long-term (2022) contour sets were prepared based upon forecasts presented in Chapter Two, Aviation Demand Forecasts. Existing and forecasted annual operations are summarized in **Table 3C**.

TABLE 3C
Operations Summary
Addison Airport

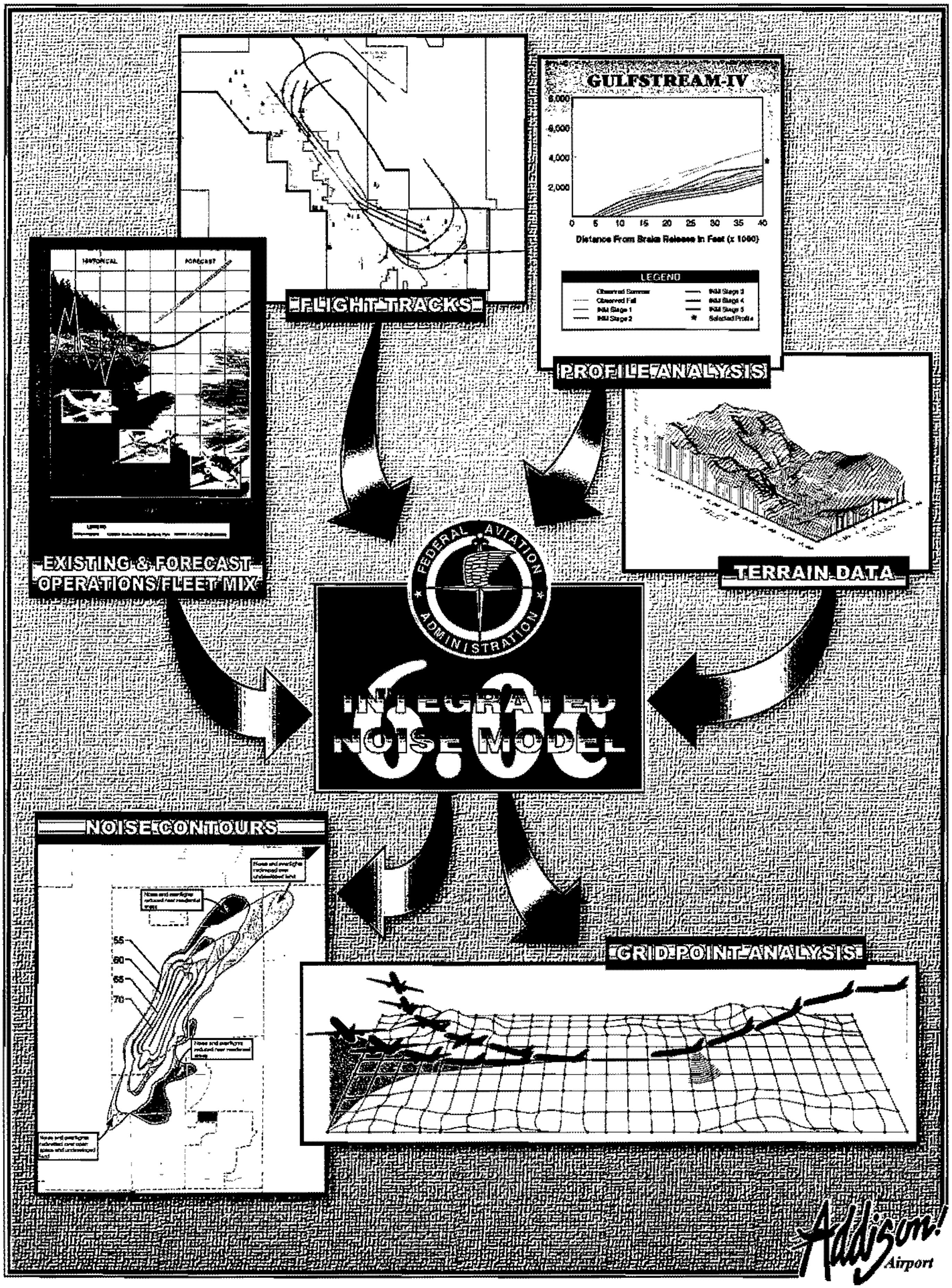
		FORECASTS	
Operations	**Existing 2002[1]**	**2007[2]**	**2022[2]**
Itinerant[3]	156,532	167,360	192,080
Local	13,893	8,900	10,000
Total	170,425	176,260	202,080

1 Year 2002 operations are based on calendar year 2001.
2 Chapter Two, Table 2U, p. 2-34
3 Includes nighttime operations.

DAILY OPERATIONS AND FLEET MIX

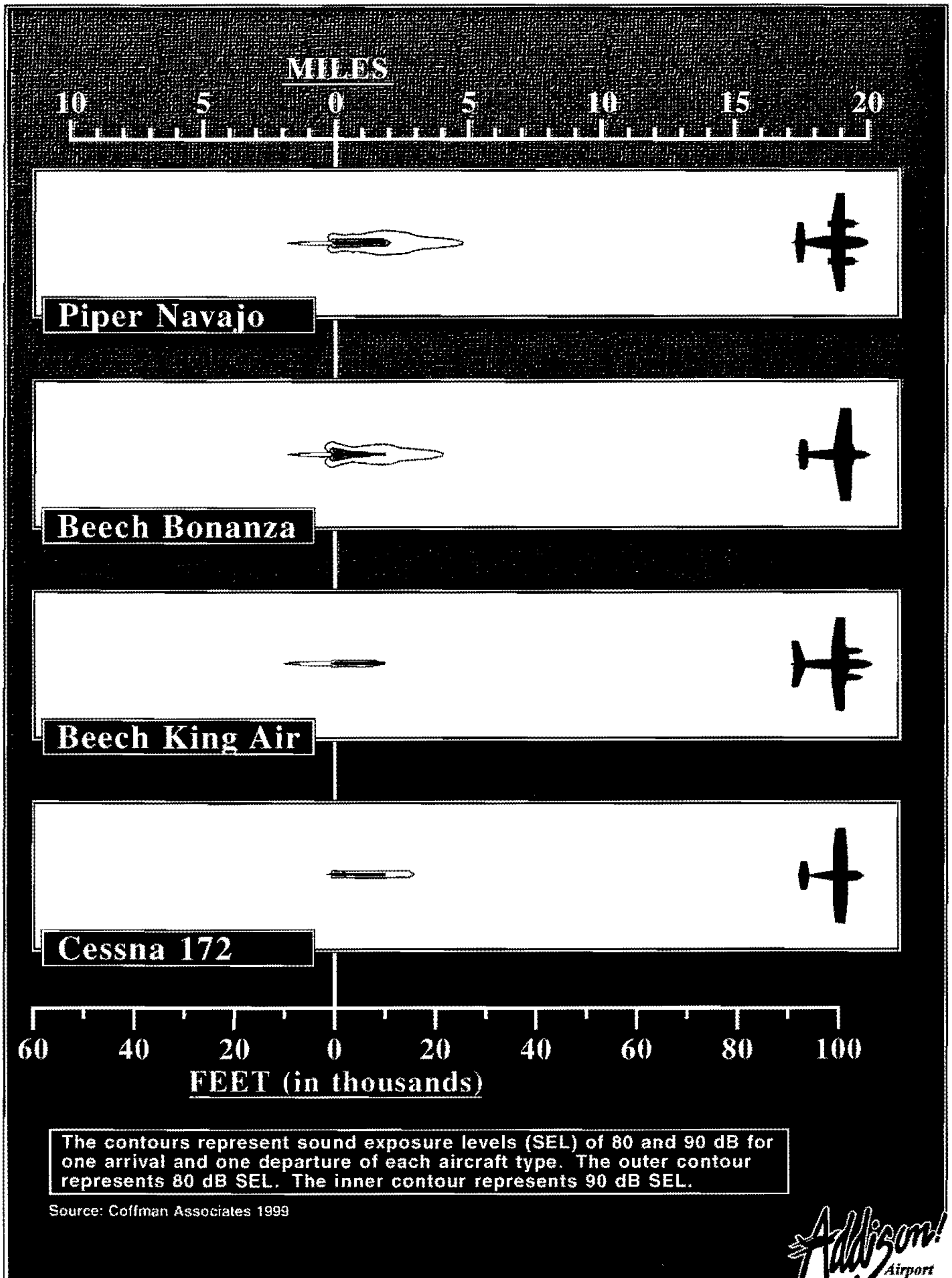
For this analysis, current aircraft operations data (takeoffs and landings) and forecasts of future activity (2007 and 2022), prepared as part of an operations forecast update presented previously in Chapter Two, Aviation Activity Forecasts, were used for noise modeling. Average daily aircraft operations were calculated by dividing total annual operations by 365 days.

The selection of individual aircraft types is important to the modeling process because different aircraft types generate different noise levels. The noise footprints presented in **Exhibit 3C**, **Exhibit 3D,** and **Exhibit 3E** illustrate this concept graphically. The footprints represent the noise pattern generated by one departure and one arrival of the given aircraft type. The aircraft illustrated are some of those commonly found at Addison Airport.



Addison! Airport

Exhibit 3B
INM PROCESS



01SP07-3C-4/23/02

Exhibit 3C
PROPELLER AIRCRAFT NOISE
FOOTPRINT COMPARISON

01SP07-3D-4/23/02

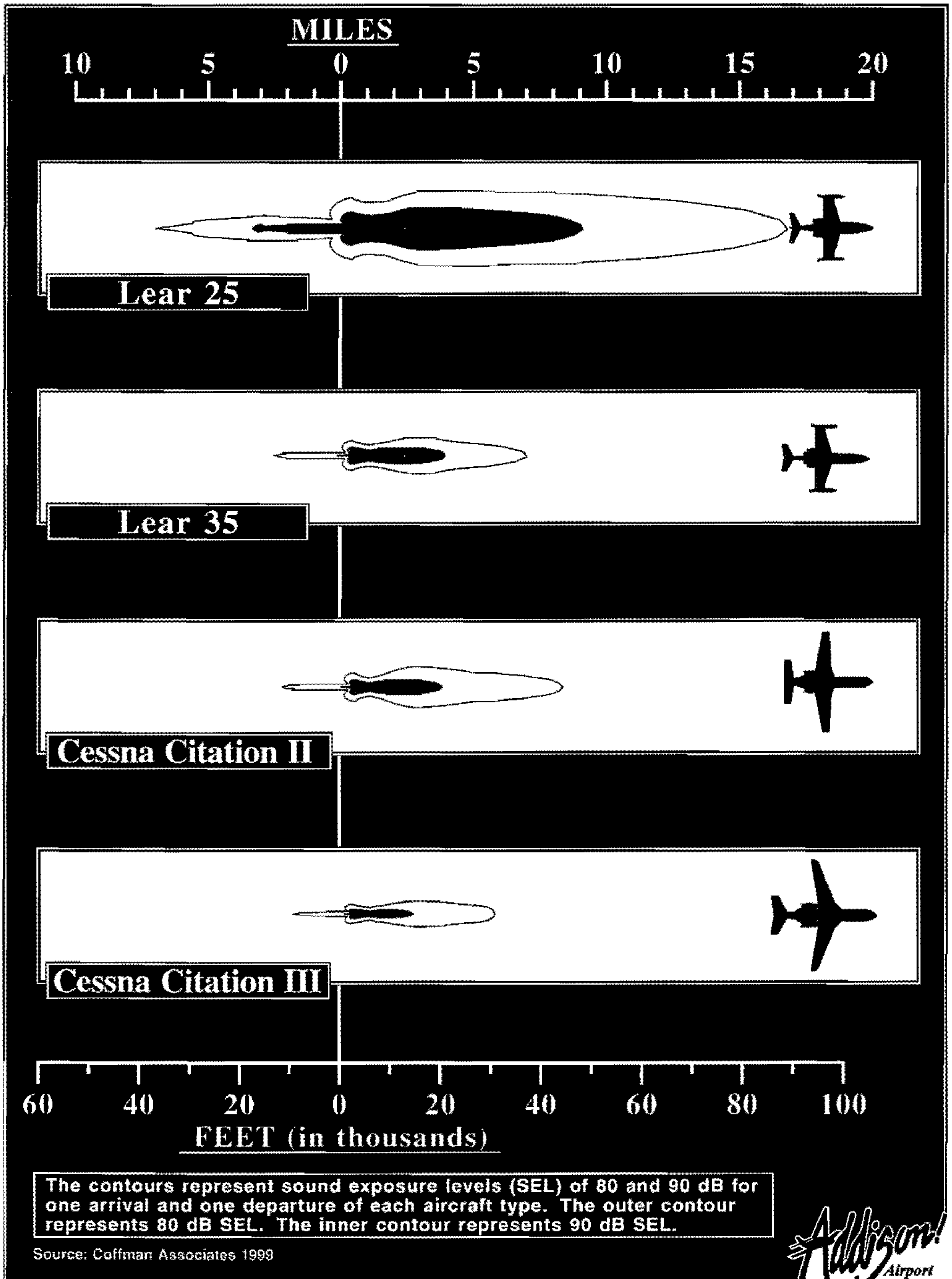
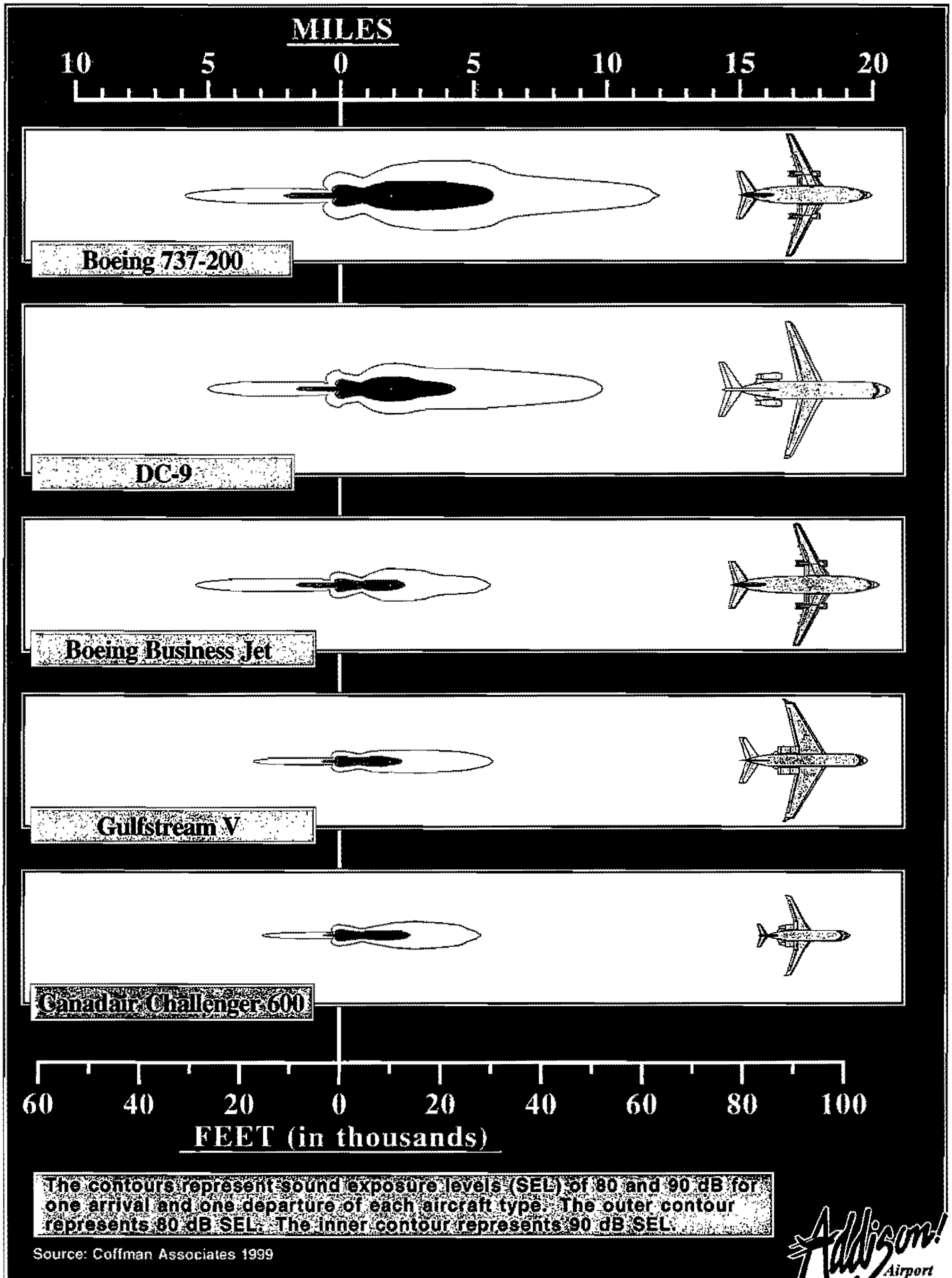


Exhibit 3D
TURBOJET AIRCRAFT NOISE
FOOTPRINT COMPARISON



01SP07-3E-4/23/02

Addison! Airport

Exhibit 3E
TURBOJET AIRCRAFT NOISE
FOOTPRINT COMPARISON

The distribution of these operations among various categories, users, and types of aircraft is critical to the development of the input model data. **Table 3D** lists the daily operations by aircraft type.

DATABASE SELECTION

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

The FAA's substitution list recommends the BEC58P, the Beech Baron, to represent the light twin-engine aircraft such as the Piper Navajo, Beech Duke, Cessna 310, and others. The CNA441 effectively represents light turbo-prop and twin-engine piston aircraft such as the King Air, Cessna 402, Gulfstream Commander, and others. In addition, the DCH6 is recommended for use in modeling the Merlin Metroliner turboprop aircraft.

The INM provides data for most of the business turbojet aircraft in the national fleet. The CNA500 effectively represents the Cessna Citation I, II, and V series aircraft. The CIT3 represents the Cessna Citation III, IV, and VII series aircraft. The FAL20 effectively represents the Falcon 20 while the LEAR25 is used to represent the Lear Jet 25. Aircraft such as the Lear 30, 40, 50, and 60 series in addition to the Hawker 800 and 1000 are effectively represented by the LEAR35 designator. Both the Canadair Challenger 600 and Falcon 2000 are modeled using the CL600. The GIIB designator represents the Gulfstream III series while the GIV represents the Gulfstream IV series of aircraft. The FAL50 designator is used for the Falcon 50. The Boeing 737-200C is effectively modeled using the 737N17 designator and the DC-9 hush-kitted aircraft is modeled using the DC930LW designator. The Gulfstream V utilizes the GV designator and the Boeing Business Jet effectively uses the 737-700 INM designator.

Six types of helicopters commonly operating at Addison Airport are also modeled. The Robinson-22 and Hughes-500 are modeled using the H500 designator. The Bell 206 and the MBB BO-105 are effectively modeled using the B206L designator. The Bell 222 and the MBB-Kawasaki BK-117 are modeled using the B222 designator in the INM.

All substitutions are commensurate with published FAA guidelines.

Single Event Analysis

Measured single event noise levels for individual aircraft, taken during the noise monitoring program, are helpful in validating the noise modeling assumptions for existing and future conditions at Addison Airport (Measured single event noise information is for comparative purposes only and can not be used as input into the INM).

TABLE 3D Operational Fleet Mix Projections				
Aircraft Type	**INM Designator**	**2002**[1]	**2007**[2]	**2022**[2]
ITINERANT OPERATIONS				
Single Engine				
Light – Fixed	GASEPF	105.93	111.15	127.76
Light – Variable	GASEPV	105.93	111.15	127.76
Subtotal		211.86	222.30	225.53
Twin Engine				
Beech Baron/Piper 31	BEC58P	61.18	61.15	62.92
King Air	CNA441	50.40	58.21	71.84
Merlin Metroliner	DCH6	11.94	12.73	9.44
Subtotal		123.52	132.09	144.20
Turbo-Jet				
Citation I, II, V	CNA500	12.21	13.06	15.03
Citation III, VI, VII	CIT3	12.21	13.06	15.03
Falcon 20	FAL20	5.32	5.69	3.96
Lear 25	LEAR25	11.93	12.70	9.42
Lear 35/45/55/60, Hawker 800/1000	LEAR35	25.25	26.97	39.14
Challenger 600, Falcon 2000	CL600	10.03	12.88	18.26
Gulfstream III	GIIB	2.27	2.42	2.77
Gulfstream IV	GIV	2.53	2.69	5.55
Falcon 50	FAL50	1.32	1.40	1.58
Boeing 737-200C	737N17	1.78	1.90	1.16
DC-9	DC930LW	2.19	2.33	1.65
Gulfstream V	GV	1.33	3.16	5.10
Boeing Business Jet	737700	1.78	1.90	1.16
Subtotal		90.20	100.43	119.81
Helicopter				
Robinson 22 & H500	H-500D	2.44	2.58	2.98
Bell 206 & BO 105	B206L	1.30	1.38	1.56
Bell 222 & BK117	B222	1.30	1.38	1.56
Subtotal		5.04	5.34	6.1
Total Itinerant		***430.62***	***460.16***	***495.64***
LOCAL OPERATIONS				
Light – Fixed	GASEPF	15.22	9.75	10.95
Light – Variable	GASEPV	15.22	9.75	10.95
Beech Baron	BEC58P	3.80	2.43	2.73
R-22 and H500 (Helicopter)	H500D	3.80	2.43	2.73
Total Local		***38.04***	***24.36***	***27.36***
Total Daily Operations		***468.66***	***484.52***	***523.00***

[1] Year 2002 operations are based on operational counts during 2001 from the Addison ATCT. Aircraft fleet mix developed from airport based aircraft lists and interviews with fixed base operators.
[2] Chapter Two, Table 2H, p. 2-20

Both the loudest sound levels (Lmax) and the Sound Exposure Levels (SEL) for various aircraft types were recorded during the noise measurement program at each noise monitoring site. A detailed INM grid point analysis can then be prepared that generates Lmax and SEL values for the corresponding aircraft types at each noise monitoring site for comparison. The resulting measured and predicted Lmax and SEL values can then be compared.

Table 3E depicts the range of measured Lmax and SEL values from monitor sites 1 and 2 and the predicted Lmax and SEL values from the INM for these sites. (Monitor sites 1 and 2 were used because they received the vast majority of aircraft overflights due to their proximity to the runway arrival and departure paths). As previously discussed, Lmax is the peak noise level of the aircraft overflight. SEL is the total noise energy (taking into account the peak and duration) of the aircraft overflight.

In most cases, the INM is very close, and in many cases, over-predicts the noise of individual aircraft types in the vicinity of the airport. In fact, the INM over-predicted the noise levels for departing aircraft captured on monitor 1. For arriving aircraft, nearly all measured noise levels were recorded at or below predicted values. The Lear 35 and Cessna Citation III, however, showed measured values that exceeded the predicted values by between 1 and 2 dBA. It should be noted, however, that there may be sizable differences between measured and predicted Lmax and SEL levels in some cases. There are several potential reasons for these differences:

- Small noise measurement sample size;
- Differences in distances from the aircraft to the monitor;
- Differences in specific aircraft configurations within the general aircraft type;
- Differences in aircraft operating procedures and pilot techniques; and
- The effect of weather conditions (temperature, wind direction, and wind velocity) on aircraft performance.

TIME-OF-DAY

The time-of-day at which operations occur is important as input to the INM due to the 10 decibel weighting of nighttime (10:00 p.m. to 7:00 a.m.) flights. In calculating airport noise exposure, one operation at night has the same noise emission value as 10 operations during the day by the same aircraft. While Addison Airport does have an Airport Traffic Control Tower (ATCT), it is closed between 10 p.m. and 6 a.m. Specific counts for nighttime activity were acquired by an individual posted at the airport during the hours in which the tower was closed. These counts recorded the time of aircraft operations in addition to aircraft type, operation type, and runway use. Data obtained from this count was used to

TABLE 3E
Summary of Measured and Predicted Single Event Noise Levels
Addison Airport

Aircraft Type	Measured Lmax, dBA[1] (Monitor Site 1)	Predicted Lmax, dBA[2]	Measured SEL, dBA[1] (Monitor Site 1)	Predicted SEL, dBA[2]
Departures				
Single GA Prop				
Fixed Pitch Propeller				
Cessna 172	62.4 - 70.7	62.2 - 75.0	74.3 - 78.3	63.1 - 83.9
Variable Pitch Propeller				
Bellanca Viking	64.6 - 78.9	63.3 - 79.6	77.7 - 87.4	72.3 - 89.0
Twin GA Prop				
Cessna 310	77.4 - 80.8	74.3 - 83.8	80.0 - 87.9	81.2 - 91.7
Twin GA Turboprop				
Beech King Air	69.3 - 78.1	70.5 - 78.6	75.0 - 85.2	76.3 - 86.4
Business Jet				
Lear 25	79.5 - 97.8	97.1 - 111.3	86.4 - 103.3	105.3 - 116.4
Lear 35	70.6 - 88.3	87.4 - 93.8	81.6 - 93.8	95.1 - 100.9
Cessna Citation III	83.6 - 90.1	78.4 - 90.1	89.4 - 96.4	86.9 - 95.8
Gulfstream IV	73.9	81.7 - 83.0	87.6	88.2 - 89.2
Canadair Challenger	72.6 - 77.5	76.4 - 88.7	84.8 - 85.1	85.2 - 95.0
Arrivals				
Aircraft Type	**Measured Lmax, dBA (Monitor Site 2)**	**Predicted Lmax, dBA**	**Measured SEL, dBA (Monitor Site 2)**	**Predicted SEL, dBA**
Single GA Prop				
Fixed Pitch Propeller				
Cessna 172	61.6 - 69.1	75.2 - 75.8	71.9 - 74.7	81.0 - 81.4
Variable Pitch Propeller				
Bellanca Viking	72.1 - 83.6	85.8 - 86.4	76.1 - 87.5	88.8 - 89.1
Twin GA Prop				
Cessna310	85.7	85.6 - 86.1	88.9	88.7 - 89.1
Twin GA Turboprop				
Beech King Air	70.3 - 86.2	92.1 - 92.6	76.7 - 90.7	96.1 - 96.5
Business Jet				
Lear 25	89.8 - 98.0	100.8 - 101.4	92.8 - 101.4	103.1 - 103.4
Lear 35	83.5 - 89.9	89.0 - 89.5	87.3 - 93.1	91.6 - 92.0
Cessna Citation III	83.5 - 86.5	85.8 - 86.3	87.2 - 91.0	87.8 - 88.2

[1] Measurements were taken April 20 thru January24, 2002. This information is for comparative purposes only and not for input into the Integrated Noise Model.
[2] Data from detailed grid analysis for 2002 base conditions.
Source: Coffman Associates Analysis

account for nighttime aircraft operations (between 10:00 p.m. and 7:00 a.m.) for modeling the 2002 noise exposure contours. This percentage of operations was applied to both future forecast scenarios.

RUNWAY USE

Runway usage data is another essential input to the INM. For modeling purposes, wind data analysis usually determines runway use percentages. Aircraft will normally land and takeoff into the wind. However, wind analysis provides only the directional availability of a runway and does not consider pilot selection, primary runway operations, or local operating conventions. At Addison Airport, the single runway configuration offers only two directions of choice.

The runway usage at Addison Airport was established through discussions with the ATCT manager. In addition, a supplemental wind analysis was conducted which supported that wind conditions are consistent for runway use as stated by ATCT. **Table 3F** summarizes the runway use percentages for the existing and future conditions.

TABLE 3F
Existing Runway Use

Runway	Business Jet	Turboprop/ Multi-Engine	Single Engine Piston
Arrivals and Departures			
15	70.0%	70.0%	70.0%
33	30.0%	30.0%	30.0%
Touch-And-Go's			
15	NA	NA	70.0%
33	NA	NA	30.0%

FLIGHT TRACKS

A review of local and regional air traffic control procedures, as well as an assessment of actual radar flight tracks, were used to develop consolidated flight tracks. The resulting analysis is a series of consolidated flight tracks describing the average corridors that lead to and from Addison Airport. For developing the flight tracks for input into the INM, radar data from February 24 and 25 and, March 1, 2, and 3, 2002 were used. **Exhibit 3F** depicts the radar flight track data provided by the Dallas/Fort Worth International Airport TRACON for the Addison area. As seen on **Exhibit 3F**, there are two corridors where the radar flight track data are heavily concentrated: straight north-northwest of the airport and straight south-southeast of the airport. More dispersed flight tracks are depicted east and southeast of the airport. A number of commercial aircraft overflights can also be seen, particularly south and southeast of the airport. These flight tracks depict aircraft arriving and departing Dallas Love Field and Dallas/Fort Worth International Airport. Since the radar flight track data acquired depicts only aircraft at or below 4,000 feet MSL, a large number of additional aircraft overflights can be expected to occur above this altitude.

Exhibit 3G depicts the consolidated departure flight tracks developed for input into the INM. INM consolidated flight tracks are developed by plotting the centerline of a concentrated group of tracks and then dispersing the consolidated track into multiple sub-tracks that conform to the radar flight track data. The dark blue colored lines on **Exhibit 3G** are the radar track data. The wider dark blue lines represent the centerline or spine of each group of radar track data.

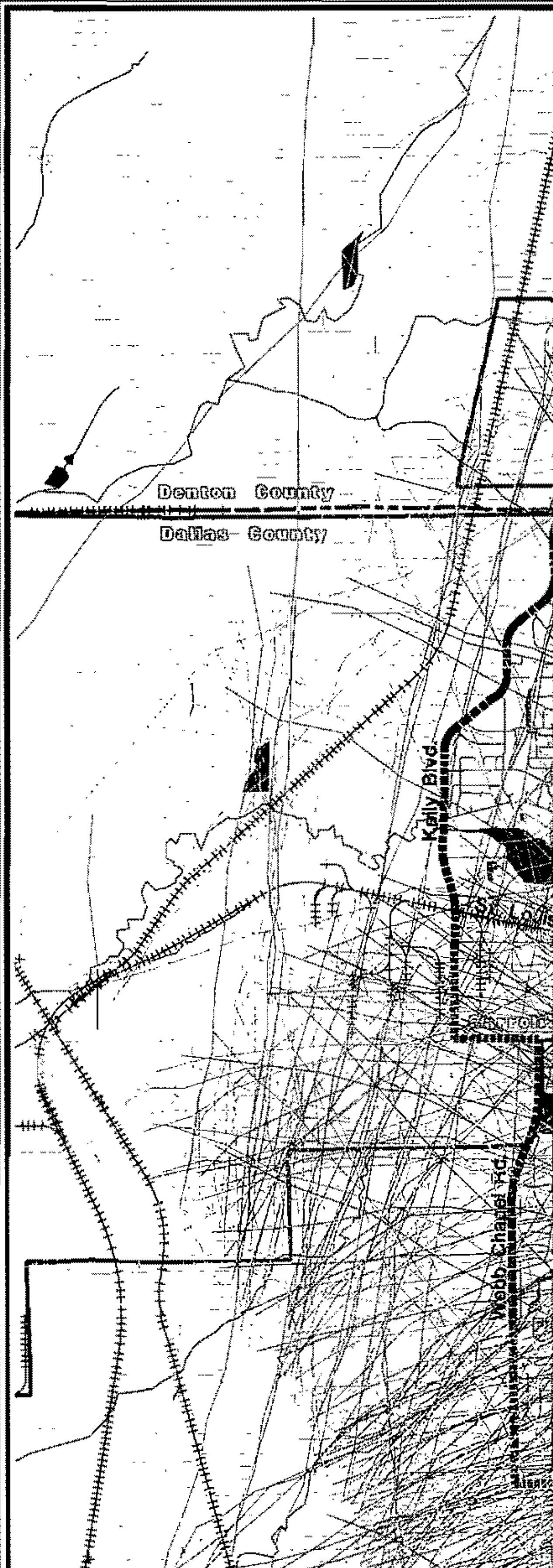
Arrival tracks at Addison Airport are generally concentrated on the runway centerline due to the precision needed to safely land an aircraft. However, the small general aviation aircraft are able to make shorter approaches to the airport. **Exhibit 3H** depicts the arrival stream and consolidated flight tracks at Addison Airport. Because both Runways 15 and 33 have instrument approach systems, the arrival stream has a tight concentration of aircraft on the extended runway centerline.

Exhibit 3J depicts the consolidated touch-and-go tracks developed for input into the INM. Typically, Addison Airport utilizes a left hand traffic pattern, however, a limited number of touch-and-go operations were modeled using right hand traffic as determined from conversations with the Addison ATCT. **Exhibit 3J** also illustrates the touch-and-go pattern tracks and the helicopter flight tracks developed for this analysis. The series of concentric oval-shaped tracks represent the radar light track and observed variances in the size of the training pattern at Addison Airport. The helicopter routes represent an average of those observed and depict both arrival and departure traffic. Helicopter touch-and-go activity is delegated to the west side of the airfield. This allows helicopters in the traffic pattern to approach and depart from Taxiway B while remaining clear of fixed wing operations. Tracks defining typical arrival and departure routes for helicopters are also depicted on **Exhibit 3J**.

ASSIGNMENT OF FLIGHT TRACKS

The final step in developing input data for the INM model is the assignment of aircraft to specific flight tracks. Prior to this step, specific flight tracks, runway utilization, and operational statistics for the various aircraft models using Addison Airport were evaluated. The radar flight track data was used to determine flight track percentages for each aircraft type. The radar flight tracks that formed the consolidated tracks and sub-tracks were first counted. Then each consolidated track was assigned a percentage based on the total number of tracks for each runway.

01SP09-3F-03/14/02



LEGEND

- Detailed Land Use Study Area
- County Boundary
- Municipal Boundary
- Airport Property
- Railroad Tracks
- Commercial Overflights
- General Aviation Overflights
- IFR Arrivals
- IFR Departures
- Love Field Activity
- Touch and Go
- VFR Arrivals
- VFR Departures
- Single Family Residential
- Multi-Family Residential
- Mixed Use
- Noise Sensitive Institutions
- School
- Day Care Facility
- Community Center/Lodges
- Medical Facilities
- Residential Care Facility
- Municipal Buildings
- Place of Worship
- Cemetery

Source: North Texas Geographic Information System.
Coffman Associates Analysis.

NORTH

0 4000
SCALE IN FEET

Addison! Airport

Exhibit 3F
RADAR FLIGHT TRACK DATA

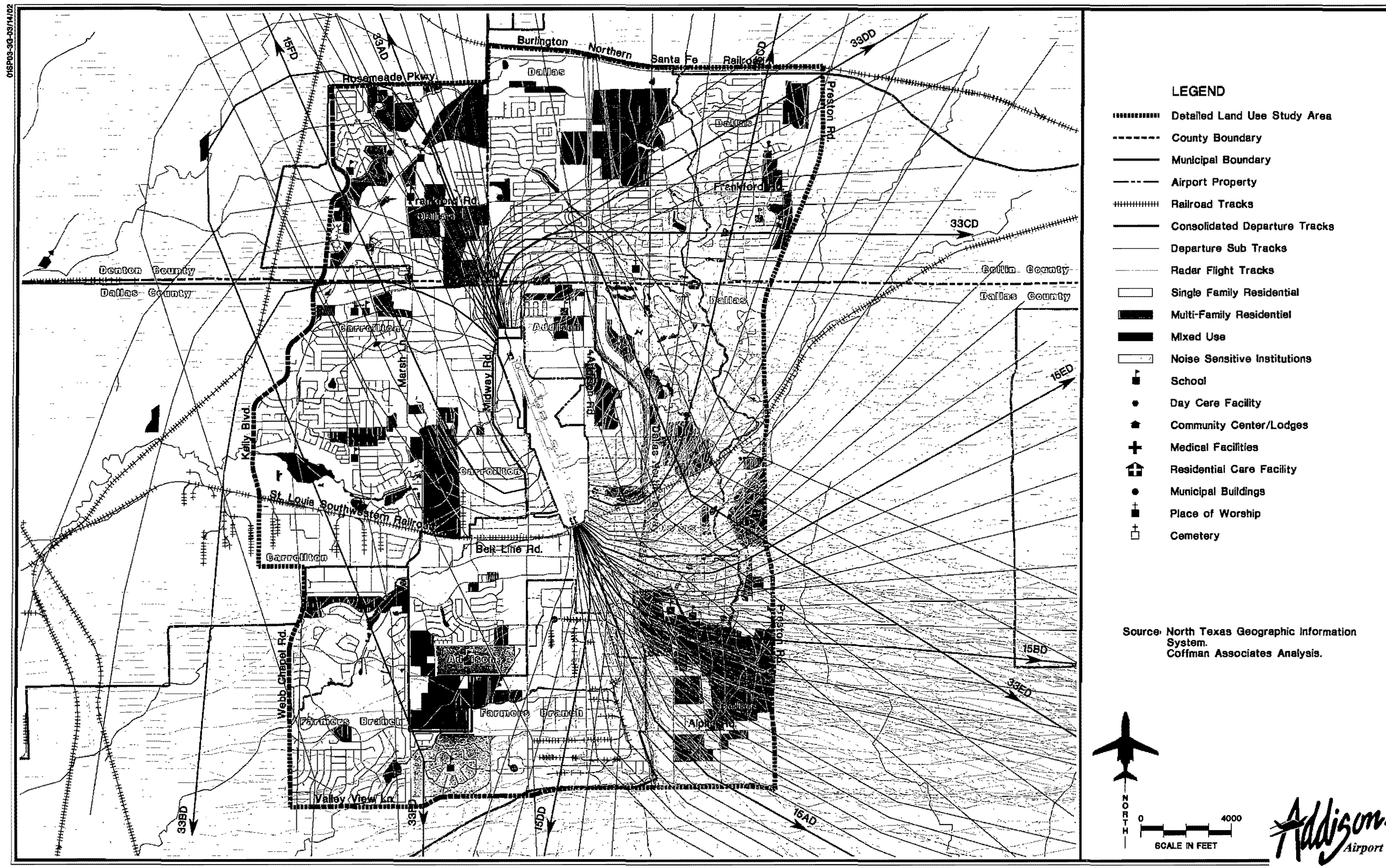


Exhibit 3G
DEPARTURE TRACKS

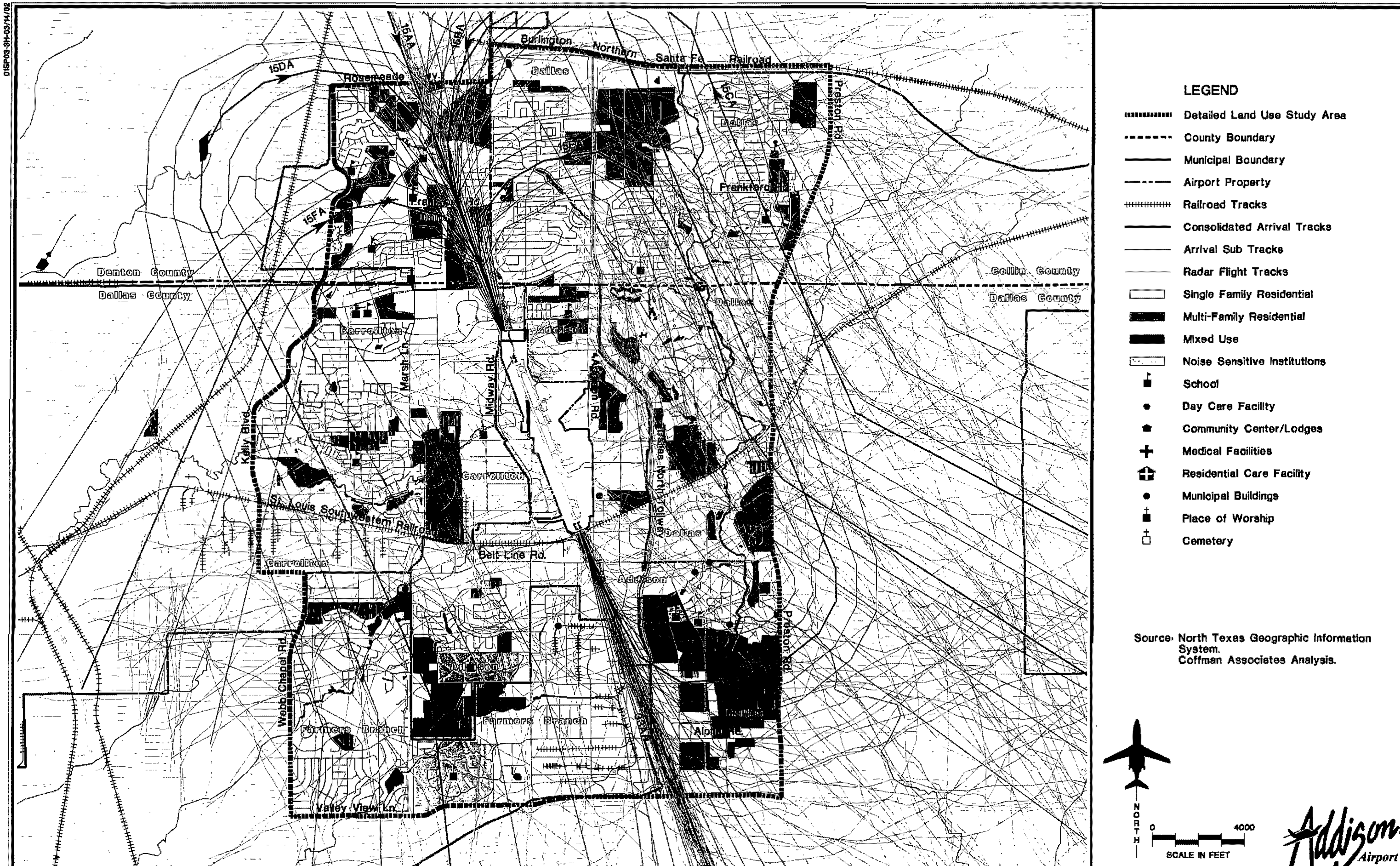


Exhibit 3H
ARRIVAL TRACKS

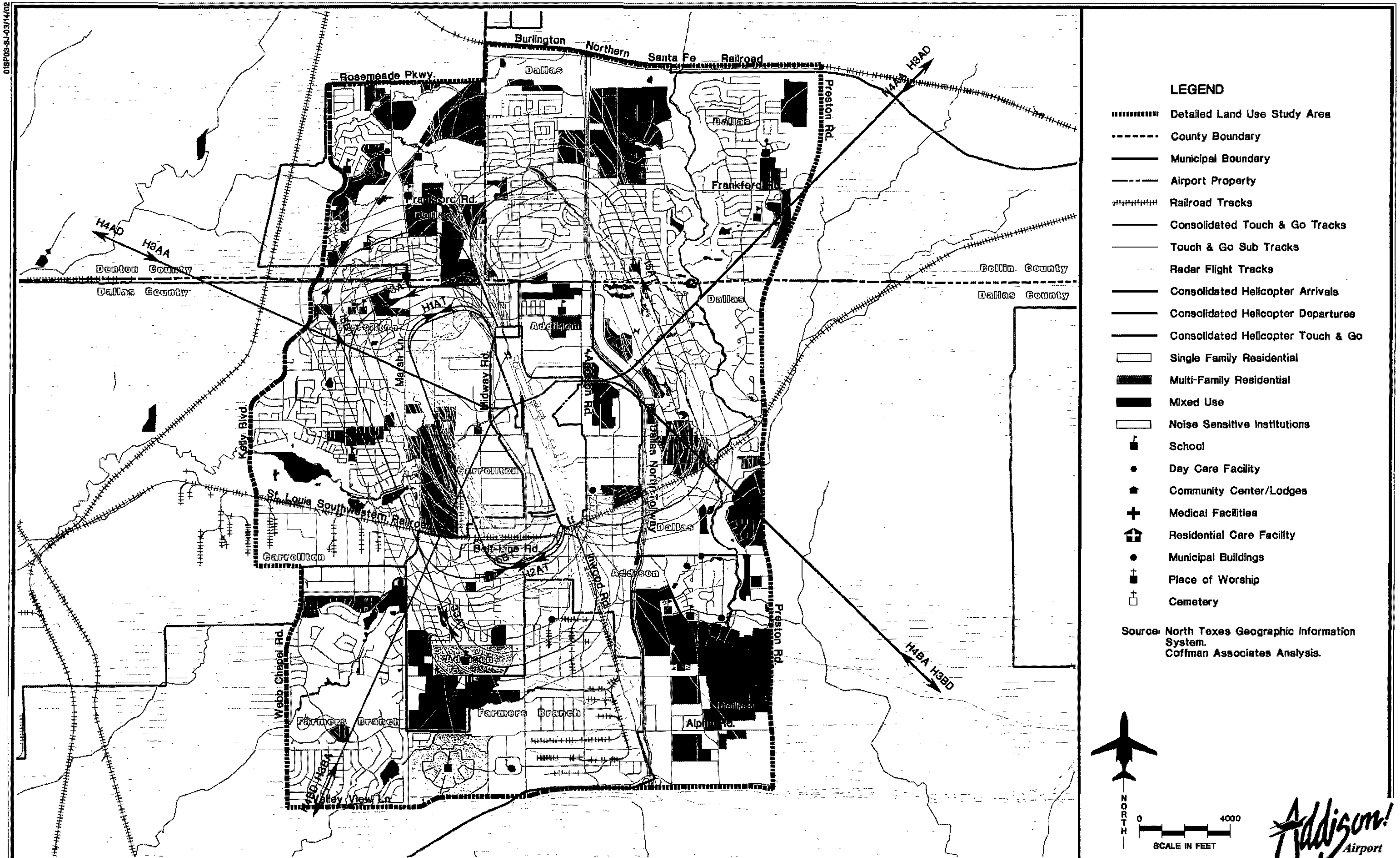


Exhibit 3J
TOUCH AND GO TRACKS

To determine the specific number of aircraft assigned to any one flight track, a long series of calculations was performed. This included a number of specific aircraft of one group, factored by runway utilization and flight track percentage. A detailed breakdown of the flight track assignments can be found in **Appendix E**.

INM OUTPUT

Output data selected for calculation by the INM were annual average noise contours in DNL. F.A.R. Part 150 requires that 65, 70, and 75 DNL contours must be mapped in the official Noise Exposure Maps. This section presents the results of the contour analysis for current and forecast noise exposure conditions, as developed from the Integrated Noise Model.

2002 NOISE EXPOSURE CONTOURS

Exhibit 3K presents the plotted results of the INM contour analysis for 2002 conditions using input data described in the preceding pages. The areas within each contour are presented in **Table 3G**.

TABLE 3G
Comparative Areas Of Noise Exposure
Addison Airport

	Area In Square Miles		
DNL Contour	**2002**	**2007**	**2022**
65	1.43	1.48	1.10
70	0.66	0.68	0.51
75	0.35	0.35	0.29

The shape and extent of the contours reflect the underlying flight track assumptions. The outermost noise contour represents the 65 DNL noise contour. The contour is asymmetrical off the ends of Runway 15-33, reflecting the uneven distribution of traffic to the north and south. The long slender shape of the contour to the north reflects the dominance of arrivals to Runway 15. The bulge in the 65 DNL contour to the northeast and northwest reflects the touch-and-go patterns east and west of the airport. To the south, the 65 DNL contour is longer and wider due to the higher number of departures from Runway 15. The next contour is the 70 DNL contour, which has the same general shape and is also influenced by same runway use and flight tracks assumptions. The remaining contour, the 75 DNL contour, generally remains on airport property.

The 65 DNL contour extends about 3,000 feet from the airport property over Accent Drive to the north. To the south, the 65 DNL contour extends about 5,350 feet from airport property. The 65 DNL contour extends off airport property 1,000 feet to the northeast, and 900 feet to the northwest and southwest.

The 70 DNL noise contour is smaller and similar in shape to the 65 DNL contour. To the north, the 70 DNL contour extends 150 feet off airport property. To the south, the 70 DNL contour extends about 2,400 feet off airport property to Landmark Boulevard. To the northeast, the contour extends 600 feet off airport property and to the northwest and southwest the 70 DNL contour extends 500 feet off airport property.

The 75 DNL noise contour remains close to the airport property line. The 75 DNL contour has small bulges extending off airport property to the northeast, northwest, and southwest.

COMPARATIVE MEASUREMENT ANALYSIS

A comparison of the average measured DNL(24) versus the computer-predicted cumulative DNL noise values for each measurement site has been developed. In this case, it is important to remember what each of the two noise levels indicates. The computer-modeled DNL contours are analogous to the climate of an area and represent the noise levels on an average day of the period under consideration. In contrast, the field measurements reflect only the noise levels on the specific days of measurement. Additionally, the field measurements consider all of the noise events that exceed a prescribed threshold and duration, while the computer model only calculates the noise due to aircraft events. As previously discussed, the field measurements can easily be contaminated by ambient noise sources other than aircraft around the measurement sites. With this understanding in mind, it is useful to evaluate the comparative aircraft DNL (24) levels of the measurement sites.

DNL Comparison

This analysis provides a direct comparison of the measured DNL(24) and predicted values for each noise measurement site. In order to facilitate such a comparison, it is necessary to ensure that the computer model input is representing the observed reality as accurately as possible within the capabilities of the model.

As previously mentioned, field noise measurements were taken during primarily above-average, warm winter weather for the Addison area. On most days, weather conditions were generally considered to be adequate for aircraft using VFR. During the last 48 hours of monitoring, weather conditions deteriorated so that flight under VFR was not allowed and only specifically-equipped aircraft with properly trained pilots could fly. Winds were generally from the south-southeast at about 10 knots with occasional gusts up to 20 knots. Daily temperatures ranged from highs in the upper 60s to lows in the upper 30s. The airport also operated primarily in a south flow with few operations observed using Runway 33.

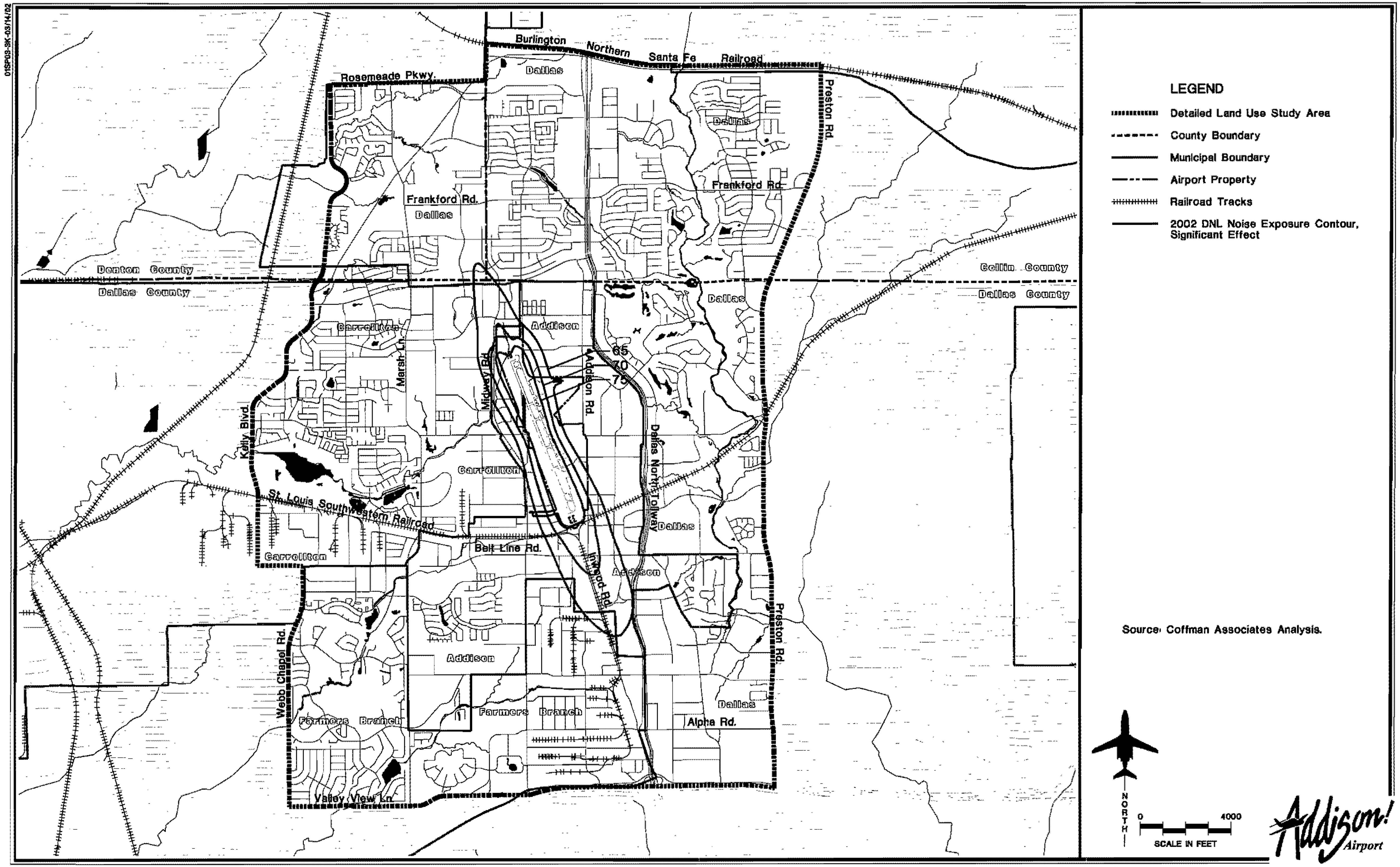


Exhibit 3K
2002 NOISE EXPOSURE CONTOUR

A difference of three to four DNL is generally not considered a significant deviation between measured and calculated noise, particularly at levels above 65 DNL. Additional deviation is expected at levels below 65 DNL. In this case, four of the noise monitor sites fall outside the 65 DNL noise contour.

The measured and predicted 2002 noise exposure contours for the annual average condition are presented for each aircraft noise measurement site on **Exhibit 3L** and **Table 3H**. As seen in **Table 3H**, in all but two cases (Site 3 and Site 6), the INM over-predicted sound levels at the noise monitor sites. The under-prediction of noise levels is less than one decibel at both of these sites, falling well within the allowable deviation tolerances of the INM. The over-prediction at remaining four sites ranges from 0.2 to 2.1 decibels. These sites are also within the allowable deviation tolerances of the INM.

TABLE 3H
Noise Measurement DNL(24) vs. Predicted DNL Values
Addison Airport

Monitor Site	Measured DNL(24)[1]	Predicted 2002[2]	Difference
1	73.6	75.7	2.1
2	70.6	71.0	0.4
3	52.0	51.5	-0.5
4	61.0	61.2	0.2
5	55.4	57.4	2.0
6	61.1	60.3	-0.8

Source: Coffman Associates Analysis
[1] Measurements were taken April 20 through January24, 2002.. This information is for comparative purposes only and not for input into the Integrated Noise Model.
[2] Annual average 2002 noise exposure contours.

2007 NOISE EXPOSURE CONTOURS

The 2007 noise contours represent the estimated noise conditions based on the forecasts of future operations. This analysis provides a near-future baseline which can subsequently be used to judge the effectiveness of proposed noise abatement procedures. **Exhibit 3M** presents the results of the INM contour analysis for 2007 conditions using input data that has been described in the preceding pages.

Generally, the 2007 noise contours are similar in shape to their 2002 counterparts. The contours are slightly wider and more elongated than the 2002 contours due to the forecast increase in operations.

The 65 DNL contour extends about 3,200 feet from airport property over

Accent Drive to the north. To the south, the 65 DNL contour extends about 5,450 feet from airport property over Langland Road. Small bulges in the 65 DNL contour extend off airport property to the northeast, northwest, and southwest about 1,000 feet.

The 70 DNL noise contour extends 200 feet off airport property to the north and about 2,450 feet off airport property to Landmark Boulevard to the south. The 70 DNL contour bulges off airport property to the northeast, northwest, and southwest about 500 feet. Small portions of the 75 DNL contour extend off airport property to the northeast, northwest, and southwest.

The surface areas of the 2007 noise exposure are presented for comparison in **Table 3G**.

2022 NOISE EXPOSURE CONTOURS

The 2022 noise contours represent the estimated noise conditions based on the forecasts of future operations. The analysis provides a long term future baseline which can also be used to judge the effectiveness of proposed noise abatement procedures and land use planning recommendations. This contour is not part of the official Noise Exposure Maps required under Part 150. The 2022 noise contour was developed to present a long-term view of potential future noise exposure at Addison Airport. **Exhibit 3N** presents the plotted results of the INM contour analysis for 2022 conditions using input data described in the preceding pages.

Due to the significant reduction of Stage 2 business jet aircraft by 2022, the 2022 noise contours are smaller than the 2007 noise contours. The reduction in Stage 2 business jets is primarily due to the age of these aircraft. These aircraft were certified at or prior to December 31, 1974.

The 65 DNL contour extends about 2,050 feet from airport property to the north. To the south, the contour extends about 4,300 feet from airport property to the Addison town limits. The 65 DNL contour extends off airport property 800 feet to the northwest, 900 feet to the northeast, and 750 feet to the southwest.

The 70 DNL contour remains on airport property to the north and extends 1,450 feet from the airport property to the south, extending to Belt Line Drive. The northeast and northwest edges of the contour extend off airport property approximately 400 feet and, to the southwest, the contour extends off airport property approximately 300 feet.

The 75 DNL noise contour has small bulges to the northwest and northeast of 100 feet and 200 feet off airport property, respectively.

The surface areas of the 2022 noise exposure are presented for comparison in **Table 3G**.

SUMMARY

The information presented in this chapter defines the noise patterns for current and future aircraft activity,

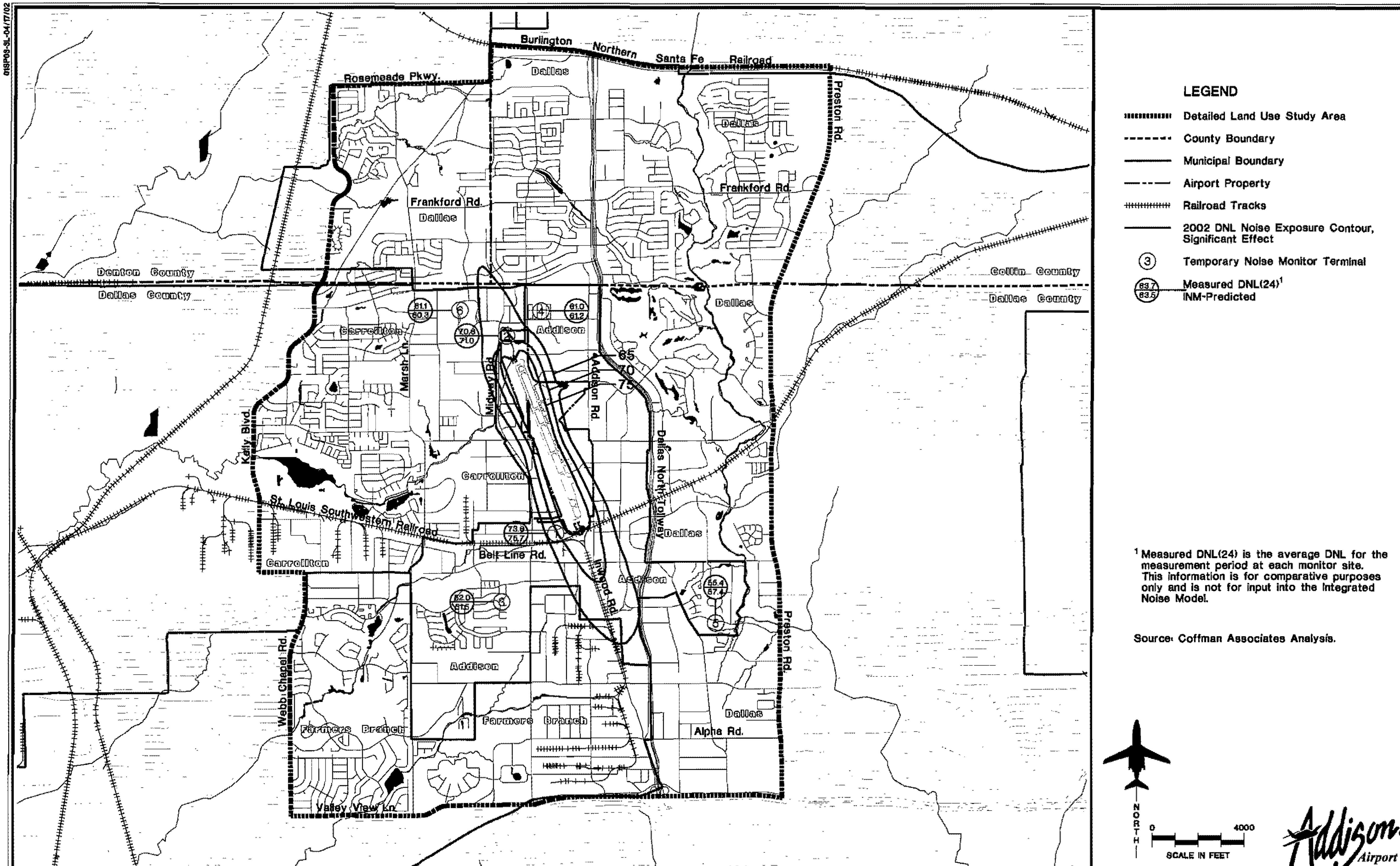


Exhibit 3L
MEASURED AND MODELED NOISE

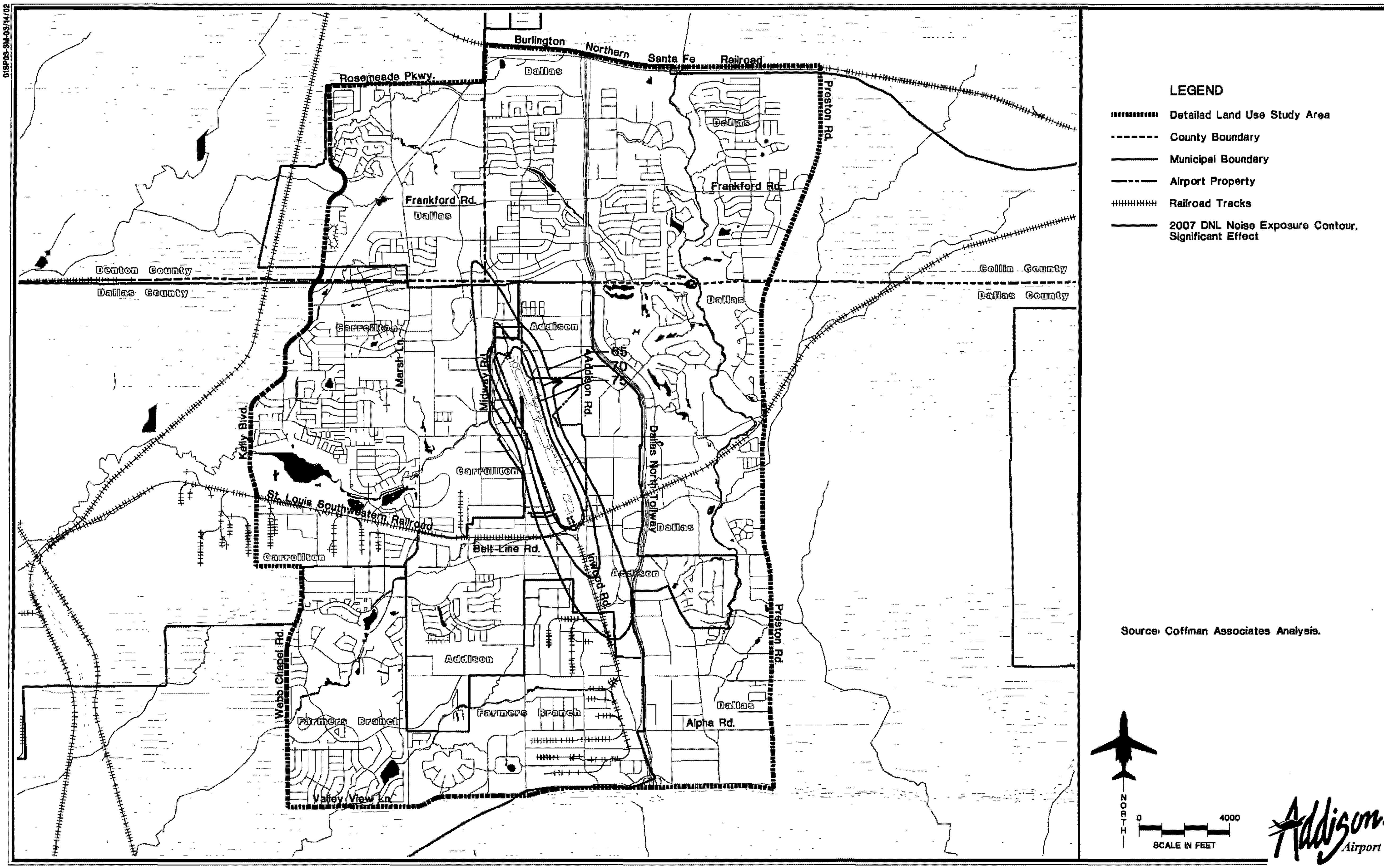
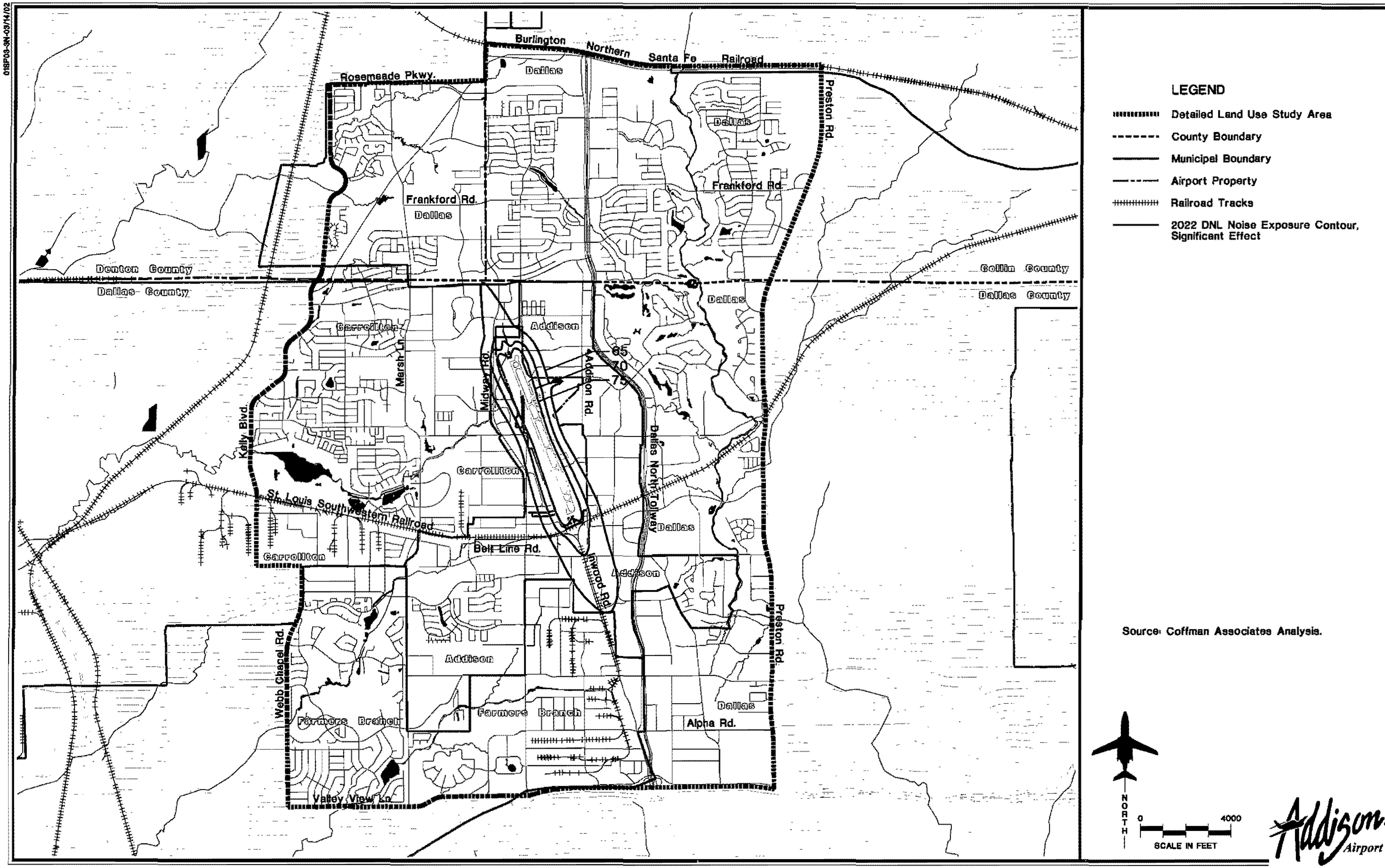


Exhibit 3M
2007 NOISE EXPOSURE CONTOUR



01SP03-3N-03/14/02

Exhibit 3N
2022 NOISE EXPOSURE CONTOUR

without additional abatement measures, at Addison Airport. It does not make an attempt to evaluate or otherwise include that activity over which the airport has no control -- such as other aircraft transiting the area and not stopping at the airport.

The current (2002) contours are based on operational counts during 2001 from the Addison ATCT and supplemental data acquired during times when the tower was closed. The 2007 and 2022 contours are based on forecasts detailed in Chapter Two. The noise exposure levels around the airport can be expected to increase slightly as the airport becomes busier in the future. However, the reduction in the size of the long range contours can be attributed to the continued introduction and use of newer, quieter aircraft. It is stressed that DNL contour lines drawn on a map do not represent absolute boundaries of acceptability or unacceptability in personal response to noise, nor do they represent the actual noise conditions present on any specific day, but rather the conditions of an average day derived from annual average information with a penalty assessed for nighttime operations.

Chapter Four
NOISE IMPACTS

NOISE IMPACTS

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

Individual responses to noise are highly variable, thus making it very difficult to predict how any person is likely to react to environmental noise. However, the response of a large group of people to environmental noise is much less variable and has been found to correlate well with cumulative noise metrics such as day-night noise level (DNL). The development of aircraft noise impact analysis techniques has been based on this relationship between average community response and cumulative noise exposure.

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

The major sections in this chapter include the following:

- Land Use Compatibility
- Noise Complaints
- Current Noise Exposure (2002)
- Potential Growth Risk
- 2007 Noise Exposure
- 2022 Noise Exposure

LAND USE COMPATIBILITY

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

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

F.A.R. PART 150 GUIDELINES

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

The FAA uses the Part 150 guidelines as the basis for defining areas within which noise compatibility projects may be eligible for federal funding through the noise set-aside funds of the Airport Improvement Program (AIP). In general, noise compatibility projects must be within the 65 DNL contour to be eligible for federal funding. According to the AIP Handbook, "Noise compatibility projects usually must be located in areas where noise measured in day-night average sound level (DNL) is 65 (dB) or greater." (See FAA Order 5100.38A, Chapter 7, paragraph 710.b.) Funding is permitted outside the 65 DNL contour only where the airport sponsor has determined that non-compatible land uses exist at lower levels, adopted a change to Table 1 of F.A.R. Part 150, and the FAA has explicitly concurred with that determination.

The FAA guidelines outlined in **Exhibit 4A** show that residential development, including standard construction (residential construction without special acoustical treatment), mobile homes, and transient lodging are incompatible with noise above 65 DNL. Homes of standard construction and transient lodgings may be considered compatible where local communities have determined these uses are permissible; however, sound insulation measures are

01SP07-4A-4/26/02

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

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

See other side for notes and key to table.

Addison! Airport

Exhibit 4A

LAND USE COMPATIBILITY GUIDELINES

KEY

Y (Yes) Land Use and related structures compatible without restrictions.

N (No) Land Use and related structures are not compatible and should be prohibited.

NLR Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, 35 Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

NOTES

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

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

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

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

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

6 Residential buildings require a NLR of 25.

7 Residential buildings require a NLR of 30.

8 Residential buildings not permitted.

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

recommended. Schools and other public use facilities are also generally incompatible with noise between 65 and 75 DNL, but, again, the guidelines note that, where local communities determine that these uses are permissible, sound insulation measures should be used. Other land uses considered incompatible at levels exceeding 65 DNL include outdoor music shells and amphitheaters.

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

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

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

NOISE COMPLAINTS

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

Addison Airport typically received an average of 12 noise complaints per month for 2001. **Table 4A** summarizes monthly noise complaints for 2001 and the first three months of 2002. Individuals who wish to lodge noise complaints can contact the airport 24 hours a day. After business hours, an answering machine records the calls. Once a complaint is received, airport staff researches the cause of the complaint and responds to the caller.

The airport management has implemented a voluntary noise abatement program to reduce noise complaints. As part of this program, lighted signage has been installed at each end of the airport's runway reminding pilots of proper noise abatement departure procedures. In addition, monthly noise abatement meetings are held by airport management to discuss ways to continue the education process to achieve voluntary compliance with the noise abatement program. These meetings are attended by a core group of pilots, flight department directors, and other airport users.

CURRENT NOISE EXPOSURE

This section describes the exposure of existing land uses and population as they relate to the 2002 noise contours.

LAND USES EXPOSED TO 2002 NOISE

The location of existing noise-sensitive land uses, in relation to the 2002 noise contours at Addison Airport, is shown on **Exhibit 4B**. Noise-sensitive land uses shown on the exhibit are based on F.A.R. Part 150 land use compatibility guidelines and include uses considered incompatible with noise above 65 DNL.

TABLE 4A
Noise Complaints
Addison Airport

Month	No. of Complaints
2001	
January	4
February	10
March	7
April	7
May	2
June	6
July	16
August	31
September	5
October	31
November	21
December	7
2002	
January	12
February	17
March	30

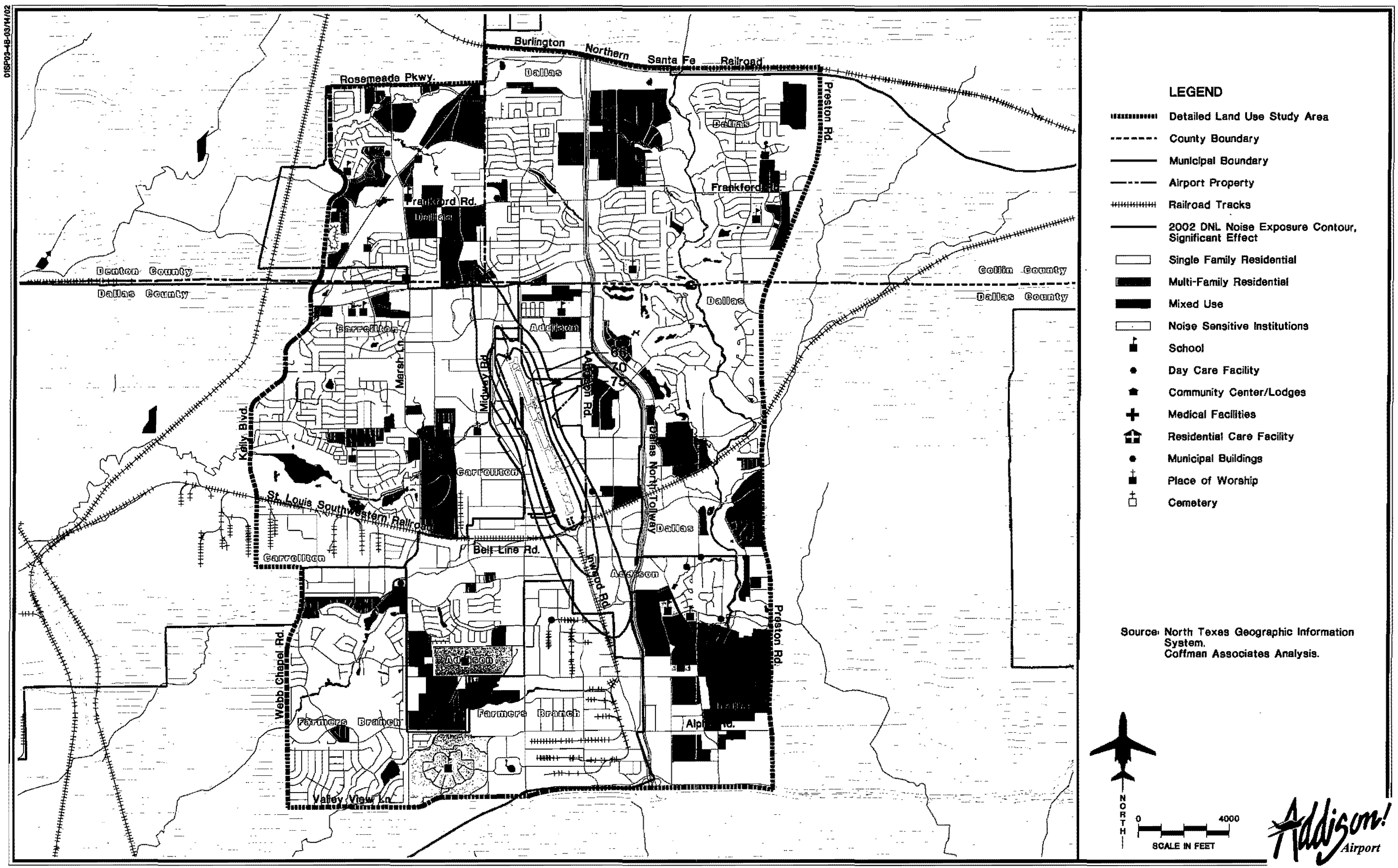


Exhibit 4B
2002 NOISE EXPOSURE CONTOUR
WITH NOISE-SENSITIVE LAND USE

Contour Descriptions

The shape and extent of the contours reflect the underlying flight track assumptions. The outermost noise contour represents the 65 DNL noise contour. The contour is asymmetrical off the ends of Runway 15-33, reflecting the uneven distribution of traffic to the north and south. The long slender shape of the contour to the north reflects the dominance of arrivals to Runway 15. The bulge in the 65 DNL contour to the northeast and northwest reflects the touch-and-go patterns east and west of the airport. To the south, the 65 DNL contour is longer and wider due to the higher number of departures from Runway 15. The next contour is the 70 DNL contour, which is also influenced by runway use and flight tracks. The remaining contour, the 75 DNL contour, generally remains on airport property.

The 65 DNL contour extends about 3,000 feet from the airport property over Accent Drive to the north. To the south, the 65 DNL contour extends about 5,350 feet away from airport property. The 65 DNL contour extends off airport property 1,000 feet to the northeast and 900 feet to the northwest and southwest.

The 70 DNL noise contour is smaller and similar in shape to the 65 DNL contour. To the north, the 70 DNL contour extends 150 feet off airport property. On the south, the 70 DNL contour extends about 2,400 feet off airport property to Landmark Boulevard. To the northeast, the contour extends 600 feet off airport property and, to the northwest and southwest, the 70 DNL contour extends off airport property 500 feet.

The 75 DNL noise contour remains close to the airport property line. The 75 DNL contour has small bulges extending off airport property to the northeast, northwest, and southwest.

2002 Land Use Impacts

The number of dwelling units within each noise contour range is determined by computer-generated counts based on an underlying housing database.

Dwelling units, for the purposes of the study, include single family homes, mobile homes, apartments, and condominium units. This database was developed with the use of aerial photography from the North Texas Geographical Information System and field surveys conducted in January 2002. The location and number of noise-sensitive institutions were derived from the area maps and notations made during the January 2002 field survey.

To determine the presence of historical or archaeological sites within the area, the Texas Historical Commission was contacted. It was determined that neither of these resources are present within the study area.

The 2002 land use impacts are summarized in **Table 4B** and described below.

A total of 283 dwelling units are located within the 65 DNL noise contour. All of the dwelling units are located within the 65 to 70 contour. No dwelling units are found within the 70 DNL or greater contour.

The majority of the dwelling units affected by noise are found directly to the north and south of the airport. To the east and west of the airport, very few dwelling units are contained within the noise contours, as depicted on **Exhibit 4B**.

As outlined in **Table 4B**, one noise-sensitive institution, a theater, is located within the 65 to 70 DNL contour. No noise-sensitive institutions within the study area are exposed to noise greater than 70 DNL.

TABLE 4B
Noise-Sensitive Land Uses Exposed to 2002 Aircraft Noise
Addison Airport

	Noise Contour (DNL)			
LAND USE	**65-70**	**70-75**	**75+**	**Total**
Existing Dwelling Units	283	0	0	283
Noise-Sensitive Institutions				
Places of Worship	0	0	0	0
Schools	0	0	0	0
Other (Library, Museum, Etc.)	1	0	0	1
Total Noise-Sensitive Institutions	1	0	0	1
Historic Resources	0	0	0	0

POPULATION EXPOSED TO 2002 NOISE

In assessing community noise impacts, the number of people exposed and the level of noise to which they are exposed must be considered. While lower noise levels cover a larger area and usually affect more people, they are less annoying than higher noise levels. To assess the intensity of the impact, it is helpful, although not required under Part 150, to have a way of jointly considering both population and noise level. The level-weighted population (LWP) methodology provides such an approach.

The LWP methodology assumes that increasing proportions of people are annoyed as noise increases. A detailed description of this methodology is provided in the ***T.I.P., Measuring the Impact of Noise on People***. In the 55 to 60 DNL range, it is assumed that 10.7 percent of the population are annoyed by noise. In the 65 to 70 DNL range, 37.6 percent; in the 70 to 75 DNL range, 64.4 percent; and above 75 DNL, 100 percent of the population are annoyed by noise.

Table 4C outlines the population, expressed in both absolute numbers and LWP, exposed to various levels of existing noise. The population is calculated by counting the number of dwelling units within a given contour range and multiplying that number by the average population per dwelling unit. The 2000 U.S. Census figures showed that the average population per dwelling unit within the study area was 2.51.

As presented in **Table 4C**, there are 710 residents affected by noise within the 65-70 DNL contour. No residents are exposed to noise levels in excess of 70 DNL. The majority of the affected population is found north of the airport.

TABLE 4C
Population Exposed to 2002 Aircraft Noise
Addison Airport

	Noise Contour (DNL)			Total Above 65 DNL	
	65-70	**70-75**	**75+**	**Residents**	**LWP**
Existing Population	710	0	0	710	267

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

POTENTIAL GROWTH RISK

Before evaluating the impact of future aircraft noise, the likelihood of future noise-sensitive development in the area must be understood. Development trends in the vicinity of the airport are critical to noise compatibility planning. Future residential growth can constrain the operation of the airport if it occurs beneath aircraft flight tracks and within areas subject to high noise levels.

The following paragraphs describe population growth and potential dwelling unit development within the study area in order to determine the potential growth risk. The focus of discussion includes population projections, residential development projects, and other noise-sensitive development.

POPULATION PROJECTIONS

As shown in **Table 4D**, the population of the Town of Addison has experienced significant population growth since 1980, nearly tripling. This equates to an average annual increase of 4.8 percent. Carrollton's population has more than doubled, increasing at an average annual rate of 5.1 percent.

Collin, Dallas, and Denton Counties have also experienced strong population growth. As indicated in **Table 4D**, Dallas County experienced the largest residential growth, increasing by 662,480 residents, which equates to an average annual growth of 1.8 percent. Collin County experienced the largest annual residential growth rate percentage, increasing 6.3 percent annually, more than tripling in population over the period.

Population forecasts presented by the North Central Texas Council of Governments (NCTCOG) indicate a slower growth over the next 20 years. The Town of Addison is expected to grow the quickest of the area municipalities at an average annual rate of 1.8 percent, reaching 21,154 residents by 2022. Collin County's residential population is projected to outpace Dallas and Denton Counties on an average annual basis. It is expected to grow at 2.6 percent annually, reaching 866,309 residents by 2022.

TABLE 4D
City and County Population

Year	Town of Addison	Annual Percent Change	City of Carrollton	Annual Percent Change	City of Dallas	Annual Percent Change	City of Farmers Branch	Annual Percent Change
1980	5,553	N/A	40,595	N/A	904,078	N/A	24,863	N/A
1990	8,787	4.7	82,169	7.3	1,007,618	1.1	24,250	-0.2
2000	14,166	4.9	109,576	2.9	1,188,580	1.7	27,508	1.3
FORECASTS								
2007	16,250	2.0	115,484	0.8	1,215,725	0.3	28,008	0.3
2022	21,154	1.8	126,397	0.6	1,256,444	0.3	29,246	0.3

Year	Dallas County	Annual Percent Change	Collin County	Annual Percent Change	Denton County	Annual Percent Change
1980	1,556,419	N/A	144,576	N/A	143,126	N/A
1990	1,852,810	1.8	264,036	6.2	273,525	6.7
2000	2,218,899	1.8	491,675	6.4	432,976	4.7
FORECASTS						
2007	2,324,670	0.7	601,439	2.9	521,965	2.7
2022	2,537,091	0.6	866,309	2.5	740,385	2.4

Source: Historical - U.S. Census Bureau; Forecasts - Interpolated from *North Central Texas 2025 Demographic Forecast* by NCTCOG.

To accommodate the projected population growth, it is anticipated that additional residential development will be needed. New and in-fill residential development within the study area is expected to satisfy some of this anticipated growth.

RESIDENTIAL AND NOISE-SENSITIVE LAND USE GROWTH RISK

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

As illustrated on Exhibit 1G, to the northeast and southeast of the airport there are areas of in-fill development or redevelopment that may occur as the area is mostly developed. Potential noise-sensitive growth risk areas are depicted on **Exhibit 4C** in beige.

2007 NOISE EXPOSURE

This section describes the exposure of existing and potential land uses and population to aircraft noise in 2007.

LAND USES EXPOSED TO 2007 NOISE

The forecasted 2007 noise contours are presented in **Exhibit 4C**, along with existing and potential future noise-sensitive land uses within the study area.

Contour Descriptions

Generally the 2007 noise contours are similar in shape to their 2002 counterparts. The contours are slightly wider and more elongated than the 2002 contours due to the forecast increase in operations.

The 65 DNL contour extends about 3,200 feet from the airport property over Accent Drive to the north. To the south, the 65 DNL contour extends about 5,450 feet away from airport property over Langland Road. Small bulges in the 65 DNL contour extend off airport property to the northeast, northwest, and southwest about 1,000 feet.

The 70 DNL noise contour extends 200 feet off airport property to the north and about 2,450 feet off airport property to Landmark Boulevard to the south. The 70 DNL contour bulges off airport property to the northeast, northwest, and southwest about 500 feet.

Small portions of the 75 DNL contour extend off airport property to the northeast, northwest, and southwest.

2007 Land Use Impacts

Noise-sensitive land uses potentially affected by noise in 2007 are shown in **Table 4E**. In the year 2007, the total number of existing dwelling units affected by noise within the 65 DNL contour increases from 283 in 2002 to 301 in 2007.

Exhibit 4C illustrates the location of noise impacts throughout the study area. As depicted in **Exhibit 4C**, the 2007 contours extend more to the north and south, which results in a small increase in the number of existing dwelling units within the noise exposure contours. Within the 65 to 70 DNL contour, 301 dwelling units are affected by noise. No existing dwelling units are affected by noise greater than 70 DNL in the year 2007.

The number of noise-sensitive institutions within the 65 DNL noise contour remain the same from 2002 to 2007. Within the 65 to 70 DNL contour, one theater is found.

TABLE 4E
Noise-Sensitive Land Uses Exposed to 2007 Aircraft Noise
Addison Airport

	Noise Contour (DNL)			
LAND USE	**65-70**	**70-75**	**75+**	**Total**
DWELLING UNITS				
Existing Dwelling Units	301	0	0	301
Future Potential Dwelling Units	285	63	21	369
Total Dwelling Units	**586**	**63**	**21**	**670**
NOISE-SENSITIVE INSTITUTIONS				
Places of Worship	0	0	0	0
Schools	0	0	0	0
Other (Library, Museum, Etc.)	1	0	0	1
Total Noise-Sensitive Institutions	**1**	**0**	**0**	**1**
HISTORIC RESOURCES				
Total Historic Resources	**0**	**0**	**0**	**0**

Based on the growth risk analysis, there is the potential for approximately 369 additional dwelling units within the 65 DNL noise contour for a total of 670 potential units. A majority of the future potential dwelling units fall within the 65 to 70 DNL contour, approximately 285 dwelling units. The potential exists for 63 dwellings to be built within the 70 to 75 DNL contour and 21 dwellings above 75 DNL. The growth potential exists primarily to the north and south of the airport as this land is currently undeveloped. **Table 4E** presents a breakdown of the potential growth within each noise contour.

POPULATION EXPOSED TO 2007 NOISE

The future population impacts parallel the patterns observed for land use impacts. The total existing population exposed to noise above 65 DNL increases from 710 in 2002 to 756 in 2007, which corresponds to an increase in the LWP value from 267 to 284. **Table 4F** depicts the impact of 2007 noise on the existing local population.

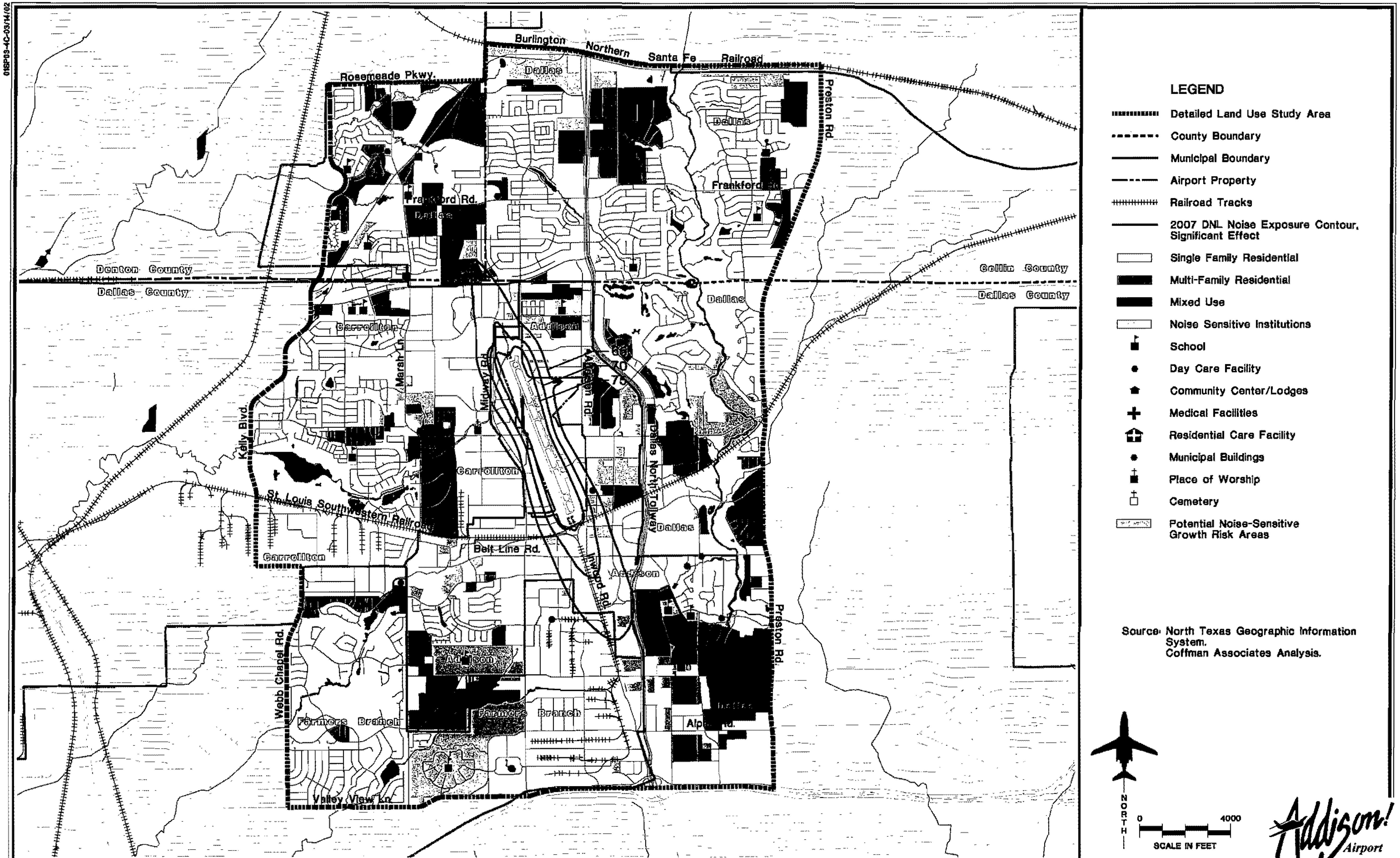


Exhibit 4C
2007 NOISE EXPOSURE CONTOUR
WITH NOISE-SENSITIVE LAND USE

TABLE 4F
Population Exposed to 2007 Aircraft Noise
Addison Airport

	Noise Contour (DNL)			Total Above 65 DNL	
	65-70	**70-75**	**75+**	**Residents**	**LWP**
Existing Population	756	0	0	756	284
Potential Population	715	159	53	927	424
Total Population	**1,471**	**159**	**53**	**1,683**	708

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

All of the affected population, 756 people, continues to reside within the 65 to 70 DNL noise contour. There are no residents affected by noise greater than 70 DNL.

Table 4F also provides an estimate of the number of potential, additional residents which may be impacted by 2007 aircraft noise. Approximately 927 additional residents could be exposed to noise above 65 DNL for a total of 1,683 existing and potential population impacts. Of these impacts, 1,471 will fall within the 65 to 70 DNL noise contour. The remaining population impacts occur in the 70 to 75 (159) and 75 DNL (53) noise contours.

2022 NOISE EXPOSURE

This section describes the exposure of existing and potential land uses and population to aircraft noise in 2022.

LAND USES EXPOSED TO 2022 NOISE

Exhibit 4D illustrates the forecast 2022 noise contours together with both existing and potential future noise-sensitive land uses within the study area.

Contour Descriptions

Due to the reduction of Stage 2 business jet aircraft in the fleet mix by 2022, the 2022 noise contours are smaller than the 2007 noise contours. The reduction in Stage 2 business jets is primarily due to the age of these aircraft. These aircraft were certified at or prior to December 31, 1974. The 65 DNL contour extends about 2,050 feet from the airport property to the north. To the south, the contour extends about 4,300 feet from airport property to the Addison town limits. The 65 DNL contour extends off airport property 800 feet to the northwest, 900 feet to the northeast, and 750 feet to the southwest.

The 70 DNL contour remains on airport property to the north and extends 1,450 feet south of airport property to Belt Line Drive. To the northeast and northwest, the 70 DNL contour extends off airport property approximately 400 feet. To the southwest, the contour extends off airport property approximately 300 feet.

The 75 DNL noise contour remains on airport property with the exception of two small bulges to the northwest and northeast. The 75 DNL contour extends off airport property 100 feet to the northwest and 200 feet to the northeast.

Land Use Impacts

Noise-sensitive land uses potentially impacted by noise in 2022 are presented in **Table 4G**.

The total number of dwelling units affected by noise above 65 DNL in 2022 decreases to no units. This is a reduction of 301 units from 2007.

The number of noise-sensitive institutions within the 65 DNL contour decreased from one in 2007 to zero in 2022.

Based on the growth risk analysis, there is the potential for approximately 237 additional residential dwelling units within the 65 DNL noise contour, as presented in **Table 4G**. Of these, 188 potential units exist within the 65-70 DNL, 38 are found within the 70 to 75 DNL contour, and 11 are within the 75+ DNL contour.

POPULATION EXPOSED TO 2022 NOISE

The total existing population exposed to noise above 65 DNL decreases from 756 in 2007 to zero in 2022, which corresponds to a decrease in LWP from 284 to 0. **Table 4H** presents the impact of 2022 noise on the existing local population.

Approximately 593 additional residents could potentially be exposed to noise greater than 65 DNL in 2022. The potential population is found within the 65 to 70 (472), 70 to 75 (94), and 75+ (27) DNL contours.

SUMMARY

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

The noise contours get larger through the year 2007 due to the forecasted increase in the use of the airport. However, by 2022 the noise contours get smaller due to the projected Stage 2 business jet aircraft elimination.

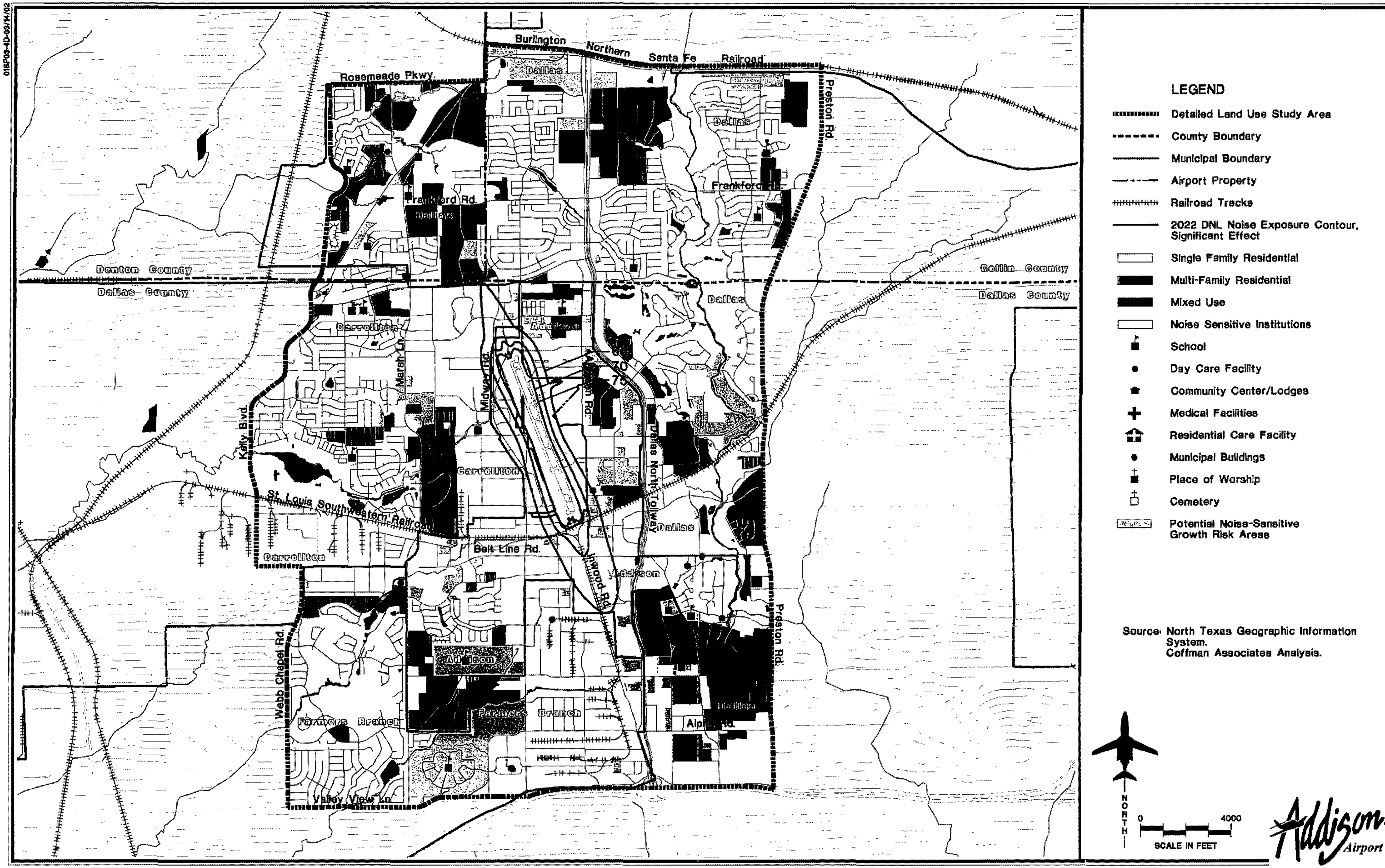


Exhibit 4D
2022 NOISE EXPOSURE CONTOUR WITH NOISE-SENSITIVE LAND USE

TABLE 4G
Noise-Sensitive Land Uses Exposed to 2022 Aircraft Noise
Addison Airport

	Noise Contour (DNL)			
LAND USE	**65-70**	**70-75**	**75+**	**Total**
DWELLING UNITS				
Existing Dwelling Units	0	0	0	0
Future Potential Dwelling Units	188	38	11	237
Total Dwelling Units	188	38	11	237
NOISE-SENSITIVE INSTITUTIONS				
Places of Worship	0	0	0	0
Schools	0	0	0	0
Other (Library, Museum, Etc.)	0	0	0	0
Total Noise-Sensitive Institutions	0	0	0	0
HISTORIC RESOURCES				
Total Historic Resources	0	0	0	0

TABLE 4H
Population Exposed to 2022 Aircraft Noise
Addison Airport

	Noise Contour (DNL)			Total Above 65 DNL	
	65-70	**70-75**	**75+**	**Residents**	**LWP**
Existing Population	0	0	0	0	0
Potential Population	472	94	27	593	266
Total Population	472	94	27	593	266

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

Source: Coffman Associates analysis.

Exhibit 4E depicts the 2002, 2007, and 2022 65 DNL noise contours for comparative purposes.

Given current zoning, planned land uses, and approved development plans within the study area, there is a potential for an increase in future residential development within the various contours in 2007 and 2022.

TABLE 4J
Land Uses and Population Impact Summary
Addison Airport

	2002	2007	2022
Land Use			
DWELLING UNITS			
Existing Dwelling units	283	301	0
Future Potential Dwelling Units	0	369	237
Total Dwelling Units	**283**	**670**	**237**
NOISE-SENSITIVE INSTITUTIONS			
Places of Worship	0	0	0
Schools	0	0	0
Other (Libraries, Museums, etc.)	1	1	0
Total Noise-Sensitive Institutions	**1**	**1**	**0**
HISTORIC RESOURCES			
Total Historic Resources	**0**	**0**	**0**
Population			
Total Existing Population above 65 DNL	710	756	0
Total Potential Population above 65 DNL	0	927	593
Total Potential LWP above 65 DNL	267	708	266

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

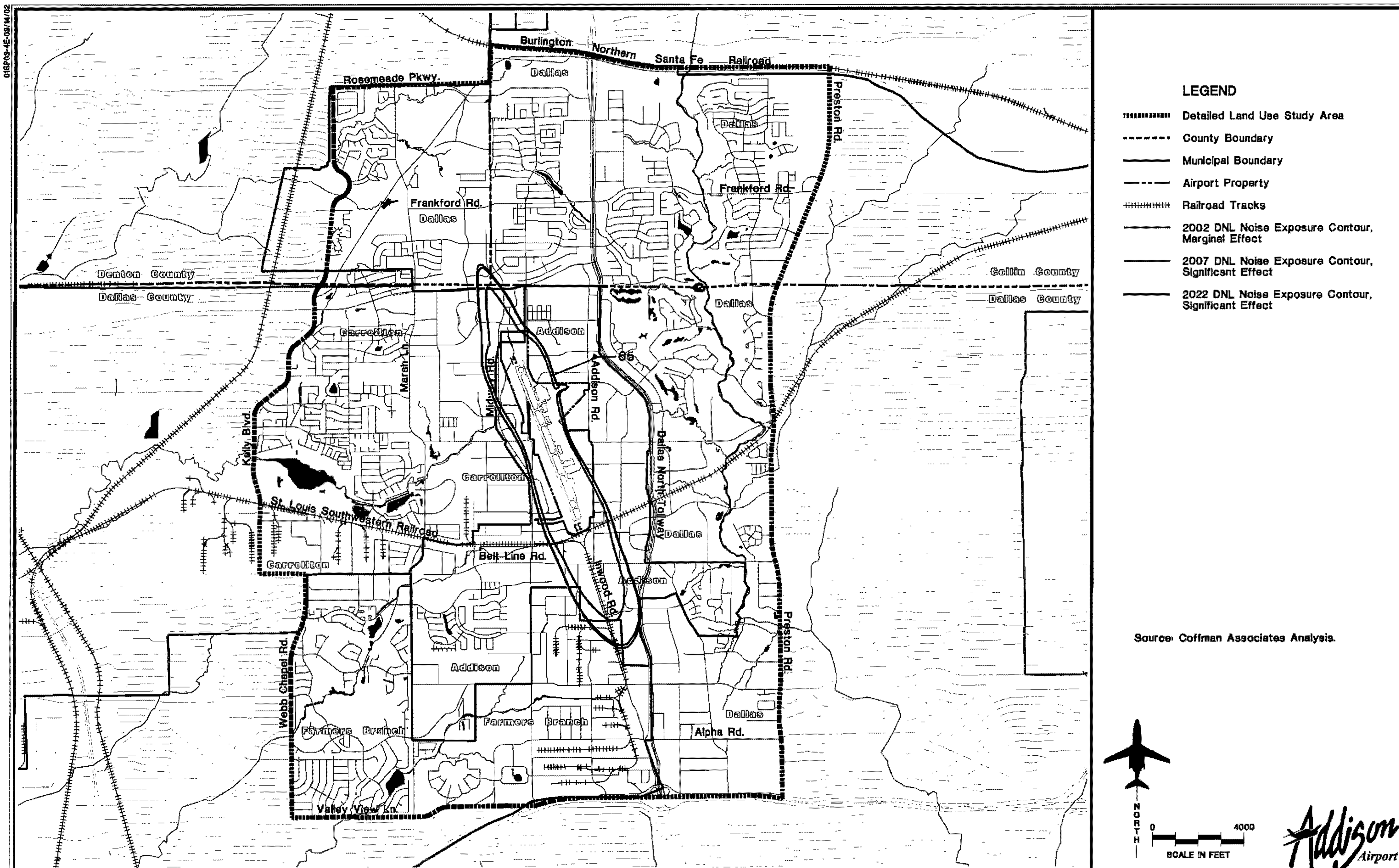


Exhibit 4E
NOISE EXPOSURE CONTOUR COMPARISON

Appendix A
WELCOME TO THE PLANNING ADVISORY COMMITTEE

Addison! Airport

WELCOME TO THE PLANNING ADVISORY COMMITTEE

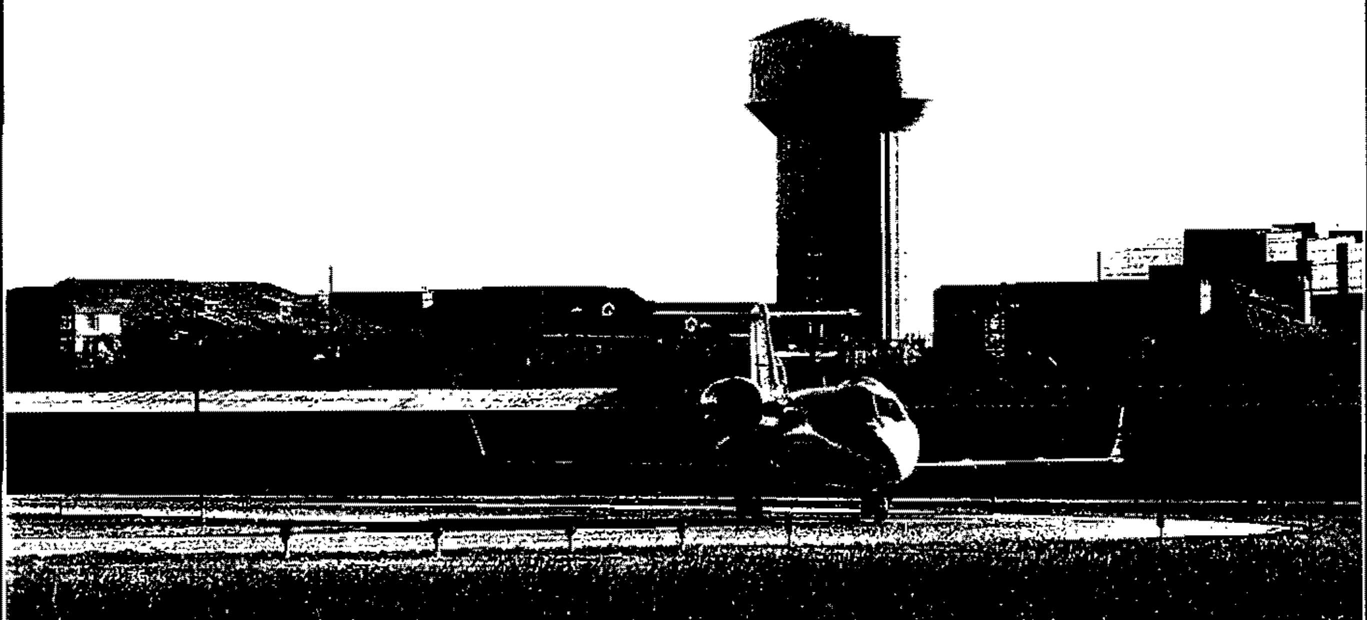
Addison! Airport

The Town of Addison and its consultant, Coffman Associates, Inc., are pleased to welcome you to the Planning Advisory Committee (PAC) for the F.A.R. Part 150 Noise Compatibility Study Update. We appreciate your interest in this Study. Over the next several months you will be able to make an important contribution to the project. We believe that you will find your participation with the committee to be an interesting and rewarding experience.

WHAT IS A NOISE COMPATIBILITY STUDY?

The impact of aircraft noise on development around airports has been a major environmental issue in the United States for many years. After years of study and demonstration programs, Congress authorized full-scale Federal support for airport noise compatibility programs through the Aviation Safety and Noise Abatement Act of 1979. In response to that Act, the Federal Aviation Administration (FAA) adopted a Federal Aviation Regulation (F.A.R. Part 150) to set minimum standards for the preparation of such studies.

A Noise Compatibility Program is intended to promote aircraft noise control and land use compatibility. Three things make such a study unique: (1) it is the only comprehensive approach to preventing and reducing airport noise and community land use conflicts; (2) eligible items in the approved plan may be funded from a special account in the Federal Airport Improvement Program; (3) it is the only kind of



airport study sponsored by the FAA primarily for the benefit of airport neighbors.

The principal objectives of any Noise Compatibility Program are to:

- Identify the current and projected aircraft noise levels and their impact on the airport environs.
- Propose ways to reduce the impact of aircraft noise through changes in aircraft operations or airport facilities.
- In undeveloped areas where aircraft noise is projected to remain, encourage future land use which is compatible with the noise, such as agriculture, commercial or industrial.
- In existing residential areas which are expected to remain impacted by noise, determine ways of reducing the adverse impacts of noise.
- Establish procedures for implementing, reviewing, and updating the plan.

WHAT IS THE ROLE OF THE COMMITTEE?

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

- Sounding Board - The consultants need a forum in which to present information, findings, ideas, and recommendations during the course of the study. Everyone involved with the study will benefit from this forum because it allows diverse interests an opportunity to experience the viewpoints, ideas, and concerns of other members directly.
- Linkage to the Community-Each of you represents one or more constituent interests -- neighborhood residents, local businesses, public agencies, and aviation users. As a committee member, you can bring together the consultant and the people you represent, you can inform your constituents about the study as it progresses, and you can bring into the committee the views of others.
- Resource - An airport noise compatibility study is very complex; it has an almost unlimited demand for information. Many of you have access to specialized information and can ensure that it is used in the study to its fullest potential.
- Think Tank - "Too many cooks spoil the broth" reflects the difficulty committees have in writing a report. On the other hand, "two heads are better than one" tells us that creative thinking is best accomplished by a group of concerned people who represent a

diversity of backgrounds and views on a subject. We need all of the creative input we can get. PAC member ideas have literally "made the difference" on other studies of this type across the country.

- Critical Review - The study team needs their work scrutinized closely for accuracy, completeness of detail, clarity of thought, and intellectual honesty. We want you to point out any shortcomings in our work and to help us improve on it.

- Implementation - A Part 150 Noise Compatibility Plan depends on the actions of many different agencies and organizations for implementation. Each of you has a unique role to play in implementing the plan and demonstrating leadership among your constituent interests. Inform and educate them about the importance of your effort on their behalf and work with them to see that the final plan is carried out.

WHO IS ON THE COMMITTEE?

Many organizations have been contacted and invited to designate representatives to serve on the PAC. The attached list of invited officials and organizations shows a broad range of interests to be represented -- local businesses and residents, pilots, fixed-base operators, national aviation organizations, and state and local governments.

HOW WILL THE PAC OPERATE?

The PAC will operate as informally as possible -- no compulsory attendance, and no voting. The meetings will be conducted by the consultant and will be called at milestone points in the study (a total of five) when committee input is especially needed. Ordinarily, meetings will be scheduled with sufficient advance notice to permit you to arrange your schedule.

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

We will hold five public information workshops during the preparation of the study so that we may report to the community at large and elicit their views and input. We strongly urge you to represent the PAC at the evening workshops. The workshops will be organized to maximize the opportunity for two-way communication. At these important meetings, you will have the chance to hear from local citizens and share your views and expertise with them.

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

To help you keep your materials organized, we will give you a study workbook (a three-ring binder with a special cover and tab dividers) to hold working papers, technical information papers, PAC membership lists, meeting notes, and other resource material.

WHERE CAN YOU GET MORE INFORMATION?

For specific information about the study, please contact:

James C. Pierce, JR., P.E.
Assistant Public Works Director
Town of Addison
16801 Westgrove Drive
Addison, TX 75001-9010
(972) 450-2879
jpierce@ci.addison.tx.us

Jim Harris, P.E.
Project Manager
Coffman Associates, Inc.
11022 N 28th Drive, Suite 240,
Phoenix, AZ 85029
(602) 993-6999
jmharris@coffmanassociates.com

David Fitz, A.I.C.P.
Senior Associate
Coffman Associates, Inc.
237 N.W. Blue Parkway, Suite 100,
Lee's Summit, MO 64063
(816) 524-3500
dfitz@coffmanassociates.com

ADDISON AIRPORT MASTER PLAN/ F.A.R. PART 150 NOISE COMPATIBILITY STUDY PLANNING ADVISORY COMMITTEE (PAC)			
Name	**Representing**	**Address**	**Phone/FAX**
Jim Pierce Assistant Director of Public Works	TOWN OF ADDISON	P.O. Box 9010 Addison, TX 75001	972-450-2879 972-450-2837
David Pearce Airport Manager	ADDISON AIRPORT	4651 Airport Pkwy. Addison, TX 75001	972-392-4855 972-788-9334
Alvin DeVane Air Traffic Manager	FAA	16000 Dooley Road Addison, TX 75001	214-239-3725 214-490-4338
Rick Compton & Nan Terry Airport Planner	FAA, SOUTHWEST REGION	2601 Meacham Blvd. Ft. Worth, TX 76137	817-222-5608 817-222-5989
Bruce Ehly Airport Planner	TEXAS DEPARTMENT OF TRANSPORTATION	150 E. Riverside Dr. South Tower, 5th Fl. Austin, TX 78704	
Charles Heath President	ADDISON BUSINESS ASSOCIATION	200 Professional Plaza 1 1 Medical Pkwy., Suite 200 Farmers Branch, TX 75234	972-247-8023 972-247-8095
Jerry Hooper Regional Representative	AIRCRAFT OWNERS & PILOTS ASSOCIATION	3332 Ball Dr. Corpus Christi, TX 78418	
Paul Smith Regional Representative	NATIONAL BUSINESS AIRCRAFT ASSOCIATION	30124 Sawgrass Trail Georgetown, TX	512-869-4167 512-869-1807
Julie Dunbar	NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS	P.O. Box 5888 Arlington, TX 76005-5888	817-640-3300
Carmen Moran	TOWN OF ADDISON DEVELOPMENT SERVICES	P.O. Box 9010 Addison, TX 75001	972-450-7018 972-450-7043
John Webb	CITY OF CARROLLTON PLANNING DEPARTMENT	P.O. Box 110535 Carrollton, TX 75011	972-466-3040
Sherell Cockrell Planning Dept. Director	CITY OF DALLAS PLANNING DEPARTMENT	1500 Marilla, 5DN Dallas, TX 75201	214-670-4127

ADDISON AIRPORT
MASTER PLAN/
F.A.R. PART 150 NOISE COMPATIBILITY STUDY
PLANNING ADVISORY COMMITTEE (PAC) (Continued)

Name	Representing	Address	Phone/FAX
Kaiser Rangwala	CITY OF FARMERS BRANCH PLANNING DEPARTMENT	P.O. Box 819010 Farmers Branch, TX 75381	972-247-3131
	CITY OF PLANO PLANNING DEPARTMENT		
Mark Acevedo	TOWN OF ADDISON	P.O. Box 9010 Addison, TX 75001	972-450-2848 972-450-2825
Chris Terry	TOWN OF ADDISON	P.O. Box 9010 Addison, TX 75001	972-450-7010 972-450-2834
Brian Langley	TOWN OF ADDISON	P.O. Box 9010 Addison, TX 75001	972-450-7090 972-450-7096
Vince Hilgeman	FIXED BASE OPERATOR MERCURY AIR	4400 Glen Curtis Addison, TX 75001	972-930-0216 972-267-7909
Jack Hopkins	FIXED BASE OPERATOR Million Air	4300 Westgrove Dr. Addison, TX 75001	972-248-1600 972-733-9803
Ed Morales	FIXED BASE OPERATOR Addison Express	4505 Claire Chennault Addison, TX 75001	972-713-7000 972-380-0046
Bonnie Tyler	CITIZEN REPRESENTATIVE	17106 Planters Row Addison, TX 75001	972-250-3079
Elizabeth Knott	CITIZEN REPRESENTATIVE		
Albert Jandura	CITIZEN REPRESENTATIVE		
Sue Halpern	CITIZEN REPRESENTATIVE		
Janise Neiman	CITIZEN REPRESENTATIVE	14921 Bellbrook Addison, TX 75240	972-387-3135 972-386-1857
John Cummings	CITIZEN REPRESENTATIVE	3817 Azure Lane Addison, TX 75001	972-247-1384
Bob Barrett	CITIZEN REPRESENTATIVE City Council	14637 Lexus Ave. Addison, TX 75001	972-386-7944
Al Ranyk	TENANT REPRESENTATIVE FLIGHT SCHOOL/BAR	4700 Airport Pkwy. Addison, TX 75001	972-701-8718 972-866-7513

ADDISON AIRPORT
MASTER PLAN/
F.A.R. PART 150 NOISE COMPATIBILITY STUDY
PLANNING ADVISORY COMMITTEE (PAC) (Continued)

Name	Representing	Address	Phone/FAX
Ron Fredericks	TENANT REPRESENTATIVE Mission Air	4600 Claire Chennault Addison, TX 75001	972-248-4500 972-248-2215
Mike Tiller	TENANT REPRESENTATIVE Pizza Hut/AABOA		972-267-4898 972-267-0939
Keith Brailey	Northern Trust Bank	16475 Dallas Pkwy. Addison, TX 75001	972-931-2345
Tracy Eubanks	Mapsco, Inc.	4181 Centurion Way Addison, TX 75001	214-521-2131

Appendix B
COORDINATION, CONSULTATION AND PUBLIC INVOLVEMENT

Addison! Airport

Appendix B
COORDINATION, CONSULTATION, AND PUBLIC INVOLVEMENT

F.A.R. Part 150
Noise Compatibility Study Update
Addison Airport

INTRODUCTION

As part of the planning process, the public, airport users, and local, state, and federal agencies were given the opportunity to review and comment on the Noise Exposure Maps (NEM) and supporting documentation. Materials prepared by the consultant were submitted for local review, discussion, and revision at several points during the process.

Much of the local coordination was handled through a special study committee formed specifically to provide advice and feedback on the Part 150 Noise Compatibility Study. Known as the Planning Advisory Committee (PAC), it included representatives of all affected groups, including local residents; airport users; officials from the towns of Addison, Farmers Branch, and Carrollton and the cities of Dallas and Plano; local businesses; aviation organizations; fixed based operator; the Texas Department of Transportation, and the Federal Aviation Administration (FAA). (A list of the PAC members is presented in **Appendix A**.)

The PAC reviewed and commented on the working papers prepared by the consultant, and provided guidance for the next phase of the study. Most comments were made orally during the meetings, and some were followed by written confirmation. All comments were appropriately incorporated into this document or otherwise addressed.

The PAC met two times during the preparation of the Noise Exposure Maps (NEM). The first meeting was held on January 24, 2002 to introduce the participants, describe the study process, discuss goals and objectives, distribute the study workbooks, and hear comments and views pertaining to conditions at the airport.

The second PAC meeting was held on May 23, 2002. Chapter One (Inventory), Chapter Two (Aviation Noise), and Chapter Three (Noise Impacts) were discussed.

Following the PAC meetings the general public was invited to a series of Public Information Workshops. These workshops were structured as an informal open-house, with display boards and information posted throughout the meeting room. The meetings allowed citizens to acquire information about the F.A.R. Part 150 Study process, aircraft operations, baseline noise analysis, and noise impacts; ask questions; and express concerns. The meetings were also intended to encourage two-way communication between the airport staff, consultants and local citizens.

In addition to the formal meetings, many written and verbal contacts were also made between project management staff and officials of local, state and federal agencies, representatives of various aviation user groups, and local residents. These were related to the day-to-day management of the project, as well as the resolution of specific questions and concerns arising from the working papers.

A supplemental volume entitled "Supporting Information on Project Coordination and Local Consultation" contains detailed information in support of the Noise Exposure Maps document. It includes copies of meeting announcements, summary notes from the meetings, sign-in sheets, and all written comments received on the Noise Exposure Maps study.

Appendix C
LOCAL ZONING PROVISIONS

Appendix C
LOCAL ZONING PROVISIONS

Contained in this appendix are a series of tables which summarize the zoning ordinances in each of the jurisdictions being evaluated as part of this noise compatibility study. Each table contains a list of the noise-sensitive uses allowed in each zone as well as the minimum lot size or density of dwelling units allowed per acre. Additional details of each zoning ordinance were provided in Chapter One, Inventory, of this document.

The following jurisdiction's zoning ordinances are summarized on the following pages.

- Town of Addison's zoning ordinance is summarized in **Table C1** beginning on page C-2.
- City of Carrollton's zoning ordinance is summarized in **Table C2**, beginning on page C-9.
- City of Farmers Branch's zoning ordinance is summarized in **Table C3**, beginning on page C-21.
- City of Dallas' zoning ordinance is summarized in **Table C4**, beginning on page C-25.

TABLE C1
Summary of Zoning Provisions:
Town of Addison

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
R-1, Single-family Dwelling	Single-family dwellings Churches Schools Libraries Day nurseries	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	12,000 s.f.
R-2, Single-family Dwelling	Single-family dwellings Churches Schools Libraries Day nurseries	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	9,000 s.f.
R-3, Single-family Dwelling	Single-family dwellings Churches Schools Libraries Day nurseries	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	7,500 s.f.

TABLE C1 (Continued)
Summary of Zoning Provisions:
Town of Addison

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
"A" Apartment	Two-family dwelling Multiple-family dwellings	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes Lodges, fraternities and sorority houses, boarding houses Dental and medical offices	Minimum lot size is 1 acre. Minimum lot area per dwelling unit is 1,400 s.f. for each efficiency, 1,600 s.f. for each 1 bedroom, 1,800 s.f. for each 2 bedroom, and 2,000 s.f. for each 3 bedroom.
LR, Local Retail	Libraries Mortuaries Dance and music studios	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	None

TABLE C1 (Continued)
Summary of Zoning Provisions:
Town of Addison

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
C-1, Commercial - 1	Medical and dental offices Mortuaries Dance and music studios	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes Homes for the insane, alcoholics, feeble-minded, and narcotics Trailer parks	None
C-2, Commercial - 2	Medical and dental offices Mortuaries Dance and music studios	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes Homes for the insane, alcoholics, feeble-minded, and narcotics Trailer parks	None

TABLE C1 (Continued)
Summary of Zoning Provisions:
Town of Addison

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
I-1, Industrial - 1	Medical and dental offices Mortuaries Dance and music studios	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	None
I-2, Industrial - 2	Medical and dental offices Mortuaries Dance and music studios	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	None
I-3, Industrial - 3	Medical and dental offices Mortuaries Dance and music studios	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	None

TABLE C1 (Continued)
Summary of Zoning Provisions:
Town of Addison

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
PD - Planned Development	Any and all uses allowed	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	None
PDTC - Planned Development, Townhouse/ condominium	Condominiums Townhomes Community centers	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	Density shall not exceed 18 d.u./acre
PDCC, Planned Development, Condominium/conversions	Condominiums Community centers	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	None

TABLE C1 (Continued)
Summary of Zoning Provisions:
Town of Addison

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
MXR - Mixed Use Residential (low-density subdistrict)	Single-family dwellings Day nurseries	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	5.5 units/acre
MXR - Mixed Use Residential (medium-density subdistrict)	Single-family dwellings Two-family dwellings Three-plexes Four plexes Rowhouses City homes Day nurseries	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	12 units/acre
MXR - Mixed Use Residential (high-density subdistrict)	Single-family dwellings Two-family dwellings Three plexes Four plexes Rowhouses City homes Townhomes Condominiums Day nurseries	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	24 units/acre

TABLE C1 (Continued)
Summary of Zoning Provisions:
Town of Addison

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
UC - Urban Center	Rowhomes Townhomes Condominiums Multifamily dwellings Hotels Motels Dance and music studios Retirement homes Medical services Community centers	Private schools Kindergartens Nurseries Religious, educational, or philanthropic institutions Day nurseries Hotels and motels Hospitals Children's homes Convalescent homes Old people's homes Maternity homes	

TABLE C2
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
IH - Interim Holding District	Single-family dwelling unit Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community center	Mobile home park Convent or monastery Adult day care Daycare center Kindergarten Private or denominational school	5 acres
SF-12/20 - Single-family Residential	Single-family dwelling unit Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	12,000 s.f.
SF-10/18 - Single-family Residential	Single-family dwelling unit Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	10,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
SF-8.4/18 - Single-family Residential	Single-family dwelling unit Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	8,400 s.f.
SF-8.4/16 - Single-family Residential	Single-family dwelling unit Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	8,400 s.f.
SF-7/16 - Single-family Residential	Single-family dwelling unit Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	7,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
SF-7/14 - Single-family Residential	Single-family dwelling unit Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	7,000 s.f.
SF-6.5/12 - Single-family Residential	Single-family dwelling unit Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	6,500 s.f.
SF-PH - Single-family Patio Home	Single-family dwelling unit Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	5,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
SF-A - Single-family Attached Residential	Single-family dwelling unit, attached Townhouse Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	4,250 s.f.
SF-TH - Single-family Townhouse Residential	Single-family dwelling unit, attached Townhouse Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	3,500 s.f.
D - Duplex Residential	Single-family dwelling unit, attached Duplex Community home for disabled persons Rectory or Parsonage Public school Church, synagogue, or temple Library Museum Community Center	Adult daycare Daycare center Kindergarten Private or denominational school	8,500 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
T - Tri-plex Residential	Tri-plex Community home for disabled persons Rectory or Parsonage	Boarding, lodging or rooming house College dormitory; fraternity or sorority house Convent or Monastery Hospice Maternity home Orphanage Other group quarters Adult daycare Daycare center Kindergarten Private or denominational school	10,000 s.f.
F - Four-plex Residential	Four-plex Tri-plex Community home for disabled persons Rectory or Parsonage	Boarding, lodging or rooming house College dormitory; fraternity or sorority house Convent or Monastery Hospice Maternity home Orphanage Other group quarters Adult daycare Daycare center Kindergarten Private or denominational school	10,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
MF-12 - Multi-family Residential	Apartment house or complex Four-plex Housing project Tri-plex Community home for disabled persons Rectory or Parsonage	Boarding, lodging or rooming house College dormitory; fraternity or sorority house Convent or Monastery Hospice Maternity home Orphanage Other group quarters Adult daycare Daycare center Kindergarten Private or denominational school	10,000 s.f.
MF-15 - Multi-family Residential	Apartment house or complex Four-plex Housing project Tri-plex Community home for disabled persons Rectory or Parsonage	Boarding, lodging or rooming house College dormitory; fraternity or sorority house Convent or Monastery Hospice Maternity home Orphanage Other group quarters Adult daycare Daycare center Kindergarten Private or denominational school	10,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
MF-18 - Multi-family Residential	Apartment house or complex Four-plex Housing project Tri-plex Community home for disabled persons Rectory or Parsonage	Boarding, lodging or rooming house College dormitory; fraternity or sorority house Convent or Monastery Hospice Maternity home Orphanage Other group quarters Adult daycare Daycare center Kindergarten Private or denominational school	10,000 s.f.
MHP - Mobile Home Park Residential	Mobile home Mobile home park Community home for disabled persons Rectory or Parsonage	Adult daycare Daycare center Kindergarten Private or denominational school	7,000 s.f.
O-1 - Office	Rectory or parsonage Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Convent or monastery Hospice Maternity home Orphanage Other group quarters Schools Adult daycare Convalescent or rest home	10,000 s.f.
O-2 - Office	Rectory or parsonage Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Convent or monastery Hospice Maternity home Orphanage Other group quarters Schools Adult daycare Convalescent or rest home	10,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

Zoning Districts	Noise-Sensitive Uses: Permitted	Noise-Sensitive Uses: Conditional	Minimum Lot Size or Density Units/Acre
O-3 - Office	Rectory or parsonage Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Convent or monastery Hospice Maternity home Orphanage Other group quarters Schools Adult daycare Convalescent or rest home	30,000 s.f.
O-4 - Office	Rectory or parsonage Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Convent or monastery Hospice Maternity home Orphanage Other group quarters Schools Convalescent or rest home Adult daycare	40,000 s.f.
NS - Neighborhood Services	Rectory or parsonage Public schools Churches Community Center Medical services	Convent or monastery Hospice Maternity home Orphanage Other group quarters Daycare Kindergarten Private Schools Adult daycare	6,000 s.f.
LR-1 - Local Retail	Rectory or parsonage Correspondence school Dance school Public school Churches Library Museum Community Center Medical services	Convent or monastery Hospice Maternity home Orphanage Other group quarters Daycare center Kindergarten Private school Adult daycare Convalescent or rest home	6,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
LR-2 - Local Retail	Rectory or parsonage Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Convent or monastery Hospice Maternity home Orphanage Other group quarters Schools Adult daycare Convalescent or rest home	6,000 s.f.
LC - Light Commercial	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Convent or monastery Hospice Maternity home Orphanage Other group quarters Schools Amphitheater Drive-in movie Adult daycare Convalescent or rest home	10,000 s.f.
HC - Heavy Commercial	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Schools Amphitheater Drive-in movie Adult daycare Convalescent or rest home	10,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
C/W - Commercial/Warehouse	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Schools Amphitheater Drive-in movie Adult daycare Convalescent or rest home	12,500 s.f.
FWY - Freeway	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Schools Amphitheater Adult daycare Convalescent or rest home	40,000 s.f.
I-35E - Interstate Overlay	Uses allowed in underlying zone	Uses allowed in underlying zone	10,000 s.f.
IP - Limited Industrial/Industrial Park	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Community Center Medical services	College dormitory; fraternity or sorority house Schools Amphitheater Adult daycare	20,000 s.f.

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
LI - Light Industrial	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Drive-in movie Community Center Medical services	College dormitory; fraternity or sorority house Schools Amphitheater Adult daycare Convalescent or rest home	12,500 s.f.
HI - Heavy Industrial	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Drive-in movie Community Center Medical services	College dormitory; fraternity or sorority house Schools Amphitheater Adult daycare Convalescent or rest home	12,500 s.f.
PD - Planned Development	Any and all uses allowed	none	none
ODC - Old Downtown Commercial District	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Medical services	Bed and breakfast inn Hotel, motel, or other transient lodging	none

TABLE C2 (Continued)
Summary of Zoning Provisions:
City of Carrollton

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
CC - Corporate Commercial	Rectory or parsonage Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Schools Churches Library Museum Medical services Community Center	Bed and breakfast inn Hotel, motel or other transient lodging Residential hotel Amphitheater Adult daycare	40,000 s.f.
GWY - Gateway Overlay District	Uses allowed in underlying zone	Uses allowed in underlying zone	40,000 s.f.

TABLE C3
Summary of Zoning Provisions:
City of Farmers Branch

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
R-1 - One-family Residential	One-family dwelling Community center	Community unit development Church school Church	1 acre
R-2 - One-family Residential	One-family dwelling Community center	Community unit development Church school Church	13,000 s.f.
R-3 - One-family Residential	One-family dwelling Community center	Community unit development Church school Church Schools	10,000 s.f.
R-4 - One-family Residential	One-family dwelling Community center	Community unit development Church school Church Schools	10,000 s.f.
R-5 - One-family Residential	One-family dwelling Community center	Community unit development Church school Church Schools	8,700 s.f.
R-6 - One-family Residential	One-family dwelling Community center	Community unit development Church school Church Schools	8,700 s.f.
D-1 - Two-family Residential	One-family dwelling Two-family dwelling Church school Church Community center	Community unit development Schools	4,350 s.f./d.u.
D-2 - Two-family Residential	One-family dwelling Two-family dwelling Church school Church Community center	Community unit development Schools	3,750 s.f./d.u.

TABLE C3 (Continued)
Summary of Zoning Provisions:
City of Farmers Branch

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
MF-1 - Multiple-family Residential	One-family dwelling One-family dwelling, attached Two-family dwelling Multiple-family dwelling Apartment Church school Church Community center	Community unit development Schools	3,500 s.f./d.u.
MF-2 - Multiple-family Residential	One-family dwelling One-family dwelling, attached Two-family dwelling Multiple-family dwelling Apartment Church school Church Community center	Community unit development Schools	2,720 s.f./d.u.
MF-3 - Multiple-family Residential	One-family dwelling One-family dwelling, attached Two-family dwelling Multiple-family dwelling Apartment Church school Church Community center	Community unit development Schools	1,800 s.f./d.u.
MF-4 - Multiple-family Residential	One-family dwelling One-family dwelling, attached Two-family dwelling Multiple-family dwelling Apartment Church school Church Community center	Community unit development Schools	1,800 s.f./d.u.
O - Office	Church school Church Schools Community center Medical offices	Hotel or motel Adult daycare	none

TABLE C3 (Continued)
Summary of Zoning Provisions:
City of Farmers Branch

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
LR-1 - Local Retail	Church school Church Schools Community center Medical offices	Adult daycare	none
LR-2 - Local Retail	Church school Church Schools Community center Medical offices	Adult daycare Animal hospital	none
C - Commercial	Boarding or rooming house Trailer or mobile home for caretaker or watchman Church school Church Schools Community center Medical offices	Hotel or motel Adult daycare Drive-in theater Animal hospital	none
LI - Light Industrial	Trailer or mobile home for caretaker or watchman Church school Church Schools Community center Animal hospital Medical offices	Hotel or motel Adult daycare Drive-in theater	none
HI - Heavy Industrial	Trailer or mobile home for caretaker or watchman Church school Church Schools Community center Animal hospital Medical offices	Hotel or motel Drive-in theater	none

TABLE C3 (Continued)
Summary of Zoning Provisions:
City of Farmers Branch

Zoning Districts	Noise-Sensitive Uses: Permitted	Noise-Sensitive Uses: Conditional	Minimum Lot Size or Density Units/Acre
I-RU - Institutional-Religious Uses	Worship facility	Adult daycare Church school Daycare Nursing home Rectory, Monastery, or Convent Schools	2 acres
PD - Planned Development	Multiple-family dwelling Apartment Two-family dwelling Church school Church Schools Community center Animal hospital Medical offices Medical center/hospital	Hotel or motel	600 s.f./d.u. - 7,500 s.f./d.u. Lot size is determined by the type of structure to be placed on the lot.

TABLE C4
Summary of Zoning Provisions:
City of Dallas

Zoning Districts	Noise-Sensitive Uses: Permitted	Noise-Sensitive Uses: Conditional	Minimum Lot Size or Density Units/Acre
A - Agricultural	Church Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools Convalescent and nursing homes Hospitals	3 acres
R-1ac - Residential	Church Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools	1 acre
R-1/2ac - Residential	Church Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools	0.5 acres
R-16 - Residential	Church Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools	16,000 s.f.
R-13 - Residential	Church Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools	13,000 s.f.
R-10 - Residential	Church Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools	10,000 s.f.

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
R-7.5 - Residential	Church Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools	7,500 s.f.
R-5 - Residential	Church Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools	5,000 s.f.
D(A) - Duplex	Church Duplex Single-family dwelling	Adult daycare Child care facility College Convent or monastery Library Schools	6,000 s.f.
TH-1(A) - Townhouse Residential	Church Duplex Single-family dwelling	Adult daycare Child care facility College Convalescent or nursing homes Convent or monastery Library Schools	6 d.u./acre
TH-2(A) - Townhouse Residential	Church Duplex Single-family dwelling	Adult daycare Child care facility College Convalescent or nursing homes Convent or monastery Library Schools	9 d.u./acre

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
TH-3(A) - Townhouse Residential	Church Duplex Single-family dwelling	Adult daycare Child care facility College Convalescent or nursing homes Convent or monastery Library Schools Retirement housing	12 d.u./acre
CH - Clustered Housing	Church Duplex Multifamily dwelling Retirement housing Single-family dwelling	Adult daycare Child care facility College Convalescent or nursing homes Convent or monastery Library Schools	18 d.u./acre
MF-1(A) - Multifamily Residential	Church Lodging or boarding house College dormitory Duplex Multifamily dwelling Retirement housing Single-family dwelling	Adult daycare Child care facility College Convalescent or nursing homes Convent or monastery Library Schools Hospitals	3,000 s.f.
MF-2(A) - Multifamily Residential	Church Lodging or boarding house College dormitory Duplex Multifamily dwelling Retirement housing Single-family dwelling	Adult daycare Child care facility College Convalescent or nursing homes Convent or monastery Library Schools Hospitals	1,000 s.f.

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
MF-3(A) - Multifamily Residential	Church Lodging or boarding house College dormitory Multifamily dwelling Retirement housing	Adult daycare Child care facility College Convalescent or nursing homes Convent or monastery Library Schools Hospitals	6,000 s.f.
MF-4(A) - Multifamily Residential	Church Lodging or boarding house College dormitory Multifamily dwelling Retirement housing	Adult daycare Child care facility College Convalescent or nursing homes Convent or monastery Library Schools Hospitals	6,000 s.f.
MH(A) - Mobile Home	Church College dormitory Manufactured home park Single-family dwelling	Adult daycare Childcare facility Library Schools	1 d.u./4,000 s.f.
NO(A) - Neighborhood Office	Church Convent or monastery Library Medical clinic	Adult daycare Childcare facility College Schools College dormitory	none
LO-1 - Limited Office-1	Church College Convent or monastery Library Medical clinic College dormitory	Adult daycare Childcare facility Schools	none
LO-2 - Limited Office-2	Church College Convent or monastery Library Medical clinic College dormitory	Adult daycare Childcare facility Schools	none

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
LO-3 - Limited Office-3	Church College Convent or monastery Library Medical clinic College dormitory	Adult daycare Childcare facility Schools	none
MO-1 - Mid-range Office-1	Church College Convent or monastery Library Medical clinic College dormitory	Adult daycare Childcare facility Schools Hotel or motel	none
MO-2 - Mid-range Office-2	Church College Convent or monastery Library Medical clinic College dormitory	Adult daycare Childcare facility Schools Hotel or motel	none
GO(A) - General Office	Church College Convent or monastery Library Medical clinic College dormitory	Adult daycare Childcare facility Schools Hotel or motel Duplexes Multi-family dwelling Single-family dwelling	none
NS(A) - Neighborhood Service	Adult daycare Childcare facility Church Convent or monastery Library Medical clinic	College Schools College dormitory	none
CR - Community Retail	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory	Schools Hotel or motel Lodging or boarding house	none

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
RR - Regional Retail	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory	Schools Hotel or motel Lodging or boarding house	none
CS - Commercial Service	Adult daycare Childcare facility Church College Lodging or boarding house Medical clinic College dormitory	Schools Hotel or motel Drive-in theater	none
LI - Light Industrial	Adult daycare Childcare facility Church College Lodging or boarding house Medical clinic	Schools Hotel or motel	none
IR - Industrial Research	Adult daycare Childcare facility Church College Lodging or boarding house Medical clinic	Schools Hotel or motel	none
IM - Industrial Manufacturing	Adult daycare Childcare facility Church College Medical clinic	Schools Hotel or motel Lodging or boarding house Drive-in theater	none

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
CA-1(A) – Central Area-1	Adult daycare Childcare facility Church College Convalescent and nursing homes Convent or monastery Hospital Library Schools Hotel or motel Lodging or boarding house Medical clinic College dormitory Duplex Multi-family dwelling Retirement housing Single-family dwelling	none	none
CA-2(A) – Central Area-2	Adult daycare Childcare facility Church College Convalescent and nursing homes Convent or monastery Hospital Library Schools Hotel or motel Lodging or boarding house Medical clinic College dormitory Duplex Multi-family dwelling Retirement housing Single-family dwelling	none	none

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
MU-1 - Mixed Use-1	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory Duplex Multi-family dwelling Retirement housing Single-family dwelling	Convalescent and nursing home Hospital Schools Hotel or motel	none
MU-2 - Mixed Use-2	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory Duplex Multi-family dwelling Retirement housing	Convalescent and nursing home Hospital Schools Hotel or motel	none
MU-3 - Mixed Use-3	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory Duplex Multi-family dwelling Retirement housing	Convalescent and nursing home Hospital Schools Hotel or motel	none

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
MC-1 - Multiple Commercial-1	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory	Hospital Schools Hotel or motel	none
MC-2 - Multiple Commercial-2	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory	Hospital Schools Hotel or motel	none
MC-3 – Multiple Commercial-3	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory	Hospital Schools Hotel or motel	none
MC-4 – Multiple Commercial-4	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic College dormitory	Hospital Schools Hotel or motel	none

TABLE C4 (Continued)
Summary of Zoning Provisions:
City of Dallas

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
UC-1 – Urban Corridor	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic Community centers Hospitals Schools Multi-family dwellings Theater	Surgical center	10 d.u./acre
UC-2 – Urban Corridor	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic Community centers Hospitals Schools Multi-family dwellings Theater	Surgical center	35 d.u./acre
UC-3 – Urban Corridor	Adult daycare Childcare facility Church College Convent or monastery Library Medical clinic Community centers Hospitals Schools Multi-family dwellings Theater	Surgical center	45 d.u./acre
P(A) - Parking	none	none	None

Appendix D
EVALUATION OF CURRENT NOISE COMPATIBILITY PROGRAM

Addison! Airport

Appendix D
EVALUATION OF CURRENT NOISE COMPATIBILITY PROGRAM

F.A.R. Part 150
Noise Compatibility Study Update
Addison Airport

The current Noise Compatibility Plan (NCP) was completed in March 1991. The primary objective of the Plan was to improve the compatibility between Addison Airport aircraft operations and noise-sensitive land uses within the airport environs, while allowing the airport to continue to serve its role in the community, region, and nation. This appendix will focus on the following:

- A comparison of the previous and current aircraft operations and noise exposure contours.
- A comparison of the previous and current dwelling units exposed to aircraft noise.
- The current status of recommendations made in the previous Noise Compatibility Program.

AIRCRAFT OPERATIONS AND NOISE EXPOSURE CONTOUR COMPARISON

Input assumptions for generating noise exposure contours have changed significantly for Addison Airport. Total aircraft operations for the base year (1987) of the 1991 F.A.R. Part 150 Airport Noise Compatibility Study for Addison Airport were lower than what is currently being experienced at the airport. The single engine aircraft category experienced a subtle increase, growing from 74,152 in 1987 to 88,444 in 2002. Multi-engine aircraft operations experienced the greatest decline with operations in this category decreasing from 63,208 to 46,480 since 1987. Helicopter operations also experienced a significant decrease in operations going from 6,311 operations in 1987 to 3,231 operations in 2002. The air carrier aircraft category is the only category that experienced a large increase in activity from 1987 to 2002 with operations going from 14,200 to 32,270, respectively. **Table D1** shows an operation comparison of the 1987, 1993 (forecast), and 2002 annual operations.

TABLE D1
Aircraft Operations Comparison
Addison Airport

Aircraft Category	1987 Operations[1]	1993 Operations[1]	2002 Operations[2]
Operations/Day by Aircraft Category			
Single-Engine	74,152	82,922	88,444
Multi-Engine	63,208	75,622	46,480
Jet	14,200	21,632	32,270
Helicopter	6,311	6,500	3,231
Total Annual Aircraft Operations			
All Categories	157,771	186,676	170,425

Sources:
1 Addison Airport F.A.R. Part 150 Airport Noise Compatibility Study, Barnard Dunkelberg & Company, and Mestre Greve Associates.
2 Addison Air Traffic Control Tower 2001.

A comparison of the overall size and shape of the 1987 baseline noise contours and the current 2002 noise contours is depicted in **Exhibit D1**. The 2002 contours are shaped differently and are significantly smaller than the 1987 contours. While the width of the contours are similar, the length of the 1987 contours is significantly longer than the 2002 contours. This is most likely the result of the introduction of quieter aircraft to the airport in past years along with a change in the fleet mix utilizing the airport.

The overall areas encompassed within the noise contours are depicted in **Table D2** and provide an indication of the reduction of aircraft noise in the vicinity of the airport.

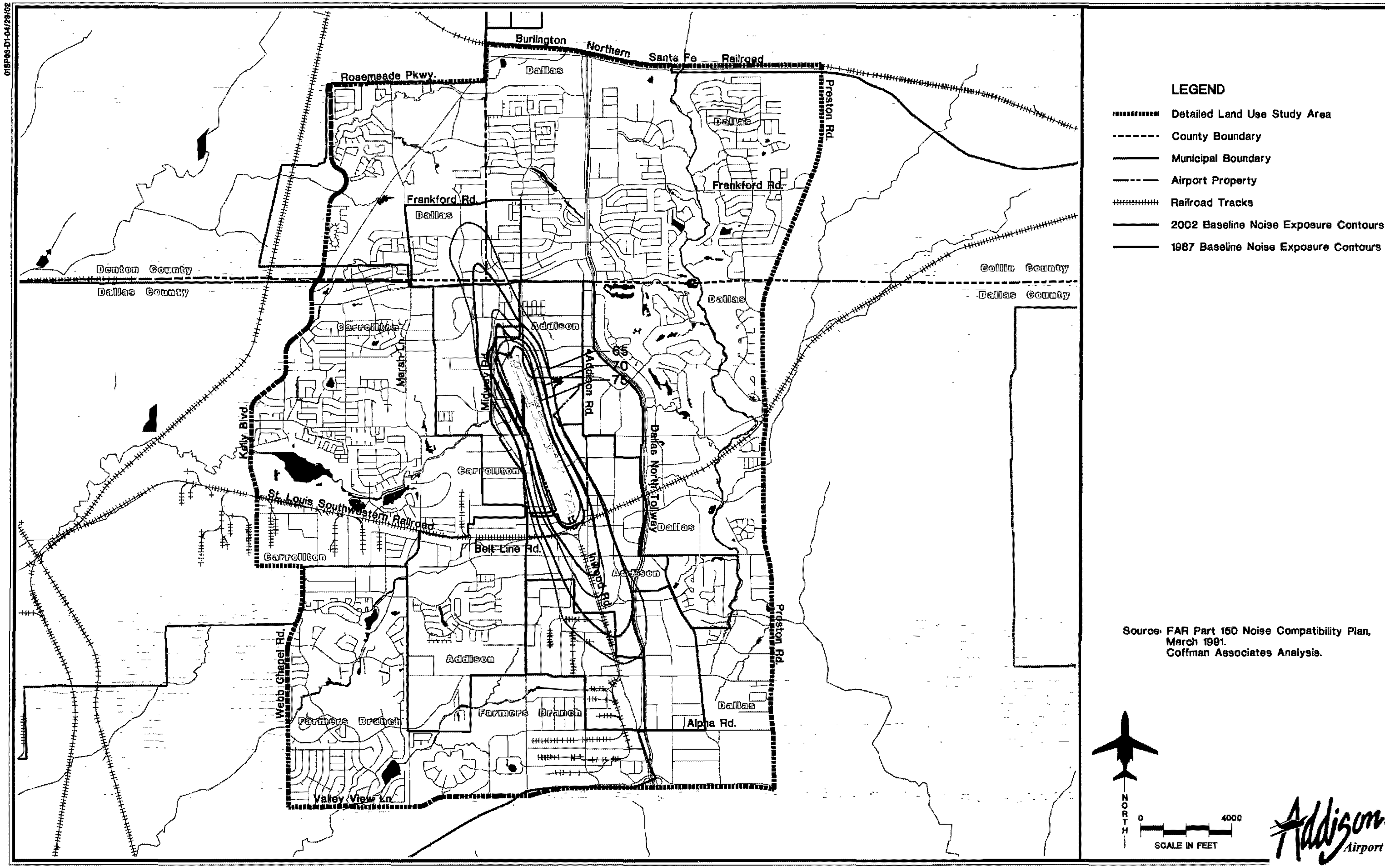


Exhibit D1
COMPARISON OF 1987 AND 2002
BASELINE NOISE EXPOSURE CONTOURS

TABLE D2
Noise Contour Area Comparison
Addison Airport

DNL Contour Value, dB	Area (Square Miles)				
	1987[1]	1993[1]	2002[1]	2007[2]	2022[2]
65	2.54	3.00	1.43	1.47	1.10
70	1.28	1.49	0.66	0.68	0.51
75	0.72	0.84	0.34	0.35	0.28

Sources:
[1] Barnard Dunkelberg & Company, and Mestre Greve Associates Analysis.
[2] Coffman Associates Analysis.

DWELLING UNIT AND POPULATION IMPACT COMPARISON

An evaluation of the dwelling unit and population impacts for both 1987 and 2002 are presented in **Table D3**. This table reveals a reduction in the number of aircraft noise impacts from 1987 to 2002. The number of dwelling units impacted by aircraft noise, in excess of 65 DNL, decreases from 1,077 in 1987 to 289 in 2002. This corresponds to a reduction in the number of individuals impacted by aircraft noise from 2,262 in 1987 to 741 in 2002 with Level Weighted Population (LWP) of 851 and 279, respectively. These decreases are primarily due to an overall reduction in the size of the noise exposure contours in the vicinity of Addison Airport. Additional variations in the number of noise impacts in the 1987 study versus the 2002 study may be due to the methods use to acquire noise impact counts. Although the impact count methodology is not detailed in the 1987 study, the number of dwelling units and population impacted by aircraft noise in the 1987 study was likely performed via manual counts using aerial photography and verified with on-site visual inspections. The 2002 study was performed by incorporating the use of technology such as geographic information systems and land use records databases in conjunction with cross-checks using aerial photography and visual inspections. These newer methods allow for increased accuracy of the impact counts.

TABLE D3 1987 vs. 2002 Dwellings and Population Impacts Above 65 DNL Addison Airport		
Land Use Classification	**1987[1]**	**2002[2]**
Total Dwellings	1,077	289
Population		
Total Existing Population	2,262	741
Total Existing Level Weighted Population (LWP)	851	279

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

[1] Addison Airport F.A.R. Part 150 Airport Noise Compatibility Study, Barnard Dunkelberg & Company, and Mestre Greve Associates.

[2] Coffman Associates Analysis.

PROGRAM RECOMMENDATION STATUS

The 1991 Noise Compatibility Program contained a number of measures to reduce the impact of aircraft noise on the surrounding airport environment. The following sections describe and relate the status of each of these measures.

NOISE COMPLAINT RESPONSE AND INVESTIGATION

The goal of this measure was to assure that the airport could explain the nature of all noise complaints and, in most instances, decipher what caused the complaint. A record-keeping system would be put into place to track all noise complaints. The goal of this measure was to provide a measurement of the effectiveness of the noise abatement procedures as well as to identify any new noise-sensitive areas.

Status: The airport has implemented and maintained a system for recording and responding to noise complaints. The system requires callers to provide their name, address, telephone number, and the nature of the complaint. Airport staff then responds to each complaint made to see if the noise event can be identified.

UPDATE AND REVIEW OF THE F.A.R. PART 150 STUDY

This measure called for an annual review of the F.A.R. Part 150 study to ensure that operation forecasts are consistent with what was used within the study, to determine the effectiveness of suggested noise abatement measures, and to determine when an update to the study is needed.

Status: An update of the current Addison Airport F.A.R. Part 150 Noise Compatibility Program (NCP) is currently being undertaken by the Town of Addison. In addition, monthly educational meetings are held with airport users to discuss methods for continuing compliance with noise abatement program recommendations.

REDUCTION OF POTENTIAL NOISE INTRUSION IN THE AIRPORT ENVIRONS

The purpose of this measure was to establish a pilot education program and noise abatement brochure distribution program to educate all pilots based at Addison Airport as well as transient pilots. The goal of these programs was to inform pilots of the noise-sensitive land uses within the airport environs and to encourage avoidance of these areas whenever possible.

Status: The airport has implemented a voluntary noise abatement program as a means to reduce the number of noise complaints. As part of this program, lighted signage has been installed at each end of the airport=s runways reminding pilots to use proper noise abatement departure procedures. In addition, monthly noise abatement meetings are held by the airport management to discuss ways to educate pilots about voluntary compliance with the noise abatement program. These meetings are attended by pilots, flight department directors, and other airport users. A hand-out has also been produced detailing noise abatement procedures and has been placed in FBOs to reach transient pilots and tenants.

REDUCTION OF FUTURE NOISE-SENSITIVE LAND USES IN THE AIRPORT ENVIRONS

This measure stated that the Town of Addison would prohibit all future residential development from occurring within the 65 DNL noise contour and would require sound attenuation for all other development within this contour. In addition, the Town was to require an avigation easement for all development within the 65 DNL noise contour.

It was also recommended that the City of Dallas amend the land use plans within the airport environs to reflect nonresidential development. In addition, it was suggested that areas currently zoned for residential, north of the airport, be re-zoned to a non noise-sensitive zoning classification.

Status: The *Town of Addison Comprehensive Plan* recommends that residential uses not be permitted within the 65 DNL noise exposure contour. In addition, the Town of Addison requires avigation easements on all new construction within the 65 DNL noise exposure contour.

The City of Dallas has not prepared a city-wide comprehensive plan. However, several area-specific land use plans have been prepared for the areas within the City of Dallas near Addison Airport. These include the *Greater Far North Dallas Area Land Use and Transportation Plan*, the *Parkway Center Study*, the *Dallas/Richardson Improvement Strategy Study*, and the *Coit/Spring Valley Neighborhood Improvement Study*. No specific guidelines pertaining to aircraft noise from Addison Airport are included in these plans, nor have they been adopted or implemented.

Appendix E
INM INPUT ASSUMPTIONS AND OUTPUT REPORT

Addison! Airport

Appendix E
INM Input Assumptions and Output Report

F.A.R. Part 150
Noise Compatibility Study Update
Addison Airport

This appendix provides detailed tables depicting reported aircraft operations, runway use, and day/nighttime operation split by aircraft type used to develop the 2002 noise exposure map contours for Addison Airport.

INM 6.0c ECHO REPORT 29-Apr-02 14:36

STUDY: D:\INM6.0c\AddisonTX\
Created : 08-Mar-02 13:24
Units : English
Airport : ADS
Description :
Addison Texas F.A.R. Part 150

CASE: 2002NEM
Created : 12-Mar-02 10:26
Description : 2002 Operations- Baseline Condition

STUDY AIRPORT
Latitude : 32.968559 deg
Longitude : -96.836448 deg
Elevation : 644.0 ft
Temperature : 65.4 F
Pressure : 29.92 in-Hg
AverageWind : 8.0 kt
ChangeNPD : No

STUDY RUNWAYS
15
Latitude : 32.977844 deg
Longitude : -96.840512 deg
Xcoord : -0.2051 nmi
Ycoord : 0.5560 nmi
Elevation : 636.3 ft
OtherEnd : 33
Length : 7201 ft
Gradient : -0.01 %
RwyWind : 8.0 kt
TkoThresh : 0 ft
AppThresh : 979 ft
33
Latitude : 32.959271 deg
Longitude : -96.832395 deg
Xcoord : 0.2046 nmi
Ycoord : -0.5562 nmi
Elevation : 635.7 ft
OtherEnd : 15
Length : 7201 ft
Gradient : 0.01 %
RwyWind : 8.0 kt
TkoThresh : 0 ft
AppThresh : 771 ft
H1
Latitude : 32.966807 deg
Longitude : -96.836971 deg
Xcoord : -0.0264 nmi
Ycoord : -0.1049 nmi
Elevation : 644.0 ft
OtherEnd : H2
Length : 202 ft
Gradient : 0.00 %
RwyWind : 8.0 kt
TkoThresh : 0 ft
AppThresh : 0 ft
H2
Latitude : 32.966285 deg
Longitude : -96.836745 deg
Xcoord : -0.0150 nmi
Ycoord : -0.1362 nmi
Elevation : 644.0 ft
OtherEnd : H1
Length : 202 ft
Gradient : 0.00 %
RwyWind : 8.0 kt
TkoThresh : 0 ft
AppThresh : 0 ft
H3
Latitude : 32.975347 deg
Longitude : -96.834108 deg
Xcoord : 0.1181 nmi
Ycoord : 0.4065 nmi
Elevation : 644.0 ft
OtherEnd : H4
Length : 49 ft
Gradient : 0.00 %
RwyWind : 8.0 kt
TkoThresh : 0 ft
AppThresh : 0 ft
H4
Latitude : 32.975347 deg
Longitude : -96.833946 deg
Xcoord : 0.1263 nmi
Ycoord : 0.4065 nmi
Elevation : 644.0 ft

OtherEnd : H3
Length : 49 ft
Gradient : 0.00 %
RwyWind : 8.0 kt
TkoThresh : 0 ft
AppThresh : 0 ft

STUDY TRACKS
RwyId-OpType-TrkId
Sub PctSub TrkType Delta(ft)
15-APP-A
0 27.32 Points 0.0
1 21.88 Points 0.0
2 21.88 Points 0.0
3 10.94 Points 0.0
4 10.94 Points 0.0
5 3.13 Points 0.0
6 3.13 Points 0.0
7 0.39 Points 0.0
8 0.39 Points 0.0
15-APP-B
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
15-APP-C
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
15-APP-D
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
15-APP-E
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
15-APP-F
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
15-DEP-1
0 100.00 Vectors 0.0
15-DEP-A
0 27.32 Points 0.0
1 21.88 Points 0.0
2 21.88 Points 0.0
3 10.94 Points 0.0
4 10.94 Points 0.0
5 3.13 Points 0.0
6 3.13 Points 0.0
7 0.39 Points 0.0
8 0.39 Points 0.0
15-DEP-B
0 31.24 Points 0.0
1 23.44 Points 0.0
2 23.44 Points 0.0
3 9.38 Points 0.0
4 9.38 Points 0.0
5 1.56 Points 0.0
6 1.56 Points 0.0
15-DEP-C
0 27.32 Points 0.0
1 21.88 Points 0.0
2 21.88 Points 0.0
3 10.94 Points 0.0
4 10.94 Points 0.0
5 3.13 Points 0.0
6 3.13 Points 0.0
7 0.39 Points 0.0
8 0.39 Points 0.0
15-DEP-D
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
15-DEP-E
0 31.24 Points 0.0
1 23.44 Points 0.0
2 23.44 Points 0.0

3 9.38 Points 0.0
4 9.38 Points 0.0
5 1.56 Points 0.0
6 1.56 Points 0.0
15-DEP-F
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
15-TGO-1
0 100.00 Vectors 0.0
15-TGO-2
0 100.00 Vectors 0.0
15-TGO-A
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
15-TGO-B
0 20.00 Points 0.0
1 20.00 Points 0.0
2 20.00 Points 0.0
3 20.00 Points 0.0
4 20.00 Points 0.0
33-APP-A
0 27.32 Points 0.0
1 21.88 Points 0.0
2 21.88 Points 0.0
3 10.94 Points 0.0
4 10.94 Points 0.0
5 3.13 Points 0.0
6 3.13 Points 0.0
7 0.39 Points 0.0
8 0.39 Points 0.0
33-APP-B
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
33-DEP-1
0 100.00 Vectors 0.0
33-DEP-A
0 27.32 Points 0.0
1 21.88 Points 0.0
2 21.88 Points 0.0
3 10.94 Points 0.0
4 10.94 Points 0.0
5 3.13 Points 0.0
6 3.13 Points 0.0
7 0.39 Points 0.0
8 0.39 Points 0.0
33-DEP-B
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
33-DEP-C
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
33-DEP-D
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
33-DEP-E
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
33-DEP-F
0 68.26 Points 0.0
1 15.87 Points 0.0
2 15.87 Points 0.0
33-TGO-1
0 100.00 Vectors 0.0
33-TGO-A
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0

H1-TGO-A
0 100.00 Vectors 0.0
H2-TGO-A
0 100.00 Vectors 0.0
H3-APP-A
0 100.00 Vectors 0.0
H3-APP-B
0 100.00 Vectors 0.0
H3-DEP-A
0 100.00 Vectors 0.0
H3-DEP-B
0 100.00 Vectors 0.0
H4-APP-A
0 100.00 Vectors 0.0
H4-APP-B
0 100.00 Vectors 0.0
H4-DEP-A
0 100.00 Vectors 0.0
H4-DEP-B
0 100.00 Vectors 0.0
OVF-OVF-1
0 100.00 Points 0.0
OVF-OVF-2
0 100.00 Points 0.0

STUDY TRACK DETAIL
RwyId-OpType-TrkId-SubTrk
SegType Dist/Angle Radius(nmi)
15-APP-A-0
1 Points -1.7569 nmi 5.1054
2 Points -1.0158 nmi 2.8729
3 Points -0.6542 nmi 1.8787
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-A-1
1 Points -1.5196 nmi 5.1842
2 Points -0.8977 nmi 2.9139
3 Points -0.6070 nmi 1.8950
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-A-2
1 Points -1.9942 nmi 5.0266
2 Points -1.1338 nmi 2.8318
3 Points -0.7014 nmi 1.8623
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-A-3
1 Points -1.2823 nmi 5.2629
2 Points -0.7796 nmi 2.9550
3 Points -0.5598 nmi 1.9114
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-A-4
1 Points -2.2315 nmi 4.9478
2 Points -1.2519 nmi 2.7908
3 Points -0.7486 nmi 1.8459
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-A-5
1 Points -1.0450 nmi 5.3417
2 Points -0.6616 nmi 2.9961
3 Points -0.5127 nmi 1.9278
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-A-6
1 Points -2.4688 nmi 4.8690
2 Points -1.3700 nmi 2.7497
3 Points -0.7958 nmi 1.8295
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-A-7
1 Points -0.8077 nmi 5.4205
2 Points -0.5435 nmi 3.0371
3 Points -0.4655 nmi 1.9442
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-A-8
1 Points -2.7061 nmi 4.7903
2 Points -1.4880 nmi 2.7087
3 Points -0.8430 nmi 1.8131
4 Points -0.2740 nmi 0.7287
5 Points -0.2051 nmi 0.5560
15-APP-B-0
1 Points 2.3665 nmi 5.4577
2 Points 1.0188 nmi 4.2762
3 Points -0.0335 nmi 3.4085
4 Points -0.5135 nmi 2.9285
5 Points -0.6830 nmi 2.1761
6 Points -0.6442 nmi 1.8269
7 Points -0.2051 nmi 0.5560

15-APP-B-1			
1	Points	2.6962 nmi	5.0817
2	Points	1.1808 nmi	4.0857
3	Points	0.1010 nmi	3.2604
4	Points	-0.3821 nmi	2.8561
5	Points	-0.5832 nmi	2.1705
6	Points	-0.6441 nmi	1.8269
7	Points	-0.2050 nmi	0.5560
15-APP-B-2			
1	Points	2.0369 nmi	5.8337
2	Points	0.8569 nmi	4.4666
3	Points	-0.1679 nmi	3.5565
4	Points	-0.6448 nmi	3.0008
5	Points	-0.7829 nmi	2.1816
6	Points	-0.6443 nmi	1.8269
7	Points	-0.2052 nmi	0.5560
15-APP-B-3			
1	Points	3.0258 nmi	4.7058
2	Points	1.3427 nmi	3.8952
3	Points	0.2355 nmi	3.1124
4	Points	-0.2507 nmi	2.7837
5	Points	-0.4833 nmi	2.1650
6	Points	-0.6440 nmi	1.8270
7	Points	-0.2049 nmi	0.5561
15-APP-B-4			
1	Points	1.7073 nmi	6.2096
2	Points	0.6950 nmi	4.6571
3	Points	-0.3024 nmi	3.7045
4	Points	-0.7762 nmi	3.0732
5	Points	-0.8827 nmi	2.1872
6	Points	-0.6444 nmi	1.8269
7	Points	-0.2053 nmi	0.5559
15-APP-C-0			
1	Points	4.5819 nmi	-1.1146
2	Points	2.2188 nmi	0.1777
3	Points	1.3696 nmi	2.1531
4	Points	1.0742 nmi	2.9469
5	Points	0.8342 nmi	3.1500
6	Points	0.5758 nmi	3.2608
7	Points	0.2065 nmi	3.2792
8	Points	-0.0704 nmi	3.1685
9	Points	-0.3842 nmi	2.9838
10	Points	-0.6227 nmi	2.6158
11	Points	-0.6796 nmi	2.1531
12	Points	-0.5968 nmi	1.6717
13	Points	-0.2051 nmi	0.5560
15-APP-C-1			
1	Points	4.3420 nmi	-1.5533
2	Points	1.8860 nmi	-0.1251
3	Points	1.0911 nmi	2.0415
4	Points	0.9106 nmi	2.8320
5	Points	0.7554 nmi	3.0224
6	Points	0.5419 nmi	3.1146
7	Points	0.2312 nmi	3.1313
8	Points	-0.0263 nmi	3.0787
9	Points	-0.2805 nmi	2.8755
10	Points	-0.5287 nmi	2.5816
11	Points	-0.6296 nmi	2.1543
12	Points	-0.5967 nmi	1.6718
13	Points	-0.2050 nmi	0.5560
15-APP-C-2			
1	Points	4.8218 nmi	-0.6759
2	Points	2.5517 nmi	0.4805
3	Points	1.6481 nmi	2.2647
4	Points	1.2379 nmi	3.0619
5	Points	0.9131 nmi	3.2776
6	Points	0.6096 nmi	3.4069
7	Points	0.1819 nmi	3.4272
8	Points	-0.1144 nmi	3.2582
9	Points	-0.4880 nmi	3.0922
10	Points	-0.7166 nmi	2.6499
11	Points	-0.7296 nmi	2.1519
12	Points	-0.5969 nmi	1.6717
13	Points	-0.2052 nmi	0.5560
15-APP-C-3			
1	Points	4.1021 nmi	-1.9920
2	Points	1.5531 nmi	-0.4280
3	Points	0.8127 nmi	1.9299
4	Points	0.7469 nmi	2.7170
5	Points	0.6765 nmi	2.8948
6	Points	0.5081 nmi	2.9685
7	Points	0.2559 nmi	2.9833
8	Points	0.0177 nmi	2.9889
9	Points	-0.1767 nmi	2.7672
10	Points	-0.4347 nmi	2.5475
11	Points	-0.5796 nmi	2.1555
12	Points	-0.5966 nmi	1.6718
13	Points	-0.2049 nmi	0.5561
15-APP-C-4			
1	Points	5.0617 nmi	-0.2372

2 Points	2.8846 nmi	0.7833
3 Points	1.9266 nmi	2.3763
4 Points	1.4015 nmi	3.1768
5 Points	0.9919 nmi	3.4052
6 Points	0.6434 nmi	3.5530
7 Points	0.1572 nmi	3.5751
8 Points	-0.1585 nmi	3.3480
9 Points	-0.5917 nmi	3.2005
10 Points	-0.8106 nmi	2.6841
11 Points	-0.7796 nmi	2.1507
12 Points	-0.5970 nmi	1.6717
13 Points	-0.2053 nmi	0.5559

15-APP-D-0

1 Points	-1.0673 nmi	-7.0777
2 Points	-0.7165 nmi	-3.0715
3 Points	-0.8394 nmi	-1.8288
4 Points	-1.2906 nmi	-0.7673
5 Points	-2.2858 nmi	1.3038
6 Points	-2.4519 nmi	1.7285
7 Points	-2.4335 nmi	2.1162
8 Points	-2.2858 nmi	2.3931
9 Points	-1.9904 nmi	2.6146
10 Points	-1.6213 nmi	2.7012
11 Points	-1.1513 nmi	2.6288
12 Points	-0.7908 nmi	2.2451
13 Points	-0.5925 nmi	1.6717
14 Points	-0.2051 nmi	0.5560

15-APP-D-1

1 Points	-1.5654 nmi	-7.0341
2 Points	-1.2165 nmi	-3.0743
3 Points	-1.2270 nmi	-1.9279
4 Points	-1.6094 nmi	-0.9116
5 Points	-2.5150 nmi	1.2041
6 Points	-2.6493 nmi	1.6961
7 Points	-2.6263 nmi	2.1693
8 Points	-2.4376 nmi	2.5232
9 Points	-2.0539 nmi	2.7505
10 Points	-1.6252 nmi	2.8011
11 Points	-1.1047 nmi	2.7173
12 Points	-0.7052 nmi	2.2968
13 Points	-0.5924 nmi	1.6717
14 Points	-0.2050 nmi	0.5560

15-APP-D-2

1 Points	-0.5692 nmi	-7.1213
2 Points	-0.2165 nmi	-3.0687
3 Points	-0.4518 nmi	-1.7298
4 Points	-0.9717 nmi	-0.6230
5 Points	-2.0566 nmi	1.4035
6 Points	-2.2545 nmi	1.7609
7 Points	-2.2407 nmi	2.0631
8 Points	-2.1340 nmi	2.2630
9 Points	-1.9269 nmi	2.4787
10 Points	-1.6174 nmi	2.6013
11 Points	-1.1979 nmi	2.5403
12 Points	-0.8764 nmi	2.1934
13 Points	-0.5926 nmi	1.6717
14 Points	-0.2052 nmi	0.5560

15-APP-D-3

1 Points	-2.0635 nmi	-6.9905
2 Points	-1.7166 nmi	-3.0771
3 Points	-1.6146 nmi	-2.0270
4 Points	-1.9283 nmi	-1.0558
5 Points	-2.7441 nmi	1.1044
6 Points	-2.8467 nmi	1.6637
7 Points	-2.8191 nmi	2.2224
8 Points	-2.5894 nmi	2.6533
9 Points	-2.1173 nmi	2.8864
10 Points	-1.6291 nmi	2.9010
11 Points	-1.0581 nmi	2.8057
12 Points	-0.6196 nmi	2.3485
13 Points	-0.5923 nmi	1.6718
14 Points	-0.2049 nmi	0.5561

15-APP-D-4

1 Points	-0.0711 nmi	-7.1649
2 Points	0.2836 nmi	-3.0659
3 Points	-0.0642 nmi	-1.6307
4 Points	-0.6529 nmi	-0.4788
5 Points	-1.8275 nmi	1.5032
6 Points	-2.0571 nmi	1.7933
7 Points	-2.0479 nmi	2.0100
8 Points	-1.9822 nmi	2.1329
9 Points	-1.8635 nmi	2.3428
10 Points	-1.6135 nmi	2.5014
11 Points	-1.2445 nmi	2.4519
12 Points	-0.9620 nmi	2.1417
13 Points	-0.5927 nmi	1.6716
14 Points	-0.2053 nmi	0.5559

15-APP-E-0

1 Points	4.3788 nmi	-2.0746
2 Points	1.6962 nmi	-0.2954

3 Points	1.4250 nmi	0.0854
4 Points	1.1665 nmi	0.9346
5 Points	0.9081 nmi	1.5069
6 Points	0.6865 nmi	1.9131
7 Points	0.3912 nmi	2.0792
8 Points	0.0035 nmi	2.0238
9 Points	-0.2550 nmi	1.8762
10 Points	-0.4761 nmi	1.6028
11 Points	-0.4459 nmi	1.2536
12 Points	-0.2051 nmi	0.5560
15-APP-E-1		
1 Points	4.1025 nmi	-2.4913
2 Points	1.4180 nmi	-0.5829
3 Points	1.0661 nmi	-0.0912
4 Points	0.8858 nmi	0.8290
5 Points	0.7290 nmi	1.4178
6 Points	0.5798 nmi	1.8077
7 Points	0.3635 nmi	1.9318
8 Points	0.0521 nmi	1.8820
9 Points	-0.1578 nmi	1.7619
10 Points	-0.3805 nmi	1.5735
11 Points	-0.4458 nmi	1.2536
12 Points	-0.2050 nmi	0.5560
15-APP-E-2		
1 Points	4.6552 nmi	-1.6579
2 Points	1.9743 nmi	-0.0079
3 Points	1.7839 nmi	0.2619
4 Points	1.4473 nmi	1.0402
5 Points	1.0871 nmi	1.5960
6 Points	0.7933 nmi	2.0184
7 Points	0.4188 nmi	2.2267
8 Points	-0.0452 nmi	2.1657
9 Points	-0.3522 nmi	1.9904
10 Points	-0.5717 nmi	1.6320
11 Points	-0.4460 nmi	1.2536
12 Points	-0.2052 nmi	0.5560
15-APP-E-3		
1 Points	3.8261 nmi	-2.9080
2 Points	1.1399 nmi	-0.8704
3 Points	0.7071 nmi	-0.2677
4 Points	0.6050 nmi	0.7234
5 Points	0.5500 nmi	1.3287
6 Points	0.4730 nmi	1.7023
7 Points	0.3359 nmi	1.7844
8 Points	0.1008 nmi	1.7401
9 Points	-0.0606 nmi	1.6477
10 Points	-0.2849 nmi	1.5443
11 Points	-0.4457 nmi	1.2537
12 Points	-0.2049 nmi	0.5561
15-APP-E-4		
1 Points	4.9316 nmi	-1.2412
2 Points	2.2524 nmi	0.2796
3 Points	2.1429 nmi	0.4385
4 Points	1.7281 nmi	1.1459
5 Points	1.2662 nmi	1.6851
6 Points	0.9000 nmi	2.1238
7 Points	0.4464 nmi	2.3741
8 Points	-0.0939 nmi	2.3076
9 Points	-0.4494 nmi	2.1046
10 Points	-0.6674 nmi	1.6613
11 Points	-0.4461 nmi	1.2536
12 Points	-0.2053 nmi	0.5559
15-APP-F-0		
1 Points	-3.3427 nmi	-1.7169
2 Points	-2.1565 nmi	0.9346
3 Points	-1.7504 nmi	1.4885
4 Points	-1.4181 nmi	1.6915
5 Points	-1.1042 nmi	1.7469
6 Points	-0.7165 nmi	1.6362
7 Points	-0.4459 nmi	1.2795
8 Points	-0.2051 nmi	0.5560
15-APP-F-1		
1 Points	-3.7991 nmi	-1.5127
2 Points	-2.3727 nmi	1.0603
3 Points	-1.8519 nmi	1.5989
4 Points	-1.4711 nmi	1.8318
5 Points	-1.0965 nmi	1.8967
6 Points	-0.6601 nmi	1.7187
7 Points	-0.4458 nmi	1.2795
8 Points	-0.2050 nmi	0.5560
15-APP-F-2		
1 Points	-2.8863 nmi	-1.9211
2 Points	-1.9404 nmi	0.8089
3 Points	-1.6489 nmi	1.3780
4 Points	-1.3650 nmi	1.5512
5 Points	-1.1120 nmi	1.5971
6 Points	-0.7730 nmi	1.5536
7 Points	-0.4460 nmi	1.2794
8 Points	-0.2052 nmi	0.5560
15-APP-F-3		

1	Points	-4.2555 nmi	-1.3086
2	Points	-2.5888 nmi	1.1860
3	Points	-1.9534 nmi	1.7093
4	Points	-1.5242 nmi	1.9721
5	Points	-1.0887 nmi	2.0465
6	Points	-0.6036 nmi	1.8012
7	Points	-0.4458 nmi	1.2796
8	Points	-0.2049 nmi	0.5561
15-APP-F-4			
1	Points	-2.4299 nmi	-2.1253
2	Points	-1.7243 nmi	0.6833
3	Points	-1.5474 nmi	1.2676
4	Points	-1.3119 nmi	1.4109
5	Points	-1.1198 nmi	1.4473
6	Points	-0.8295 nmi	1.4711
7	Points	-0.4461 nmi	1.2794
8	Points	-0.2053 nmi	0.5559
15-DEP-1-0			
1	Straight	2.0000 nmi	
2	Straight	2.0000 nmi	
3	Straight	2.0000 nmi	
15-DEP-A-0			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542
3	Points	0.7927 nmi	-2.0615
4	Points	1.1719 nmi	-2.4631
5	Points	2.3096 nmi	-3.1212
6	Points	4.5738 nmi	-4.2031
15-DEP-A-1			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542
3	Points	0.8983 nmi	-1.9947
4	Points	1.2495 nmi	-2.3650
5	Points	2.3679 nmi	-3.0106
6	Points	4.6816 nmi	-3.9775
15-DEP-A-2			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542
3	Points	0.6871 nmi	-2.1284
4	Points	1.0944 nmi	-2.5611
5	Points	2.2513 nmi	-3.2317
6	Points	4.4661 nmi	-4.4286
15-DEP-A-3			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542

3	Points	1.0039 nmi	-1.9278
4	Points	1.3270 nmi	-2.2670
5	Points	2.4262 nmi	-2.9000
6	Points	4.7894 nmi	-3.7520
15-DEP-A-4			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542
3	Points	0.5815 nmi	-2.1953
4	Points	1.0168 nmi	-2.6592
5	Points	2.1930 nmi	-3.3423
6	Points	4.3583 nmi	-4.6542
15-DEP-A-5			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542
3	Points	1.1095 nmi	-1.8609
4	Points	1.4046 nmi	-2.1690
5	Points	2.4845 nmi	-2.7894
6	Points	4.8972 nmi	-3.5264
15-DEP-A-6			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542
3	Points	0.4759 nmi	-2.2621
4	Points	0.9393 nmi	-2.7572
5	Points	2.1348 nmi	-3.4529
6	Points	4.2505 nmi	-4.8797
15-DEP-A-7			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542
3	Points	1.2151 nmi	-1.7941
4	Points	1.4821 nmi	-2.0709
5	Points	2.5428 nmi	-2.6788
6	Points	5.0049 nmi	-3.3009
15-DEP-A-8			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5542
3	Points	0.3702 nmi	-2.3290
4	Points	0.8617 nmi	-2.8552
5	Points	2.0765 nmi	-3.5635
6	Points	4.1428 nmi	-5.1053
15-DEP-B-0			
1	Points	-0.2051 nmi	0.5560
2	Points	0.2046 nmi	-0.5551
3	Points	0.3304 nmi	-0.8862
4	Points	0.5548 nmi	-1.1702
5	Points	0.7856 nmi	-1.3144

6 Points 1.0404 nmi -1.4058
7 Points 1.4490 nmi -1.4683
8 Points 1.8577 nmi -1.5115
9 Points 2.5285 nmi -1.5585
10 Points 4.3257 nmi -1.7492

15-DEP-B-1

1 Points -0.2050 nmi 0.5560
2 Points 0.2047 nmi -0.5551
3 Points 0.3593 nmi -0.8698
4 Points 0.5993 nmi -1.1205
5 Points 0.8147 nmi -1.2544
6 Points 1.0608 nmi -1.3250
7 Points 1.4640 nmi -1.3526
8 Points 1.8694 nmi -1.3787
9 Points 2.5431 nmi -1.3925
10 Points 4.3538 nmi -1.4840

15-DEP-B-2

1 Points -0.2052 nmi 0.5560
2 Points 0.2045 nmi -0.5551
3 Points 0.3015 nmi -0.9026
4 Points 0.5103 nmi -1.2199
5 Points 0.7565 nmi -1.3745
6 Points 1.0199 nmi -1.4865
7 Points 1.4341 nmi -1.5839
8 Points 1.8460 nmi -1.6443
9 Points 2.5139 nmi -1.7245
10 Points 4.2976 nmi -2.0144

15-DEP-B-3

1 Points -0.2049 nmi 0.5561
2 Points 0.2048 nmi -0.5550
3 Points 0.3883 nmi -0.8534
4 Points 0.6438 nmi -1.0708
5 Points 0.8438 nmi -1.1943
6 Points 1.0813 nmi -1.2443
7 Points 1.4789 nmi -1.2369
8 Points 1.8810 nmi -1.2459
9 Points 2.5577 nmi -1.2265
10 Points 4.3820 nmi -1.2188

15-DEP-B-4

1 Points -0.2053 nmi 0.5559
2 Points 0.2044 nmi -0.5552
3 Points 0.2725 nmi -0.9190
4 Points 0.4658 nmi -1.2696
5 Points 0.7274 nmi -1.4345
6 Points 0.9995 nmi -1.5672
7 Points 1.4191 nmi -1.6996
8 Points 1.8344 nmi -1.7771
9 Points 2.4993 nmi -1.8905
10 Points 4.2694 nmi -2.2796

15-DEP-B-5

1 Points -0.2048 nmi 0.5561
2 Points 0.2049 nmi -0.5550
3 Points 0.4172 nmi -0.8370
4 Points 0.6884 nmi -1.0211
5 Points 0.8729 nmi -1.1343
6 Points 1.1017 nmi -1.1636
7 Points 1.4939 nmi -1.1213
8 Points 1.8927 nmi -1.1131
9 Points 2.5724 nmi -1.0605
10 Points 4.4101 nmi -0.9536

15-DEP-B-6

1 Points -0.2054 nmi 0.5559
2 Points 0.2043 nmi -0.5552
3 Points 0.2436 nmi -0.9354
4 Points 0.4213 nmi -1.3193
5 Points 0.6983 nmi -1.4945
6 Points 0.9791 nmi -1.6479
7 Points 1.4042 nmi -1.8153
8 Points 1.8227 nmi -1.9099
9 Points 2.4846 nmi -2.0565
10 Points 4.2413 nmi -2.5448

15-DEP-C-0

1 Points -0.2051 nmi 0.5560
2 Points 0.0774 nmi -0.2273
3 Points 0.2590 nmi -0.3989
4 Points 0.5013 nmi -0.4973
5 Points 0.6981 nmi -0.4821
6 Points 0.8444 nmi -0.3686
7 Points 0.9403 nmi -0.2197
8 Points 0.9983 nmi -0.0784
9 Points 1.1669 nmi 0.5201
10 Points 1.8205 nmi 3.2885

15-DEP-C-1

1 Points -0.2051 nmi 0.5560
2 Points 0.0774 nmi -0.2273
3 Points 0.2793 nmi -0.3674
4 Points 0.5109 nmi -0.4355
5 Points 0.6711 nmi -0.4122
6 Points 0.7891 nmi -0.3179
7 Points 0.8516 nmi -0.1735

8 Points	0.8920 nmi	-0.0417
9 Points	0.9733 nmi	0.5702
10 Points	1.3338 nmi	3.4034
15-DEP-C-2		
1 Points	-0.2051 nmi	0.5560
2 Points	0.0773 nmi	-0.2273
3 Points	0.2388 nmi	-0.4304
4 Points	0.4916 nmi	-0.5590
5 Points	0.7251 nmi	-0.5521
6 Points	0.8997 nmi	-0.4192
7 Points	1.0289 nmi	-0.2660
8 Points	1.1047 nmi	-0.1151
9 Points	1.3605 nmi	0.4700
10 Points	2.3071 nmi	3.1737
15-DEP-C-3		
1 Points	-0.2050 nmi	0.5560
2 Points	0.0774 nmi	-0.2272
3 Points	0.2995 nmi	-0.3358
4 Points	0.5205 nmi	-0.3738
5 Points	0.6441 nmi	-0.3422
6 Points	0.7338 nmi	-0.2673
7 Points	0.7630 nmi	-0.1272
8 Points	0.7856 nmi	-0.0051
9 Points	0.7797 nmi	0.6203
10 Points	0.8472 nmi	3.5183
15-DEP-C-4		
1 Points	-0.2052 nmi	0.5560
2 Points	0.0773 nmi	-0.2273
3 Points	0.2185 nmi	-0.4619
4 Points	0.4820 nmi	-0.6208
5 Points	0.7521 nmi	-0.6221
6 Points	0.9550 nmi	-0.4699
7 Points	1.1176 nmi	-0.3122
8 Points	1.2110 nmi	-0.1518
9 Points	1.5542 nmi	0.4199
10 Points	2.7937 nmi	3.0588
15-DEP-C-5		
1 Points	-0.2050 nmi	0.5561
2 Points	0.0775 nmi	-0.2272
3 Points	0.3198 nmi	-0.3043
4 Points	0.5301 nmi	-0.3120
5 Points	0.6171 nmi	-0.2722
6 Points	0.6785 nmi	-0.2166
7 Points	0.6743 nmi	-0.0809
8 Points	0.6793 nmi	0.0316
9 Points	0.5861 nmi	0.6704
10 Points	0.3606 nmi	3.6332
15-DEP-C-6		
1 Points	-0.2052 nmi	0.5559
2 Points	0.0772 nmi	-0.2274
3 Points	0.1983 nmi	-0.4934
4 Points	0.4724 nmi	-0.6825
5 Points	0.7791 nmi	-0.6920
6 Points	1.0103 nmi	-0.5206
7 Points	1.2063 nmi	-0.3585
8 Points	1.3174 nmi	-0.1885
9 Points	1.7478 nmi	0.3698
10 Points	3.2803 nmi	2.9439
15-DEP-C-7		
1 Points	-0.2049 nmi	0.5561
2 Points	0.0775 nmi	-0.2272
3 Points	0.3401 nmi	-0.2728
4 Points	0.5397 nmi	-0.2502
5 Points	0.5901 nmi	-0.2022
6 Points	0.6232 nmi	-0.1660
7 Points	0.5857 nmi	-0.0347
8 Points	0.5729 nmi	0.0683
9 Points	0.3924 nmi	0.7205
10 Points	-0.1260 nmi	3.7480
15-DEP-C-8		
1 Points	-0.2053 nmi	0.5559
2 Points	0.0772 nmi	-0.2274
3 Points	0.1780 nmi	-0.5249
4 Points	0.4628 nmi	-0.7443
5 Points	0.8061 nmi	-0.7620
6 Points	1.0656 nmi	-0.5712
7 Points	1.2949 nmi	-0.4048
8 Points	1.4237 nmi	-0.2252
9 Points	1.9414 nmi	0.3197
10 Points	3.7670 nmi	2.8290
15-DEP-D-0		
1 Points	-0.2051 nmi	0.5560
2 Points	0.2046 nmi	-0.5532
3 Points	0.2854 nmi	-0.7804
4 Points	0.3213 nmi	-0.9330
5 Points	0.3288 nmi	-1.1029
6 Points	0.3288 nmi	-1.2279
7 Points	0.2808 nmi	-1.5692
8 Points	-0.5123 nmi	-5.3742
15-DEP-D-1		

1 Points	-0.2050 nmi	0.5560
2 Points	0.2047 nmi	-0.5532
3 Points	0.3334 nmi	-0.7663
4 Points	0.3956 nmi	-0.9227
5 Points	0.4289 nmi	-1.1007
6 Points	0.4535 nmi	-1.2366
7 Points	0.4285 nmi	-1.5950
8 Points	-0.1206 nmi	-5.4558

15-DEP-D-2

1 Points	-0.2052 nmi	0.5560
2 Points	0.2045 nmi	-0.5532
3 Points	0.2374 nmi	-0.7945
4 Points	0.2470 nmi	-0.9433
5 Points	0.2288 nmi	-1.1051
6 Points	0.2042 nmi	-1.2191
7 Points	0.1330 nmi	-1.5435
8 Points	-0.9040 nmi	-5.2926

15-DEP-D-3

1 Points	-0.2049 nmi	0.5561
2 Points	0.2048 nmi	-0.5531
3 Points	0.3814 nmi	-0.7521
4 Points	0.4699 nmi	-0.9124
5 Points	0.5289 nmi	-1.0984
6 Points	0.5782 nmi	-1.2454
7 Points	0.5763 nmi	-1.6208
8 Points	0.2710 nmi	-5.5375

15-DEP-D-4

1 Points	-0.2053 nmi	0.5559
2 Points	0.2044 nmi	-0.5533
3 Points	0.1894 nmi	-0.8087
4 Points	0.1727 nmi	-0.9536
5 Points	0.1288 nmi	-1.1073
6 Points	0.0795 nmi	-1.2104
7 Points	-0.0148 nmi	-1.5177
8 Points	-1.2956 nmi	-5.2109

15-DEP-E-0

1 Points	-0.2051 nmi	0.5560
2 Points	0.2046 nmi	-0.5542
3 Points	0.4226 nmi	-0.7961
4 Points	0.6132 nmi	-0.8687
5 Points	0.8311 nmi	-0.9595
6 Points	1.0489 nmi	-0.9958
7 Points	1.2214 nmi	-0.9958
8 Points	1.4755 nmi	-0.9050
9 Points	3.8265 nmi	0.3567

15-DEP-E-1

1 Points	-0.2050 nmi	0.5560
2 Points	0.2047 nmi	-0.5542
3 Points	0.4415 nmi	-0.7686
4 Points	0.6318 nmi	-0.8222
5 Points	0.8495 nmi	-0.8954
6 Points	1.0544 nmi	-0.9293
7 Points	1.2100 nmi	-0.9300
8 Points	1.4417 nmi	-0.8288
9 Points	3.6688 nmi	0.6504

15-DEP-E-2

1 Points	-0.2052 nmi	0.5560
2 Points	0.2045 nmi	-0.5542
3 Points	0.4038 nmi	-0.8236
4 Points	0.5947 nmi	-0.9152
5 Points	0.8126 nmi	-1.0236
6 Points	1.0434 nmi	-1.0622
7 Points	1.2328 nmi	-1.0615
8 Points	1.5094 nmi	-0.9812
9 Points	3.9841 nmi	0.0630

15-DEP-E-3

1 Points	-0.2050 nmi	0.5560
2 Points	0.2047 nmi	-0.5541
3 Points	0.4603 nmi	-0.7411
4 Points	0.6503 nmi	-0.7757
5 Points	0.8679 nmi	-0.8313
6 Points	1.0599 nmi	-0.8628
7 Points	1.1986 nmi	-0.8643
8 Points	1.4079 nmi	-0.7527
9 Points	3.5112 nmi	0.9441

15-DEP-E-4

1 Points	-0.2052 nmi	0.5560
2 Points	0.2045 nmi	-0.5543
3 Points	0.3849 nmi	-0.8511
4 Points	0.5762 nmi	-0.9617
5 Points	0.7942 nmi	-1.0876
6 Points	1.0379 nmi	-1.1287
7 Points	1.2442 nmi	-1.1272
8 Points	1.5432 nmi	-1.0573
9 Points	4.1417 nmi	-0.2307

15-DEP-E-5

1 Points	-0.2049 nmi	0.5561
2 Points	0.2048 nmi	-0.5541
3 Points	0.4791 nmi	-0.7136
4 Points	0.6688 nmi	-0.7292

5 Points 0.8864 nmi -0.7672
6 Points 1.0654 nmi -0.7963
7 Points 1.1872 nmi -0.7986
8 Points 1.3741 nmi -0.6765
9 Points 3.3536 nmi 1.2378

15-DEP-E-6
1 Points -0.2053 nmi 0.5559
2 Points 0.2044 nmi -0.5543
3 Points 0.3661 nmi -0.8786
4 Points 0.5576 nmi -1.0082
5 Points 0.7758 nmi -1.1517
6 Points 1.0324 nmi -1.1952
7 Points 1.2555 nmi -1.1929
8 Points 1.5770 nmi -1.1335
9 Points 4.2993 nmi -0.5244

15-DEP-F-0
1 Points -0.2051 nmi 0.5560
2 Points 0.0142 nmi -0.0427
3 Points 0.0019 nmi -0.1555
4 Points -0.0302 nmi -0.2887
5 Points -0.1042 nmi -0.3603
6 Points -0.2793 nmi -0.3948
7 Points -0.4619 nmi -0.2863
8 Points -0.6642 nmi 0.0418
9 Points -0.8986 nmi 0.5525
10 Points -2.1825 nmi 3.5881

15-DEP-F-1
1 Points -0.2050 nmi 0.5560
2 Points 0.0143 nmi -0.0427
3 Points 0.0758 nmi -0.1684
4 Points 0.0567 nmi -0.3384
5 Points -0.0579 nmi -0.4489
6 Points -0.2963 nmi -0.4934
7 Points -0.5496 nmi -0.3754
8 Points -0.7964 nmi -0.0289
9 Points -1.0816 nmi 0.4718
10 Points -2.4127 nmi 3.4907

15-DEP-F-2
1 Points -0.2052 nmi 0.5560
2 Points 0.0141 nmi -0.0427
3 Points -0.0720 nmi -0.1427
4 Points -0.1170 nmi -0.2391
5 Points -0.1505 nmi -0.2717
6 Points -0.2623 nmi -0.2963
7 Points -0.3742 nmi -0.1972
8 Points -0.5319 nmi 0.1126
9 Points -0.7156 nmi 0.6332
10 Points -1.9522 nmi 3.6855

15-DEP-F-3
1 Points -0.2049 nmi 0.5561
2 Points 0.0144 nmi -0.0427
3 Points 0.1497 nmi -0.1812
4 Points 0.1435 nmi -0.3880
5 Points -0.0115 nmi -0.5375
6 Points -0.3133 nmi -0.5919
7 Points -0.6372 nmi -0.4645
8 Points -0.9287 nmi -0.0997
9 Points -1.2646 nmi 0.3912
10 Points -2.6430 nmi 3.3933

15-DEP-F-4
1 Points -0.2053 nmi 0.5559
2 Points 0.0140 nmi -0.0427
3 Points -0.1459 nmi -0.1298
4 Points -0.2038 nmi -0.1895
5 Points -0.1968 nmi -0.1830
6 Points -0.2453 nmi -0.1977
7 Points -0.2865 nmi -0.1081
8 Points -0.3997 nmi 0.1834
9 Points -0.5326 nmi 0.7139
10 Points -1.7220 nmi 3.7828

15-TGO-1-0
1 Straight 1.0000 nmi
2 Left-Turn 90.0000 deg 0.4000
3 Straight 0.3000 nmi
4 Left-Turn 90.0000 deg 0.4000
5 Straight 1.7500 nmi
6 Left-Turn 90.0000 deg 0.4000
7 Straight 0.3000 nmi
8 Left-Turn 90.0000 deg 0.4000
9 Straight 0.7500 nmi

15-TGO-2-0
1 Straight 1.0000 nmi
2 Right-Turn 90.0000 deg 0.4000
3 Straight 0.3000 nmi
4 Right-Turn 90.0000 deg 0.4000
5 Straight 1.7500 nmi
6 Right-Turn 90.0000 deg 0.4000
7 Straight 0.3000 nmi
8 Right-Turn 90.0000 deg 0.4000
9 Straight 0.7500 nmi

15-TGO-A-0
1 Points -0.2051 nmi 0.5560
2 Points 0.1632 nmi -0.4352
3 Points 0.1987 nmi -0.4834
4 Points 0.2546 nmi -0.5469
5 Points 0.2922 nmi -0.5752
6 Points 0.3371 nmi -0.6025
7 Points 0.3837 nmi -0.6223
8 Points 0.4375 nmi -0.6344
9 Points 0.4884 nmi -0.6412
10 Points 0.5334 nmi -0.6412
11 Points 0.5896 nmi -0.6357
12 Points 0.6557 nmi -0.6186
13 Points 0.9393 nmi -0.5122
14 Points 1.0130 nmi -0.4738
15 Points 1.0909 nmi -0.4099
16 Points 1.1420 nmi -0.3429
17 Points 1.1676 nmi -0.2806
18 Points 1.1896 nmi -0.2213
19 Points 1.1984 nmi -0.1702
20 Points 1.1966 nmi -0.0979
21 Points 1.1740 nmi -0.0038
22 Points 0.5716 nmi 1.6407
23 Points 0.5132 nmi 1.7347
24 Points 0.4548 nmi 1.7957
25 Points 0.3887 nmi 1.8465
26 Points 0.2922 nmi 1.8871
27 Points 0.2160 nmi 1.8998
28 Points 0.1423 nmi 1.8998
29 Points 0.0559 nmi 1.8820
30 Points -0.2895 nmi 1.7449
31 Points -0.3784 nmi 1.6763
32 Points -0.4419 nmi 1.5823
33 Points -0.4724 nmi 1.5162
34 Points -0.4851 nmi 1.4527
35 Points -0.4851 nmi 1.3867
36 Points -0.4800 nmi 1.3283
37 Points -0.4699 nmi 1.2698
38 Points -0.3963 nmi 1.0869
39 Points -0.2051 nmi 0.5560
15-TGO-A-1
1 Points -0.2050 nmi 0.5560
2 Points 0.1853 nmi -0.4233
3 Points 0.2376 nmi -0.4521
4 Points 0.3055 nmi -0.4919
5 Points 0.3343 nmi -0.5131
6 Points 0.3713 nmi -0.5358
7 Points 0.4067 nmi -0.5509
8 Points 0.4507 nmi -0.5606
9 Points 0.4933 nmi -0.5663
10 Points 0.5298 nmi -0.5663
11 Points 0.5765 nmi -0.5619
12 Points 0.6331 nmi -0.5471
13 Points 0.8985 nmi -0.4209
14 Points 0.9579 nmi -0.3903
15 Points 1.0189 nmi -0.3405
16 Points 1.0552 nmi -0.2932
17 Points 1.0744 nmi -0.2443
18 Points 1.0930 nmi -0.1953
19 Points 1.0987 nmi -0.1629
20 Points 1.0975 nmi -0.1109
21 Points 1.0783 nmi -0.0328
22 Points 0.4817 nmi 1.5969
23 Points 0.4342 nmi 1.6734
24 Points 0.3880 nmi 1.7212
25 Points 0.3384 nmi 1.7600
26 Points 0.2644 nmi 1.7911
27 Points 0.2077 nmi 1.8001
28 Points 0.1525 nmi 1.8003
29 Points 0.0846 nmi 1.7862
30 Points -0.2400 nmi 1.6579
31 Points -0.3055 nmi 1.6078
32 Points -0.3548 nmi 1.5332
33 Points -0.3773 nmi 1.4853
34 Points -0.3856 nmi 1.4429
35 Points -0.3852 nmi 1.3910
36 Points -0.3809 nmi 1.3412
37 Points -0.3737 nmi 1.2972
38 Points -0.3029 nmi 1.1225
39 Points -0.2050 nmi 0.5560
15-TGO-A-2
1 Points -0.2052 nmi 0.5560
2 Points 0.1412 nmi -0.4470
3 Points 0.1597 nmi -0.5148
4 Points 0.2036 nmi -0.6020
5 Points 0.2502 nmi -0.6373
6 Points 0.3028 nmi -0.6693
7 Points 0.3608 nmi -0.6937
8 Points 0.4243 nmi -0.7082
9 Points 0.4834 nmi -0.7160

10	Points	0.5370 nmi	-0.7161
11	Points	0.6026 nmi	-0.7096
12	Points	0.6783 nmi	-0.6901
13	Points	0.9800 nmi	-0.6035
14	Points	1.0681 nmi	-0.5572
15	Points	1.1628 nmi	-0.4794
16	Points	1.2287 nmi	-0.3927
17	Points	1.2607 nmi	-0.3170
18	Points	1.2861 nmi	-0.2473
19	Points	1.2981 nmi	-0.1775
20	Points	1.2958 nmi	-0.0849
21	Points	1.2697 nmi	0.0251
22	Points	0.6615 nmi	1.6845
23	Points	0.5922 nmi	1.7960
24	Points	0.5215 nmi	1.8701
25	Points	0.4390 nmi	1.9329
26	Points	0.3200 nmi	1.9832
27	Points	0.2242 nmi	1.9995
28	Points	0.1322 nmi	1.9993
29	Points	0.0273 nmi	1.9778
30	Points	-0.3390 nmi	1.8318
31	Points	-0.4513 nmi	1.7447
32	Points	-0.5290 nmi	1.6314
33	Points	-0.5675 nmi	1.5472
34	Points	-0.5846 nmi	1.4626
35	Points	-0.5850 nmi	1.3824
36	Points	-0.5792 nmi	1.3154
37	Points	-0.5661 nmi	1.2425
38	Points	-0.4897 nmi	1.0513
39	Points	-0.2052 nmi	0.5560

15-TGO-A-3

1	Points	-0.2049 nmi	0.5561
2	Points	0.2073 nmi	-0.4114
3	Points	0.2766 nmi	-0.4208
4	Points	0.3564 nmi	-0.4368
5	Points	0.3764 nmi	-0.4510
6	Points	0.4055 nmi	-0.4691
7	Points	0.4296 nmi	-0.4795
8	Points	0.4639 nmi	-0.4867
9	Points	0.4983 nmi	-0.4915
10	Points	0.5262 nmi	-0.4913
11	Points	0.5635 nmi	-0.4880
12	Points	0.6105 nmi	-0.4756
13	Points	0.8578 nmi	-0.3295
14	Points	0.9029 nmi	-0.3069
15	Points	0.9470 nmi	-0.2710
16	Points	0.9685 nmi	-0.2435
17	Points	0.9813 nmi	-0.2079
18	Points	0.9965 nmi	-0.1693
19	Points	0.9989 nmi	-0.1556
20	Points	0.9983 nmi	-0.1239
21	Points	0.9825 nmi	-0.0617
22	Points	0.3918 nmi	1.5531
23	Points	0.3552 nmi	1.6120
24	Points	0.3212 nmi	1.6468
25	Points	0.2881 nmi	1.6736
26	Points	0.2366 nmi	1.6950
27	Points	0.1995 nmi	1.7005
28	Points	0.1626 nmi	1.7008
29	Points	0.1132 nmi	1.6904
30	Points	-0.1906 nmi	1.5710
31	Points	-0.2326 nmi	1.5394
32	Points	-0.2677 nmi	1.4841
33	Points	-0.2822 nmi	1.4543
34	Points	-0.2861 nmi	1.4330
35	Points	-0.2853 nmi	1.3954
36	Points	-0.2817 nmi	1.3541
37	Points	-0.2775 nmi	1.3246
38	Points	-0.2094 nmi	1.1581
39	Points	-0.2049 nmi	0.5561

15-TGO-A-4

1	Points	-0.2053 nmi	0.5559
2	Points	0.1192 nmi	-0.4589
3	Points	0.1207 nmi	-0.5461
4	Points	0.1527 nmi	-0.6571
5	Points	0.2081 nmi	-0.6994
6	Points	0.2686 nmi	-0.7360
7	Points	0.3378 nmi	-0.7651
8	Points	0.4111 nmi	-0.7821
9	Points	0.4784 nmi	-0.7908
10	Points	0.5406 nmi	-0.7910
11	Points	0.6156 nmi	-0.7835
12	Points	0.7009 nmi	-0.7617
13	Points	1.0207 nmi	-0.6948
14	Points	1.1232 nmi	-0.6407
15	Points	1.2348 nmi	-0.5488
16	Points	1.3155 nmi	-0.4424
17	Points	1.3538 nmi	-0.3534
18	Points	1.3827 nmi	-0.2733
19	Points	1.3979 nmi	-0.1848

20	Points	1.3949 nmi	-0.0719
21	Points	1.3654 nmi	0.0541
22	Points	0.7514 nmi	1.7284
23	Points	0.6712 nmi	1.8573
24	Points	0.5883 nmi	1.9445
25	Points	0.4893 nmi	2.0193
26	Points	0.3478 nmi	2.0792
27	Points	0.2325 nmi	2.0991
28	Points	0.1220 nmi	2.0988
29	Points	-0.0013 nmi	2.0736
30	Points	-0.3885 nmi	1.9187
31	Points	-0.5242 nmi	1.8132
32	Points	-0.6162 nmi	1.6805
33	Points	-0.6626 nmi	1.5782
34	Points	-0.6841 nmi	1.4724
35	Points	-0.6849 nmi	1.3780
36	Points	-0.6784 nmi	1.3024
37	Points	-0.6622 nmi	1.2151
38	Points	-0.5832 nmi	1.0157
39	Points	-0.2053 nmi	0.5559

15-TGO-B-0

1	Points	-0.2051 nmi	0.5560
2	Points	0.1531 nmi	-0.4012
3	Points	0.1592 nmi	-0.4996
4	Points	0.1531 nmi	-0.5919
5	Points	0.1346 nmi	-0.6535
6	Points	0.0977 nmi	-0.7273
7	Points	0.0792 nmi	-0.7642
8	Points	0.0115 nmi	-0.8196
9	Points	-0.0746 nmi	-0.8812
10	Points	-0.3762 nmi	-0.9919
11	Points	-0.4685 nmi	-1.0104
12	Points	-0.5362 nmi	-1.0104
13	Points	-0.5977 nmi	-1.0042
14	Points	-0.6838 nmi	-0.9796
15	Points	-0.7454 nmi	-0.9488
16	Points	-0.7946 nmi	-0.8996
17	Points	-0.8500 nmi	-0.8442
18	Points	-0.8931 nmi	-0.7519
19	Points	-1.4962 nmi	0.8850
20	Points	-1.5208 nmi	0.9650
21	Points	-1.5269 nmi	1.0635
22	Points	-1.5023 nmi	1.1681
23	Points	-1.4469 nmi	1.2542
24	Points	-1.3977 nmi	1.3219
25	Points	-1.2992 nmi	1.3773
26	Points	-0.9731 nmi	1.5004
27	Points	-0.8869 nmi	1.5127
28	Points	-0.7638 nmi	1.5127
29	Points	-0.6838 nmi	1.4881
30	Points	-0.6100 nmi	1.4450
31	Points	-0.5362 nmi	1.3773
32	Points	-0.4808 nmi	1.2850
33	Points	-0.4500 nmi	1.2235
34	Points	-0.2051 nmi	0.5560

15-TGO-B-1

1	Points	-0.2050 nmi	0.5560
2	Points	0.2509 nmi	-0.3804
3	Points	0.2592 nmi	-0.4998
4	Points	0.2515 nmi	-0.6097
5	Points	0.2276 nmi	-0.6904
6	Points	0.1871 nmi	-0.7720
7	Points	0.1573 nmi	-0.8267
8	Points	0.0723 nmi	-0.8990
9	Points	-0.0279 nmi	-0.9696
10	Points	-0.3490 nmi	-1.0882
11	Points	-0.4586 nmi	-1.1099
12	Points	-0.5412 nmi	-1.1103
13	Points	-0.6165 nmi	-1.1025
14	Points	-0.7201 nmi	-1.0728
15	Points	-0.8039 nmi	-1.0300
16	Points	-0.8653 nmi	-0.9703
17	Points	-0.9319 nmi	-0.9016
18	Points	-0.9854 nmi	-0.7904
19	Points	-1.5909 nmi	0.8530
20	Points	-1.6191 nmi	0.9471
21	Points	-1.6266 nmi	1.0720
22	Points	-1.5944 nmi	1.2072
23	Points	-1.5295 nmi	1.3107
24	Points	-1.4642 nmi	1.3966
25	Points	-1.3415 nmi	1.4679
26	Points	-0.9980 nmi	1.5972
27	Points	-0.8940 nmi	1.6124
28	Points	-0.7489 nmi	1.6116
29	Points	-0.6436 nmi	1.5797
30	Points	-0.5507 nmi	1.5255
31	Points	-0.4587 nmi	1.4405
32	Points	-0.3931 nmi	1.3332
33	Points	-0.3582 nmi	1.2632
34	Points	-0.2050 nmi	0.5560

15-TGO-B-2

1	Points	-0.2052 nmi	0.5560
2	Points	0.0553 nmi	-0.4220
3	Points	0.0592 nmi	-0.4994
4	Points	0.0547 nmi	-0.5741
5	Points	0.0416 nmi	-0.6166
6	Points	0.0083 nmi	-0.6826
7	Points	0.0011 nmi	-0.7017
8	Points	-0.0493 nmi	-0.7402
9	Points	-0.1213 nmi	-0.7928
10	Points	-0.4034 nmi	-0.8956
11	Points	-0.4784 nmi	-0.9109
12	Points	-0.5312 nmi	-0.9105
13	Points	-0.5789 nmi	-0.9059
14	Points	-0.6475 nmi	-0.8864
15	Points	-0.6869 nmi	-0.8676
16	Points	-0.7239 nmi	-0.8289
17	Points	-0.7681 nmi	-0.7868
18	Points	-0.8008 nmi	-0.7134
19	Points	-1.4015 nmi	0.9170
20	Points	-1.4225 nmi	0.9829
21	Points	-1.4272 nmi	1.0550
22	Points	-1.4102 nmi	1.1290
23	Points	-1.3643 nmi	1.1977
24	Points	-1.3312 nmi	1.2472
25	Points	-1.2569 nmi	1.2867
26	Points	-0.9482 nmi	1.4036
27	Points	-0.8798 nmi	1.4130
28	Points	-0.7787 nmi	1.4138
29	Points	-0.7240 nmi	1.3965
30	Points	-0.6693 nmi	1.3645
31	Points	-0.6137 nmi	1.3141
32	Points	-0.5685 nmi	1.2368
33	Points	-0.5418 nmi	1.1838
34	Points	-0.2052 nmi	0.5560

15-TGO-B-3

1	Points	-0.2049 nmi	0.5561
2	Points	0.3487 nmi	-0.3595
3	Points	0.3592 nmi	-0.5000
4	Points	0.3499 nmi	-0.6275
5	Points	0.3205 nmi	-0.7273
6	Points	0.2765 nmi	-0.8168
7	Points	0.2354 nmi	-0.8892
8	Points	0.1331 nmi	-0.9784
9	Points	0.0189 nmi	-1.0580
10	Points	-0.3219 nmi	-1.1845
11	Points	-0.4488 nmi	-1.2094
12	Points	-0.5462 nmi	-1.2102
13	Points	-0.6354 nmi	-1.2008
14	Points	-0.7563 nmi	-1.1660
15	Points	-0.8624 nmi	-1.1112
16	Points	-0.9360 nmi	-1.0410
17	Points	-1.0138 nmi	-0.9590
18	Points	-1.0777 nmi	-0.8289
19	Points	-1.6856 nmi	0.8210
20	Points	-1.7174 nmi	0.9292
21	Points	-1.7263 nmi	1.0804
22	Points	-1.6864 nmi	1.2462
23	Points	-1.6121 nmi	1.3672
24	Points	-1.5307 nmi	1.4713
25	Points	-1.3838 nmi	1.5585
26	Points	-1.0228 nmi	1.6940
27	Points	-0.9011 nmi	1.7121
28	Points	-0.7341 nmi	1.7105
29	Points	-0.6035 nmi	1.6712
30	Points	-0.4913 nmi	1.6059
31	Points	-0.3813 nmi	1.5038
32	Points	-0.3055 nmi	1.3813
33	Points	-0.2665 nmi	1.3028
34	Points	-0.2049 nmi	0.5561

15-TGO-B-4

1	Points	-0.2053 nmi	0.5559
2	Points	-0.0425 nmi	-0.4429
3	Points	-0.0408 nmi	-0.4992
4	Points	-0.0437 nmi	-0.5563
5	Points	-0.0513 nmi	-0.5797
6	Points	-0.0811 nmi	-0.6378
7	Points	-0.0770 nmi	-0.6392
8	Points	-0.1101 nmi	-0.6608
9	Points	-0.1681 nmi	-0.7044
10	Points	-0.4305 nmi	-0.7993
11	Points	-0.4882 nmi	-0.8114
12	Points	-0.5262 nmi	-0.8106
13	Points	-0.5600 nmi	-0.8076
14	Points	-0.6113 nmi	-0.7932
15	Points	-0.6284 nmi	-0.7864
16	Points	-0.6532 nmi	-0.7582
17	Points	-0.6862 nmi	-0.7294
18	Points	-0.7085 nmi	-0.6749
19	Points	-1.3068 nmi	0.9490

20 Points	-1.3242 nmi	1.0008
21 Points	-1.3275 nmi	1.0466
22 Points	-1.3182 nmi	1.0900
23 Points	-1.2817 nmi	1.1412
24 Points	-1.2647 nmi	1.1725
25 Points	-1.2146 nmi	1.1961
26 Points	-0.9234 nmi	1.3068
27 Points	-0.8727 nmi	1.3133
28 Points	-0.7935 nmi	1.3149
29 Points	-0.7641 nmi	1.3050
30 Points	-0.7287 nmi	1.2841
31 Points	-0.6911 nmi	1.2508
32 Points	-0.6561 nmi	1.1887
33 Points	-0.6335 nmi	1.1442
34 Points	-0.2053 nmi	0.5559
33-APP-A-0		
1 Points	1.8675 nmi	-5.0602
2 Points	1.1648 nmi	-3.1696
3 Points	0.7131 nmi	-1.9315
4 Points	0.2781 nmi	-0.7771
5 Points	0.2046 nmi	-0.5562
33-APP-A-1		
1 Points	1.6332 nmi	-5.1473
2 Points	1.0475 nmi	-3.2128
3 Points	0.6662 nmi	-1.9489
4 Points	0.2780 nmi	-0.7771
5 Points	0.2046 nmi	-0.5562
33-APP-A-2		
1 Points	2.1018 nmi	-4.9731
2 Points	1.2821 nmi	-3.1264
3 Points	0.7600 nmi	-1.9142
4 Points	0.2781 nmi	-0.7771
5 Points	0.2046 nmi	-0.5562
33-APP-A-3		
1 Points	1.3988 nmi	-5.2344
2 Points	0.9302 nmi	-3.2560
3 Points	0.6193 nmi	-1.9663
4 Points	0.2780 nmi	-0.7771
5 Points	0.2045 nmi	-0.5562
33-APP-A-4		
1 Points	2.3362 nmi	-4.8860
2 Points	1.3994 nmi	-3.0832
3 Points	0.8068 nmi	-1.8968
4 Points	0.2782 nmi	-0.7771
5 Points	0.2047 nmi	-0.5562
33-APP-A-5		
1 Points	1.1645 nmi	-5.3215
2 Points	0.8129 nmi	-3.2992
3 Points	0.5724 nmi	-1.9837
4 Points	0.2779 nmi	-0.7772
5 Points	0.2045 nmi	-0.5562
33-APP-A-6		
1 Points	2.5705 nmi	-4.7989
2 Points	1.5167 nmi	-3.0400
3 Points	0.8537 nmi	-1.8794
4 Points	0.2782 nmi	-0.7771
5 Points	0.2047 nmi	-0.5562
33-APP-A-7		
1 Points	0.9302 nmi	-5.4086
2 Points	0.6956 nmi	-3.3424
3 Points	0.5256 nmi	-2.0011
4 Points	0.2779 nmi	-0.7772
5 Points	0.2044 nmi	-0.5563
33-APP-A-8		
1 Points	2.8048 nmi	-4.7118
2 Points	1.6340 nmi	-2.9968
3 Points	0.9006 nmi	-1.8620
4 Points	0.2783 nmi	-0.7770
5 Points	0.2048 nmi	-0.5561
33-APP-B-0		
1 Points	-0.0760 nmi	4.4896
2 Points	2.0621 nmi	-0.9394
3 Points	2.0621 nmi	-1.1700
4 Points	1.9363 nmi	-1.4006
5 Points	1.6638 nmi	-1.6102
6 Points	1.3494 nmi	-1.7150
7 Points	0.9512 nmi	-1.7360
8 Points	0.6577 nmi	-1.5473
9 Points	0.4690 nmi	-1.2119
10 Points	0.2046 nmi	-0.5562
33-APP-B-1		
1 Points	0.3893 nmi	4.6728
2 Points	2.2095 nmi	-0.9115
3 Points	2.2075 nmi	-1.2071
4 Points	2.0504 nmi	-1.4980
5 Points	1.7343 nmi	-1.7426
6 Points	1.3773 nmi	-1.8624
7 Points	0.9127 nmi	-1.8809
8 Points	0.5849 nmi	-1.6159
9 Points	0.4689 nmi	-1.2120

10	Points	0.2045 nmi	-0.5562
33-APP-B-2			
1	Points	-0.5412 nmi	4.3064
2	Points	1.9147 nmi	-0.9674
3	Points	1.9168 nmi	-1.1329
4	Points	1.8223 nmi	-1.3031
5	Points	1.5934 nmi	-1.4778
6	Points	1.3215 nmi	-1.5676
7	Points	0.9896 nmi	-1.5910
8	Points	0.7305 nmi	-1.4787
9	Points	0.4691 nmi	-1.2119
10	Points	0.2047 nmi	-0.5562
33-APP-B-3			
1	Points	0.8545 nmi	4.8560
2	Points	2.3569 nmi	-0.8835
3	Points	2.3528 nmi	-1.2441
4	Points	2.1644 nmi	-1.5955
5	Points	1.8047 nmi	-1.8751
6	Points	1.4052 nmi	-2.0098
7	Points	0.8742 nmi	-2.0259
8	Points	0.5122 nmi	-1.6845
9	Points	0.4689 nmi	-1.2120
10	Points	0.2044 nmi	-0.5563
33-APP-B-4			
1	Points	-1.0064 nmi	4.1232
2	Points	1.7674 nmi	-0.9954
3	Points	1.7714 nmi	-1.0959
4	Points	1.7083 nmi	-1.2057
5	Points	1.5230 nmi	-1.3453
6	Points	1.2936 nmi	-1.4202
7	Points	1.0281 nmi	-1.4460
8	Points	0.8032 nmi	-1.4101
9	Points	0.4692 nmi	-1.2118
10	Points	0.2048 nmi	-0.5561
33-DEP-1-0			
1	Straight	2.0000 nmi	
2	Straight	2.0000 nmi	
3	Straight	2.0000 nmi	
33-DEP-A-0			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2055 nmi	0.5557
3	Points	-1.8635 nmi	5.0954
33-DEP-A-1			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2056 nmi	0.5557
3	Points	-2.0983 nmi	5.0096
33-DEP-A-2			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2054 nmi	0.5557
3	Points	-1.6287 nmi	5.1812
33-DEP-A-3			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2057 nmi	0.5556
3	Points	-2.3332 nmi	4.9239
33-DEP-A-4			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2053 nmi	0.5558
3	Points	-1.3938 nmi	5.2669
33-DEP-A-5			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2058 nmi	0.5556
3	Points	-2.5680 nmi	4.8381
33-DEP-A-6			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2052 nmi	0.5558
3	Points	-1.1590 nmi	5.3527
33-DEP-A-7			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2059 nmi	0.5556
3	Points	-2.8029 nmi	4.7523
33-DEP-A-8			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2051 nmi	0.5558
3	Points	-0.9241 nmi	5.4385
33-DEP-B-0			
1	Points	0.2046 nmi	-0.5562
2	Points	-0.2052 nmi	0.5557
3	Points	-0.3788 nmi	0.7558
4	Points	-0.4990 nmi	0.8663
5	Points	-0.6374 nmi	0.9727
6	Points	-0.8605 nmi	1.0771
7	Points	-1.1289 nmi	1.1666
8	Points	-1.4470 nmi	1.1666
9	Points	-1.8496 nmi	1.0920
10	Points	-2.1429 nmi	0.6347
11	Points	-2.2174 nmi	0.2818
12	Points	-2.3069 nmi	-0.2053
13	Points	-2.4013 nmi	-1.1596
14	Points	-2.5635 nmi	-2.7577
33-DEP-B-1			

1	Points	0.2045 nmi	-0.5562
2	Points	-0.2053 nmi	0.5556
3	Points	-0.4147 nmi	0.7209
4	Points	-0.5795 nmi	0.7707
5	Points	-0.7414 nmi	0.8018
6	Points	-0.9346 nmi	0.8914
7	Points	-1.1649 nmi	0.9445
8	Points	-1.4196 nmi	0.8678
9	Points	-1.6544 nmi	0.8015
10	Points	-1.7728 nmi	0.4829
11	Points	-1.7759 nmi	0.1947
12	Points	-1.8118 nmi	-0.2751
13	Points	-1.7546 nmi	-1.2244
14	Points	-1.8173 nmi	-2.8334

33-DEP-B-2

1	Points	0.2047 nmi	-0.5562
2	Points	-0.2051 nmi	0.5558
3	Points	-0.3430 nmi	0.7906
4	Points	-0.4186 nmi	0.9620
5	Points	-0.5335 nmi	1.1435
6	Points	-0.7864 nmi	1.2628
7	Points	-1.0929 nmi	1.3887
8	Points	-1.4744 nmi	1.4653
9	Points	-2.0449 nmi	1.3825
10	Points	-2.5130 nmi	0.7865
11	Points	-2.6589 nmi	0.3690
12	Points	-2.8020 nmi	-0.1354
13	Points	-3.0481 nmi	-1.0948
14	Points	-3.3096 nmi	-2.6820

33-DEP-B-3

1	Points	0.2044 nmi	-0.5563
2	Points	-0.2054 nmi	0.5556
3	Points	-0.4506 nmi	0.6860
4	Points	-0.6600 nmi	0.6750
5	Points	-0.8453 nmi	0.6309
6	Points	-1.0088 nmi	0.7056
7	Points	-1.2010 nmi	0.7224
8	Points	-1.3922 nmi	0.5691
9	Points	-1.4591 nmi	0.5111
10	Points	-1.4027 nmi	0.3312
11	Points	-1.3345 nmi	0.1075
12	Points	-1.3167 nmi	-0.3450
13	Points	-1.1078 nmi	-1.2892
14	Points	-1.0712 nmi	-2.9091

33-DEP-B-4

1	Points	0.2048 nmi	-0.5561
2	Points	-0.2050 nmi	0.5558
3	Points	-0.3071 nmi	0.8255
4	Points	-0.3381 nmi	1.0576
5	Points	-0.4296 nmi	1.3144
6	Points	-0.7122 nmi	1.4486
7	Points	-1.0568 nmi	1.6108
8	Points	-1.5019 nmi	1.7641
9	Points	-2.2401 nmi	1.6730
10	Points	-2.8830 nmi	0.9383
11	Points	-3.1004 nmi	0.4562
12	Points	-3.2971 nmi	-0.0656
13	Points	-3.6949 nmi	-1.0300
14	Points	-4.0558 nmi	-2.6063

33-DEP-C-0

1	Points	0.2046 nmi	-0.5562
2	Points	-0.2052 nmi	0.5560
3	Points	-0.3160 nmi	0.8712
4	Points	-0.3160 nmi	0.9789
5	Points	-0.2980 nmi	1.0866
6	Points	-0.2621 nmi	1.1944
7	Points	-0.2083 nmi	1.2841
8	Points	-0.1454 nmi	1.3559
9	Points	-0.0377 nmi	1.4277
10	Points	0.0700 nmi	1.4816
11	Points	0.2226 nmi	1.4996
12	Points	3.0591 nmi	1.4367

33-DEP-C-1

1	Points	0.2045 nmi	-0.5562
2	Points	-0.2053 nmi	0.5560
3	Points	-0.3653 nmi	0.8628
4	Points	-0.3658 nmi	0.9831
5	Points	-0.3466 nmi	1.0987
6	Points	-0.3303 nmi	1.2257
7	Points	-0.2891 nmi	1.3430
8	Points	-0.2279 nmi	1.4499
9	Points	-0.1130 nmi	1.5575
10	Points	0.0270 nmi	1.6253
11	Points	0.2155 nmi	1.6494
12	Points	3.0646 nmi	1.6867

33-DEP-C-2

1	Points	0.2047 nmi	-0.5562
2	Points	-0.2051 nmi	0.5561
3	Points	-0.2667 nmi	0.8796
4	Points	-0.2662 nmi	0.9748

5 Points	-0.2495 nmi	1.0746
6 Points	-0.1940 nmi	1.1630
7 Points	-0.1274 nmi	1.2252
8 Points	-0.0630 nmi	1.2620
9 Points	0.0376 nmi	1.2980
10 Points	0.1129 nmi	1.3379
11 Points	0.2297 nmi	1.3497
12 Points	3.0536 nmi	1.1868
33-DEP-C-3		
1 Points	0.2044 nmi	-0.5563
2 Points	-0.2054 nmi	0.5559
3 Points	-0.4146 nmi	0.8544
4 Points	-0.4156 nmi	0.9872
5 Points	-0.3951 nmi	1.1108
6 Points	-0.3984 nmi	1.2570
7 Points	-0.3699 nmi	1.4019
8 Points	-0.3103 nmi	1.5439
9 Points	-0.1883 nmi	1.6872
10 Points	-0.0159 nmi	1.7690
11 Points	0.2084 nmi	1.7992
12 Points	3.0702 nmi	1.9366
33-DEP-C-4		
1 Points	0.2048 nmi	-0.5561
2 Points	-0.2050 nmi	0.5561
3 Points	-0.2174 nmi	0.8880
4 Points	-0.2163 nmi	0.9707
5 Points	-0.2010 nmi	1.0625
6 Points	-0.1259 nmi	1.1317
7 Points	-0.0466 nmi	1.1664
8 Points	0.0194 nmi	1.1680
9 Points	0.1129 nmi	1.1683
10 Points	0.1559 nmi	1.1942
11 Points	0.2368 nmi	1.1999
12 Points	3.0480 nmi	0.9368
33-DEP-D-0		
1 Points	0.2046 nmi	-0.5562
2 Points	-0.2135 nmi	0.5769
3 Points	-0.2827 nmi	0.7846
4 Points	-0.3173 nmi	0.9231
5 Points	-0.3087 nmi	1.1135
6 Points	-0.2394 nmi	1.2519
7 Points	-0.1615 nmi	1.3471
8 Points	-0.0144 nmi	1.4337
9 Points	0.1413 nmi	1.5115
10 Points	2.8673 nmi	3.0692
33-DEP-D-1		
1 Points	0.2045 nmi	-0.5562
2 Points	-0.2136 nmi	0.5769
3 Points	-0.3307 nmi	0.7706
4 Points	-0.3919 nmi	0.9156
5 Points	-0.4054 nmi	1.1386
6 Points	-0.3234 nmi	1.3063
7 Points	-0.2266 nmi	1.4231
8 Points	-0.0622 nmi	1.5215
9 Points	0.0942 nmi	1.5997
10 Points	2.7433 nmi	3.2863
33-DEP-D-2		
1 Points	0.2047 nmi	-0.5562
2 Points	-0.2134 nmi	0.5770
3 Points	-0.2347 nmi	0.7986
4 Points	-0.2427 nmi	0.9305
5 Points	-0.2119 nmi	1.0883
6 Points	-0.1555 nmi	1.1976
7 Points	-0.0965 nmi	1.2712
8 Points	0.0333 nmi	1.3458
9 Points	0.1885 nmi	1.4234
10 Points	2.9913 nmi	2.8522
33-DEP-D-3		
1 Points	0.2044 nmi	-0.5563
2 Points	-0.2137 nmi	0.5769
3 Points	-0.3787 nmi	0.7567
4 Points	-0.4666 nmi	0.9081
5 Points	-0.5022 nmi	1.1638
6 Points	-0.4073 nmi	1.3606
7 Points	-0.2917 nmi	1.4990
8 Points	-0.1099 nmi	1.6094
9 Points	0.0470 nmi	1.6879
10 Points	2.6192 nmi	3.5034
33-DEP-D-4		
1 Points	0.2048 nmi	-0.5561
2 Points	-0.2133 nmi	0.5770
3 Points	-0.1867 nmi	0.8126
4 Points	-0.1681 nmi	0.9380
5 Points	-0.1151 nmi	1.0631
6 Points	-0.0716 nmi	1.1432
7 Points	-0.0314 nmi	1.1952
8 Points	0.0811 nmi	1.2579
9 Points	0.2357 nmi	1.3352
10 Points	3.1154 nmi	2.6351
33-DEP-E-0		

1 Points 0.2046 nmi -0.5562
2 Points -0.2112 nmi 0.5819
3 Points -0.3115 nmi 0.9165
4 Points -0.3227 nmi 1.1619
5 Points -0.2558 nmi 1.3627
6 Points -0.0996 nmi 1.4519
7 Points 0.2238 nmi 1.4519
8 Points 0.3912 nmi 1.3292
9 Points 0.6142 nmi 0.7604
10 Points 1.0715 nmi -0.4219
11 Points 4.0942 nmi -2.3850

33-DEP-E-1
1 Points 0.2045 nmi -0.5562
2 Points -0.2112 nmi 0.5819
3 Points -0.4101 nmi 0.8998
4 Points -0.4217 nmi 1.1757
5 Points -0.3331 nmi 1.4261
6 Points -0.1253 nmi 1.5486
7 Points 0.2550 nmi 1.5470
8 Points 0.4902 nmi 1.4055
9 Points 0.8006 nmi 0.8330
10 Points 1.2656 nmi -0.2643
11 Points 4.3666 nmi -1.9657

33-DEP-E-2
1 Points 0.2047 nmi -0.5562
2 Points -0.2111 nmi 0.5820
3 Points -0.2130 nmi 0.9333
4 Points -0.2236 nmi 1.1482
5 Points -0.1784 nmi 1.2993
6 Points -0.0739 nmi 1.3553
7 Points 0.1927 nmi 1.3569
8 Points 0.2921 nmi 1.2530
9 Points 0.4279 nmi 0.6878
10 Points 0.8775 nmi -0.5795
11 Points 3.8219 nmi -2.8043

33-DEP-E-3
1 Points 0.2044 nmi -0.5563
2 Points -0.2113 nmi 0.5819
3 Points -0.5087 nmi 0.8830
4 Points -0.5208 nmi 1.1895
5 Points -0.4104 nmi 1.4895
6 Points -0.1509 nmi 1.6452
7 Points 0.2861 nmi 1.6420
8 Points 0.5893 nmi 1.4817
9 Points 0.9870 nmi 0.9056
10 Points 1.4597 nmi -0.1068
11 Points 4.6389 nmi -1.5463

33-DEP-E-4
1 Points 0.2048 nmi -0.5561
2 Points -0.2110 nmi 0.5820
3 Points -0.1144 nmi 0.9501
4 Points -0.1246 nmi 1.1344
5 Points -0.1011 nmi 1.2359
6 Points -0.0483 nmi 1.2586
7 Points 0.1616 nmi 1.2618
8 Points 0.1930 nmi 1.1768
9 Points 0.2415 nmi 0.6152
10 Points 0.6834 nmi -0.7371
11 Points 3.5496 nmi -3.2237

33-DEP-F-0
1 Points 0.2046 nmi -0.5562
2 Points -0.1762 nmi 0.5838
3 Points -0.7754 nmi 2.1765
4 Points -1.0592 nmi 2.5550
5 Points -1.4850 nmi 2.6969
6 Points -1.8004 nmi 2.6654
7 Points -2.1946 nmi 2.4604
8 Points -2.3996 nmi 2.1292
9 Points -2.3996 nmi 1.6246
10 Points -0.8858 nmi -2.3177
11 Points -0.9804 nmi -7.1431

33-DEP-F-1
1 Points 0.2044 nmi -0.5563
2 Points -0.1763 nmi 0.5838
3 Points -0.9507 nmi 2.0804
4 Points -1.2346 nmi 2.3116
5 Points -1.5293 nmi 2.2994
6 Points -1.6862 nmi 2.2820
7 Points -1.9225 nmi 2.1672
8 Points -2.0149 nmi 2.0198
9 Points -1.9080 nmi 1.7158
10 Points -0.0978 nmi -2.1796
11 Points 0.0194 nmi -7.1627

33-DEP-F-2
1 Points 0.2048 nmi -0.5561
2 Points -0.1760 nmi 0.5839
3 Points -0.6000 nmi 2.2727
4 Points -0.8838 nmi 2.7984
5 Points -1.4407 nmi 3.0945
6 Points -1.9146 nmi 3.0487

7 Points -2.4667 nmi 2.7536
8 Points -2.7844 nmi 2.2387
9 Points -2.8912 nmi 1.5335
10 Points -1.6738 nmi -2.4558
11 Points -1.9802 nmi -7.1235

33-TGO-1-0

1 Straight 1.5000 nmi
2 Left-Turn 90.0000 deg 0.4000
3 Straight 0.3000 nmi
4 Left-Turn 90.0000 deg 0.4000
5 Straight 2.0000 nmi
6 Left-Turn 90.0000 deg 0.4000
7 Straight 0.3000 nmi
8 Left-Turn 90.0000 deg 0.4000
9 Straight 0.5000 nmi

33-TGO-A-0

1 Points 0.2046 nmi -0.5562
2 Points -0.3158 nmi 0.8619
3 Points -0.3722 nmi 0.9425
4 Points -0.4246 nmi 1.0070
5 Points -0.4689 nmi 1.0433
6 Points -0.5133 nmi 1.0675
7 Points -0.5617 nmi 1.0917
8 Points -0.6181 nmi 1.1038
9 Points -0.6746 nmi 1.1118
10 Points -0.7350 nmi 1.1118
11 Points -0.7955 nmi 1.1038
12 Points -1.0938 nmi 0.9909
13 Points -1.1664 nmi 0.9586
14 Points -1.2269 nmi 0.9143
15 Points -1.2712 nmi 0.8699
16 Points -1.3156 nmi 0.8175
17 Points -1.3357 nmi 0.7651
18 Points -1.3559 nmi 0.7046
19 Points -1.3720 nmi 0.6280
20 Points -1.3478 nmi 0.4789
21 Points -0.6592 nmi -1.3935
22 Points -0.5973 nmi -1.5085
23 Points -0.5265 nmi -1.5792
24 Points -0.4425 nmi -1.6235
25 Points -0.3496 nmi -1.6500
26 Points -0.2833 nmi -1.6588
27 Points -0.1992 nmi -1.6456
28 Points -0.1373 nmi -1.6412
29 Points 0.1502 nmi -1.5306
30 Points 0.2729 nmi -1.4563
31 Points 0.3333 nmi -1.3757
32 Points 0.3696 nmi -1.3152
33 Points 0.3857 nmi -1.2345
34 Points 0.3938 nmi -1.1660
35 Points 0.3857 nmi -1.0491
36 Points 0.2046 nmi -0.5562

33-TGO-A-1

1 Points 0.2045 nmi -0.5562
2 Points -0.3601 nmi 0.8387
3 Points -0.4121 nmi 0.9124
4 Points -0.4636 nmi 0.9682
5 Points -0.5053 nmi 0.9893
6 Points -0.5480 nmi 1.0010
7 Points -0.5865 nmi 1.0209
8 Points -0.6313 nmi 1.0299
9 Points -0.6799 nmi 1.0370
10 Points -0.7301 nmi 1.0370
11 Points -0.7772 nmi 1.0310
12 Points -1.0558 nmi 0.8984
13 Points -1.1163 nmi 0.8721
14 Points -1.1618 nmi 0.8384
15 Points -1.1977 nmi 0.8023
16 Points -1.2295 nmi 0.7665
17 Points -1.2416 nmi 0.7313
18 Points -1.2594 nmi 0.6785
19 Points -1.2721 nmi 0.6257
20 Points -1.2510 nmi 0.5043
21 Points -0.5681 nmi -1.3524
22 Points -0.5171 nmi -1.4488
23 Points -0.4672 nmi -1.4987
24 Points -0.4053 nmi -1.5307
25 Points -0.3292 nmi -1.5521
26 Points -0.2845 nmi -1.5588
27 Points -0.2106 nmi -1.5462
28 Points -0.1591 nmi -1.5435
29 Points 0.1062 nmi -1.4409
30 Points 0.2058 nmi -1.3823
31 Points 0.2503 nmi -1.3198
32 Points 0.2763 nmi -1.2791
33 Points 0.2869 nmi -1.2189
34 Points 0.2939 nmi -1.1636
35 Points 0.2880 nmi -1.0700
36 Points 0.2045 nmi -0.5562

33-TGO-A-2

1 Points	0.2047 nmi	-0.5562
2 Points	-0.2714 nmi	0.8850
3 Points	-0.3323 nmi	0.9726
4 Points	-0.3856 nmi	1.0458
5 Points	-0.4326 nmi	1.0972
6 Points	-0.4786 nmi	1.1339
7 Points	-0.5368 nmi	1.1625
8 Points	-0.6049 nmi	1.1776
9 Points	-0.6692 nmi	1.1866
10 Points	-0.7400 nmi	1.1866
11 Points	-0.8139 nmi	1.1765
12 Points	-1.1318 nmi	1.0833
13 Points	-1.2166 nmi	1.0451
14 Points	-1.2920 nmi	0.9902
15 Points	-1.3448 nmi	0.9376
16 Points	-1.4016 nmi	0.8685
17 Points	-1.4299 nmi	0.7989
18 Points	-1.4524 nmi	0.7308
19 Points	-1.4719 nmi	0.6304
20 Points	-1.4446 nmi	0.4535
21 Points	-0.7503 nmi	-1.4345
22 Points	-0.6775 nmi	-1.5681
23 Points	-0.5859 nmi	-1.6598
24 Points	-0.4797 nmi	-1.7162
25 Points	-0.3700 nmi	-1.7479
26 Points	-0.2821 nmi	-1.7589
27 Points	-0.1879 nmi	-1.7449
28 Points	-0.1156 nmi	-1.7388
29 Points	0.1942 nmi	-1.6203
30 Points	0.3399 nmi	-1.5303
31 Points	0.4164 nmi	-1.4315
32 Points	0.4629 nmi	-1.3512
33 Points	0.4845 nmi	-1.2502
34 Points	0.4938 nmi	-1.1684
35 Points	0.4835 nmi	-1.0282
36 Points	0.2047 nmi	-0.5562

33-TGO-A-3

1 Points	0.2044 nmi	-0.5563
2 Points	-0.4044 nmi	0.8156
3 Points	-0.4520 nmi	0.8823
4 Points	-0.5025 nmi	0.9293
5 Points	-0.5416 nmi	0.9354
6 Points	-0.5827 nmi	0.9346
7 Points	-0.6114 nmi	0.9501
8 Points	-0.6445 nmi	0.9561
9 Points	-0.6852 nmi	0.9622
10 Points	-0.7251 nmi	0.9622
11 Points	-0.7588 nmi	0.9583
12 Points	-1.0178 nmi	0.8060
13 Points	-1.0661 nmi	0.7856
14 Points	-1.0967 nmi	0.7625
15 Points	-1.1242 nmi	0.7346
16 Points	-1.1435 nmi	0.7156
17 Points	-1.1475 nmi	0.6976
18 Points	-1.1629 nmi	0.6523
19 Points	-1.1723 nmi	0.6234
20 Points	-1.1542 nmi	0.5297
21 Points	-0.4770 nmi	-1.3114
22 Points	-0.4369 nmi	-1.3891
23 Points	-0.4079 nmi	-1.4181
24 Points	-0.3681 nmi	-1.4379
25 Points	-0.3088 nmi	-1.4542
26 Points	-0.2857 nmi	-1.4588
27 Points	-0.2220 nmi	-1.4469
28 Points	-0.1808 nmi	-1.4459
29 Points	0.0622 nmi	-1.3512
30 Points	0.1388 nmi	-1.3082
31 Points	0.1672 nmi	-1.2640
32 Points	0.1830 nmi	-1.2430
33 Points	0.1881 nmi	-1.2032
34 Points	0.1939 nmi	-1.1612
35 Points	0.1903 nmi	-1.0909
36 Points	0.2044 nmi	-0.5563

33-TGO-A-4

1 Points	0.2048 nmi	-0.5561
2 Points	-0.2271 nmi	0.9082
3 Points	-0.2924 nmi	1.0027
4 Points	-0.3467 nmi	1.0847
5 Points	-0.3963 nmi	1.1512
6 Points	-0.4439 nmi	1.2004
7 Points	-0.5120 nmi	1.2333
8 Points	-0.5918 nmi	1.2514
9 Points	-0.6639 nmi	1.2614
10 Points	-0.7450 nmi	1.2614
11 Points	-0.8322 nmi	1.2492
12 Points	-1.1698 nmi	1.1758
13 Points	-1.2667 nmi	1.1316
14 Points	-1.3571 nmi	1.0661
15 Points	-1.4183 nmi	1.0053
16 Points	-1.4877 nmi	0.9195

17 Points -1.5240 nmi 0.8327
18 Points -1.5489 nmi 0.7569
19 Points -1.5718 nmi 0.6327
20 Points -1.5414 nmi 0.4281
21 Points -0.8415 nmi -1.4755
22 Points -0.7577 nmi -1.6278
23 Points -0.6452 nmi -1.7403
24 Points -0.5169 nmi -1.8090
25 Points -0.3904 nmi -1.8458
26 Points -0.2809 nmi -1.8589
27 Points -0.1765 nmi -1.8443
28 Points -0.0938 nmi -1.8364
29 Points 0.2382 nmi -1.7100
30 Points 0.4070 nmi -1.6043
31 Points 0.4994 nmi -1.4873
32 Points 0.5562 nmi -1.3873
33 Points 0.5834 nmi -1.2659
34 Points 0.5937 nmi -1.1708
35 Points 0.5812 nmi -1.0073
36 Points 0.2048 nmi -0.5561

H1-TGO-A-0
1 Straight 0.5000 nmi
2 Right-Turn 90.0000 deg 0.2000
3 Straight 0.2000 nmi
4 Right-Turn 90.0000 deg 0.2000
5 Straight 1.5000 nmi
6 Right-Turn 90.0000 deg 0.2000
7 Straight 0.2000 nmi
8 Right-Turn 90.0000 deg 0.2000
9 Straight 1.0000 nmi

H2-TGO-A-0
1 Straight 1.0000 nmi
2 Left-Turn 90.0000 deg 0.2000
3 Straight 0.2000 nmi
4 Left-Turn 90.0000 deg 0.2000
5 Straight 1.5000 nmi
6 Left-Turn 90.0000 deg 0.2000
7 Straight 0.2000 nmi
8 Left-Turn 90.0000 deg 0.2000
9 Straight 0.5000 nmi

H3-APP-A-0
1 Straight 3.0000 nmi
2 Right-Turn 45.0000 deg 0.3000
3 Straight 0.2000 nmi
4 Left-Turn 23.0000 deg 0.1000
5 Straight 0.1200 nmi
6 Right-Turn 43.0000 deg 0.0100
7 Straight 0.0001 nmi

H3-APP-B-0
1 Straight 3.0000 nmi
2 Left-Turn 45.0000 deg 0.3000
3 Straight 0.2000 nmi
4 Left-Turn 23.0000 deg 0.1000
5 Straight 0.1200 nmi
6 Right-Turn 43.0000 deg 0.0100
7 Straight 0.0001 nmi

H3-DEP-A-0
1 Straight 0.3000 nmi
2 Left-Turn 45.0000 deg 0.4000
3 Straight 3.0000 nmi

H3-DEP-B-0
1 Straight 0.3000 nmi
2 Right-Turn 45.0000 deg 0.4000
3 Straight 3.0000 nmi

H4-APP-A-0
1 Straight 3.0000 nmi
2 Left-Turn 45.0000 deg 0.4000
3 Straight 0.3000 nmi

H4-APP-B-0
1 Straight 3.0000 nmi
2 Right-Turn 45.0000 deg 0.4000
3 Straight 0.3000 nmi

H4-DEP-A-0
1 Straight 0.0001 nmi
2 Left-Turn 40.0000 deg 0.0100
3 Straight 0.1300 nmi
4 Right-Turn 20.0000 deg 0.1000
5 Straight 0.2000 nmi
6 Left-Turn 45.0000 deg 0.3000
7 Straight 3.0000 nmi

H4-DEP-B-0
1 Straight 0.0001 nmi
2 Left-Turn 40.0000 deg 0.0100
3 Straight 0.1300 nmi
4 Right-Turn 20.0000 deg 0.1000
5 Straight 0.2000 nmi
6 Right-Turn 45.0000 deg 0.3000
7 Straight 3.0000 nmi

OVF-OVF-1-0
1 Points -0.2935 nmi -1.0177

2 Points -0.2935 nmi -1.0908
3 Points -0.3373 nmi -1.1419
4 Points -0.3373 nmi -1.1200
OVF-OVF-2-0
1 Points -0.6156 nmi 0.9667
2 Points -0.6006 nmi 0.9975
3 Points -0.6537 nmi 0.9975

STUDY AIRCRAFT
737700 Standard data
737N17 Standard data
A109 User-defined
Descrip : Augusta A-109
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : A109
ATRS : No
TkoWgt : 5730 lb
LndWgt : 5730 lb
LndDist : 0 ft
StaticThr : 0 lb
B206L User-defined
Descrip : Bell 206L
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : B206L
ATRS : No
TkoWgt : 4000 lb
LndWgt : 4000 lb
LndDist : 0 ft
StaticThr : 0 lb
B212 User-defined
Descrip : Bell 212 (UH-1N)
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : B212
ATRS : No
TkoWgt : 10500 lb
LndWgt : 10500 lb
LndDist : 0 ft
StaticThr : 0 lb
B222 User-defined
Descrip : Bell 222
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : B222
ATRS : No
TkoWgt : 7800 lb
LndWgt : 7800 lb
LndDist : 0 ft
StaticThr : 0 lb
BEC58P Standard data
BO105 User-defined
Descrip : Boelkow BO-105
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : BO105
ATRS : No
TkoWgt : 5070 lb
LndWgt : 5070 lb
LndDist : 0 ft
StaticThr : 0 lb
CH47D User-defined
Descrip : Boeing Vertol 234 (CH-47D)

UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : CH47D
ATRS : No
TkoWgt : 48500 lb
LndWgt : 48500 lb
LndDist : 0 ft
StaticThr : 0 lb
CIT3 Standard data
CL600 Standard data
CNA441 Standard data
CNA500 Standard data
CNA55B Standard data
CNA750 Standard data
DC93LW Standard data
DHC6 Standard data
FAL20 Standard data
FAL50 User-defined
Descrip : Falcon 50
UserID : GA
WgtCat : Small
OwnerCat : Gen-Aviation
EngType : Jet
NoiseCat : Stage3
Type : Jet
NumEng : 3
NoiseId : FAL50
ATRS : No
TkoWgt : 18300 lb
LndWgt : 15300 lb
LndDist : 3076 ft
StaticThr : 3500 lb
GASEPF Standard data
GASEPV Standard data
GIIB Standard data
GIV Standard data
GV Standard data
H500D User-defined
Descrip : Hughes 500D
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : H500D
ATRS : No
TkoWgt : 2550 lb
LndWgt : 2550 lb
LndDist : 0 ft
StaticThr : 0 lb
LEAR25 Standard data
LEAR35 Standard data
S61 User-defined
Descrip : Sikorsky S-61 (CH-3A)
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : S61
ATRS : No
TkoWgt : 19000 lb
LndWgt : 19000 lb
LndDist : 0 ft
StaticThr : 0 lb
S65 User-defined
Descrip : Sikorsky S-65 (CH-53)
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : S65
ATRS : No
TkoWgt : 37000 lb
LndWgt : 37000 lb
LndDist : 0 ft
StaticThr : 0 lb
S70 User-defined

Descrip : Sikorsky S-70 (UH-60A)

UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : S70
ATRS : No
TkoWgt : 20250 lb
LndWgt : 20250 lb
LndDist : 0 ft
StaticThr : 0 lb

S76 User-defined
Descrip : Sikorsky S-76
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : S76
ATRS : No
TkoWgt : 10000 lb
LndWgt : 10000 lb
LndDist : 0 ft
StaticThr : 0 lb

SA330J User-defined
Descrip : Aerospatiale SA-330J
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : SA330J
ATRS : No
TkoWgt : 15432 lb
LndWgt : 15432 lb
LndDist : 0 ft
StaticThr : 0 lb

SA341G User-defined
Descrip : Aerospatiale SA-341G
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : SA341G
ATRS : No
TkoWgt : 3970 lb
LndWgt : 3970 lb
LndDist : 0 ft
StaticThr : 0 lb

SA350D User-defined
Descrip : Aerospatiale SA-350D
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : SA350D
ATRS : No
TkoWgt : 4300 lb
LndWgt : 4300 lb
LndDist : 0 ft
StaticThr : 0 lb

SA355F User-defined
Descrip : Aerospatiale SA-355F
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : SA355F
ATRS : No
TkoWgt : 5070 lb
LndWgt : 5070 lb
LndDist : 0 ft
StaticThr : 0 lb

SA365N User-defined
Descrip : Aerospatiale SA-365N
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : SA365N
ATRS : No
TkoWgt : 8488 lb
LndWgt : 8488 lb
LndDist : 0 ft
StaticThr : 0 lb

STUDY SUBSTITUTION AIRCRAFT
Name Description
Acft Percent

USER-DEFINED NOISE CURVES

Type	Thrust	Op	200	400	630	1000	2000	4000	6300	10000	16000	25000
A109 type=other model=INM app=217 dep=115 afb=301												
SEL	1.00	A	94.3	90.9	88.5	85.9	81.5	76.4	72.4	67.6	62.7	58.1
SEL	1.00	D	90.9	87.4	84.8	82.1	77.5	71.9	67.6	62.6	57.5	52.6
SEL	1.00	X	91.8	88.0	85.4	82.5	77.5	71.5	67.1	61.9	56.6	51.6
SEL	2.00	A	94.3	90.9	88.5	85.9	81.5	76.4	72.4	67.6	62.7	58.1
SEL	2.00	D	90.9	87.4	84.8	82.1	77.5	71.9	67.6	62.6	57.5	52.6
B206L type=other model=INM app=222 dep=120 afb=307												
SEL	1.00	A	85.8	83.4	81.6	79.5	75.6	70.6	66.7	62.0	57.2	52.6
SEL	1.00	D	81.8	79.6	77.7	75.4	69.7	65.3	61.2	56.4	51.5	46.9
SEL	1.00	X	84.7	82.4	80.5	78.0	73.3	67.4	63.1	58.2	53.3	48.6
SEL	2.00	A	85.8	83.4	81.6	79.5	75.6	70.6	66.7	62.0	57.2	52.6
SEL	2.00	D	81.8	79.6	77.7	75.4	69.7	65.3	61.2	56.4	51.5	46.9
B212 type=other model=INM app=221 dep=114 afb=304												
SEL	1.00	A	92.1	88.8	86.6	84.1	80.1	75.2	71.4	66.7	62.0	57.6
SEL	1.00	D	89.1	85.9	83.5	80.9	76.6	71.3	67.2	62.2	57.1	52.3
SEL	1.00	X	93.8	90.4	88.0	85.3	80.8	75.6	71.5	66.8	62.0	57.5
SEL	2.00	A	92.1	88.8	86.6	84.1	80.1	75.2	71.4	66.7	62.0	57.6
SEL	2.00	D	89.1	85.9	83.5	80.9	76.6	71.3	67.2	62.2	57.1	52.3
B222 type=other model=INM app=218 dep=115 afb=304												
SEL	1.00	A	91.0	87.6	85.3	82.9	78.9	74.3	70.7	66.7	62.5	58.6
SEL	1.00	D	86.6	82.9	80.2	77.5	72.8	67.5	63.5	59.0	54.4	50.0

```
  SEL     1.00 X  90.8 87.1 84.5 81.7 77.0 71.8 67.8 63.3 58.7 54.4
  SEL     2.00 A  91.0 87.6 85.3 82.9 78.9 74.3 70.7 66.7 62.5 58.6
  SEL     2.00 D  86.6 82.9 80.2 77.5 72.8 67.5 63.5 59.0 54.4 50.0
BO105  type=other model=INM app=217 dep=114 afb=301
  SEL     1.00 A  90.5 87.1 84.7 82.1 77.6 72.1 67.7 62.4 56.9 51.8
  SEL     1.00 D  85.9 82.5 80.2 77.7 73.4 68.4 64.4 59.6 54.8 50.2
  SEL     1.00 X  90.4 87.0 84.5 81.9 77.5 72.0 67.9 62.9 57.8 53.1
  SEL     2.00 A  90.5 87.1 84.7 82.1 77.6 72.1 67.7 62.4 56.9 51.8
  SEL     2.00 D  85.9 82.5 80.2 77.7 73.4 68.4 64.4 59.6 54.8 50.2
CH47D  type=other model=INM app=221 dep=119 afb=306
  SEL     1.00 A  97.3 94.0 91.8 89.4 85.5 80.9 77.4 73.2 68.9 64.8
  SEL     1.00 D  90.4 86.6 84.0 81.0 76.0 70.1 65.7 60.5 55.3 50.3
  SEL     1.00 X  90.9 87.1 84.4 81.5 76.7 71.1 67.0 62.5 57.9 53.5
  SEL     2.00 A  97.3 94.0 91.8 89.4 85.5 80.9 77.4 73.2 68.9 64.8
  SEL     2.00 D  90.4 86.6 84.0 81.0 76.0 70.1 65.7 60.5 55.3 50.3
FAL50  type=pounds model=INM app=201 dep=101 afb=0
  EPNL  1000.00 A  99.9 94.7 90.7 86.2 78.3 70.1 63.9 56.8 48.8 38.0
  EPNL  1500.00 A 103.6 100.3 96.6 92.3 84.7 76.9 71.1 64.4 56.5 46.7
  EPNL  1500.00 D 105.4 100.3 96.6 92.3 84.7 76.9 71.1 64.4 56.6 46.7
  EPNL  2650.00 D 116.6 110.7 106.1 100.8 92.7 84.1 77.3 69.4 61.2 49.6
  LAMAX 1000.00 A  92.8 86.0 81.0 75.7 67.3 58.4 52.0 45.3 38.1 30.4
  LAMAX 1500.00 A  97.9 91.1 86.2 81.1 72.8 63.7 57.0 49.8 41.9 33.4
  LAMAX 1500.00 D  97.9 91.1 86.2 81.1 72.8 63.7 57.0 49.8 41.9 33.4
  LAMAX 2650.00 D 109.3 101.6 96.2 90.7 81.9 72.1 64.7 56.4 47.1 36.8
  SEL   1000.00 A  95.5 90.8 87.4 83.6 77.4 70.7 65.9 60.6 54.9 48.7
  SEL   1500.00 A 101.1 96.6 93.2 89.6 83.6 76.7 71.5 65.8 59.4 52.4
  SEL   1500.00 D 101.1 96.6 93.2 89.6 83.6 76.7 71.5 65.8 59.4 52.4
  SEL   2650.00 D 112.3 106.8 102.9 98.9 92.4 84.8 78.9 72.1 64.3 55.6
H500D  type=other model=INM app=217 dep=116 afb=304
  SEL     1.00 A  86.0 82.6 80.2 77.6 73.2 67.8 63.4 58.1 52.7 47.6
  SEL     1.00 D  84.1 80.8 78.5 75.9 71.7 66.5 62.3 57.1 51.9 46.9
  SEL     1.00 X  84.9 81.5 79.2 76.6 72.4 67.2 63.3 58.5 53.7 49.1
  SEL     2.00 A  86.0 82.6 80.2 77.6 73.2 67.8 63.4 58.1 52.7 47.6
  SEL     2.00 D  84.1 80.8 78.5 75.9 71.7 66.5 62.3 57.1 51.9 46.9
S61    type=other model=INM app=219 dep=120 afb=303
  SEL     1.00 A  91.6 88.2 85.8 83.2 78.8 73.5 69.4 64.7 59.9 55.3
  SEL     1.00 D  92.8 89.3 86.8 84.0 79.2 73.5 69.0 63.7 58.4 53.3
  SEL     1.00 X  94.0 90.5 88.0 85.2 80.5 74.7 70.2 64.8 59.3 54.2
  SEL     2.00 A  91.6 88.2 85.8 83.2 78.8 73.5 69.4 64.7 59.9 55.3
  SEL     2.00 D  92.8 89.3 86.8 84.0 79.2 73.5 69.0 63.7 58.4 53.3
S65    type=other model=INM app=219 dep=116 afb=305
  SEL     1.00 A  95.7 92.5 90.3 87.9 83.9 79.4 76.0 71.9 67.9 64.0
  SEL     1.00 D  94.8 91.5 89.1 86.6 82.4 77.4 73.5 68.7 63.8 59.1
  SEL     1.00 X  97.7 94.3 91.8 89.0 84.4 78.8 74.5 69.3 64.1 59.1
  SEL     2.00 A  95.7 92.5 90.3 87.9 83.9 79.4 76.0 71.9 67.9 64.0
```

SEL 2.00 D 94.8 91.5 89.1 86.6 82.4 77.4 73.5 68.7 63.8 59.1
S70 type=other model=INM app=218 dep=114 afb=305
SEL 1.00 A 94.3 91.0 88.7 86.3 82.3 77.7 74.2 70.0 65.7 61.7
SEL 1.00 D 87.7 84.0 81.3 78.4 73.5 68.0 63.9 59.1 54.3 49.8
SEL 1.00 X 99.8 96.1 93.5 90.7 85.8 80.1 75.7 70.6 65.4 60.4
SEL 2.00 A 94.3 91.0 88.7 86.3 82.3 77.7 74.2 70.0 65.7 61.7
SEL 2.00 D 87.7 84.0 81.3 78.4 73.5 68.0 63.9 59.1 54.3 49.8
S76 type=other model=INM app=219 dep=119 afb=302
SEL 1.00 A 91.6 88.4 86.1 83.7 79.7 75.2 71.6 67.3 63.0 58.9
SEL 1.00 D 89.1 85.7 83.2 80.5 75.9 70.3 65.8 60.3 54.8 49.5
SEL 1.00 X 92.0 88.5 85.9 83.1 78.3 72.3 67.7 62.4 57.0 52.0
SEL 2.00 A 91.6 88.4 86.1 83.7 79.7 75.2 71.6 67.3 63.0 58.9
SEL 2.00 D 89.1 85.7 83.2 80.5 75.9 70.3 65.8 60.3 54.8 49.5
SA330J type=other model=INM app=218 dep=118 afb=303
SEL 1.00 A 92.3 88.9 86.5 83.9 79.7 74.7 70.8 66.2 61.6 57.2
SEL 1.00 D 92.5 89.0 86.6 83.9 79.3 73.7 69.3 63.9 58.5 53.4
SEL 1.00 X 94.1 90.5 88.0 85.2 80.5 74.7 70.1 64.6 59.1 53.8
SEL 2.00 A 92.3 88.9 86.5 83.9 79.7 74.7 70.8 66.2 61.6 57.2
SEL 2.00 D 92.5 89.0 86.6 83.9 79.3 73.7 69.3 63.9 58.5 53.4
SA341G type=other model=INM app=219 dep=117 afb=302
SEL 1.00 A 88.0 84.5 82.1 79.5 75.1 69.9 65.9 61.2 56.5 52.0
SEL 1.00 D 89.4 85.2 82.2 78.5 72.0 64.3 58.6 52.3 45.8 39.7
SEL 1.00 X 88.3 84.5 81.7 78.6 73.0 65.9 60.4 54.0 47.6 41.4
SEL 2.00 A 88.0 84.5 82.1 79.5 75.1 69.9 65.9 61.2 56.5 52.0
SEL 2.00 D 89.4 85.2 82.2 78.5 72.0 64.3 58.6 52.3 45.8 39.7
SA350D type=other model=INM app=219 dep=115 afb=301
SEL 1.00 A 88.6 85.2 82.8 80.3 76.0 70.9 67.0 62.2 57.4 52.8
SEL 1.00 D 87.6 83.9 81.4 78.5 73.7 67.8 63.3 58.0 52.7 47.6
SEL 1.00 X 87.2 83.5 80.9 78.0 73.1 67.3 62.9 57.7 52.5 47.5
SEL 2.00 A 88.6 85.2 82.8 80.3 76.0 70.9 67.0 62.2 57.4 52.8
SEL 2.00 D 87.6 83.9 81.4 78.5 73.7 67.8 63.3 58.0 52.7 47.6
SA355F type=other model=INM app=219 dep=115 afb=301
SEL 1.00 A 90.0 86.6 82.4 81.7 77.5 72.4 68.4 63.8 59.0 54.5
SEL 1.00 D 88.2 84.7 82.1 79.4 74.6 68.8 64.3 59.9 55.7 51.8
SEL 1.00 X 87.3 83.8 81.4 78.6 74.0 68.5 64.4 59.0 53.7 48.7
SEL 2.00 A 90.0 86.6 82.4 81.7 77.5 72.4 68.4 63.8 59.0 54.5
SEL 2.00 D 88.2 84.7 82.1 79.4 74.6 68.8 64.3 59.9 55.7 51.8
SA365N type=other model=INM app=220 dep=117 afb=302
SEL 1.00 A 94.3 90.2 87.5 84.7 80.1 74.8 70.8 66.1 61.3 56.9
SEL 1.00 D 91.2 87.2 84.2 80.8 75.0 68.2 63.1 57.6 52.2 47.1
SEL 1.00 X 89.3 85.3 82.2 78.9 73.1 66.6 62.0 57.0 51.8 47.0
SEL 2.00 A 94.3 90.2 87.5 84.7 80.1 74.8 70.8 66.1 61.3 56.9
SEL 2.00 D 91.2 87.2 84.2 80.8 75.0 68.2 63.1 57.6 52.2 47.1

USER-DEFINED METRICS

Name	Type	Family	Day	Eve	Night	10Log(T)

USER-DEFINED PROFILE IDENTIFIERS

Op	Profile	Stg	Weight(lb)
A109			
APP	USER	1	5730
DEP	USER	1	5730
B206L			
APP	USER	1	4000
DEP	USER	1	4000
B212			
APP	USER	1	10500
DEP	USER	1	10500
OVF	USER	1	10500
OVF	USER	2	10500
B222			
APP	USER	1	7800
DEP	USER	1	7800
BO105			
APP	USER	1	5070
DEP	USER	1	5070
CH47D			
APP	USER	1	48500
DEP	USER	1	48500
FAL50			
APP	STANDARD	1	13800
DEP	STANDARD	1	18300
H500D			
APP	USER	1	2550
DEP	USER	1	2550
TGO	USER	1	2550
S61			
APP	USER	1	19000
DEP	USER	1	19000
S65			
APP	USER	1	37000
DEP	USER	1	37000
S70			
APP	USER	1	20250
DEP	USER	1	20250
S76			
APP	USER	1	10000
DEP	USER	1	10000
SA330J			

	APP USER	1	15432
	DEP USER	1	15432
SA341G			
	APP USER	1	3970
	DEP USER	1	3970
SA350D			
	APP USER	1	4300
	DEP USER	1	4300
SA355F			
	APP USER	1	5070
	DEP USER	1	5070
SA365N			
	APP USER	1	8488
	DEP USER	1	8488

USER-DEFINED PROCEDURAL PROFILES

#	StepType	Flap	ThrType	Alt/Clm	Speed(kt)	Ang/Thr/Dis
FAL50-APP-STANDARD-1						
1	Descend	ZERO	None	6000.0 ft	250.0	3.0 deg
2	Descend	10	None	3000.0 ft	144.5	3.0 deg
3	Descend	D-INTR	None	1500.0 ft	134.5	3.0 deg
4	Descend	D-40	None	1000.0 ft	127.8	3.0 deg
5	Land	D-40	None	181.4 ft	0.0	0.0
6	Decelerate		None	1632.6 ft	121.2	60.0 %
7	Decelerate		None	0.0 ft	30.0	10.0 %
FAL50-DEP-STANDARD-1						
1	Takeoff	20	MaxTakeOff	0.0	0.0	0.0
2	Accelerate	20	MaxTakeOff	1493.0 fpm	158.0	0.0
3	Climb	20	MaxTakeOff	1500.0 ft	0.0	0.0
4	Accelerate	10	MaxTakeOff	1493.0 fpm	183.0	0.0
5	Climb	ZERO	MaxClimb	3000.0 ft	0.0	0.0
6	Accelerate	ZERO	MaxClimb	1706.0 fpm	250.0	0.0
7	Climb	ZERO	MaxClimb	5500.0 ft	0.0	0.0
8	Climb	ZERO	MaxClimb	7500.0 ft	0.0	0.0
9	Climb	ZERO	MaxClimb	10000.0 ft	0.0	0.0

USER-DEFINED FIXED-POINT PROFILES

#	Dist(ft)	Alt(ft)	Spd(kt)	Thrust	OpMode
B206L-APP-USER-1					
1	-23697.0	1500.0	100.0	1.0	A
2	-18836.0	1000.0	100.0	1.0	A
3	-14583.0	1000.0	100.0	1.0	A
4	-9772.0	1000.0	100.0	1.0	A
5	-4861.0	500.0	60.0	1.0	A
6	-50.0	15.0	3.0	1.0	A
7	0.0	0.0	3.0	1.0	A
B206L-DEP-USER-1					
1	0.0	0.0	5.0	1.0	D
2	50.0	0.0	15.0	1.0	D
3	1000.0	133.0	60.0	1.0	D
4	3750.0	500.0	60.0	1.0	X
5	7500.0	1000.0	100.0	1.0	X
6	24280.0	1000.0	100.0	1.0	X
7	54280.0	5000.0	100.0	1.0	X

B212-OVF-USER-1

1	0.0	0.0	5.0	1.0	D
2	500.0	200.0	15.0	1.0	D
3	1000.0	500.0	70.0	1.0	X
4	2000.0	500.0	70.0	1.0	A
5	3900.0	300.0	15.0	1.0	A
6	5800.0	0.0	5.0	1.0	A

B212-OVF-USER-2

1	0.0	0.0	5.0	1.0	D
2	500.0	200.0	15.0	1.0	D
3	1000.0	500.0	70.0	1.0	X
4	65277.0	500.0	70.0	1.0	A
5	67177.0	300.0	15.0	1.0	A
6	69077.0	0.0	5.0	1.0	A

B222-APP-USER-1

1	-23697.0	1500.0	100.0	1.0	A
2	-18836.0	1000.0	100.0	1.0	A
3	-14583.0	1000.0	100.0	1.0	A
4	-9772.0	1000.0	100.0	1.0	A
5	-4861.0	500.0	60.0	1.0	A
6	-50.0	15.0	3.0	1.0	A
7	0.0	0.0	3.0	1.0	A

B222-DEP-USER-1

1	0.0	0.0	5.0	1.0	D
2	50.0	0.0	15.0	1.0	D
3	1000.0	133.0	60.0	1.0	D
4	3750.0	500.0	60.0	1.0	X
5	7500.0	1000.0	100.0	1.0	X
6	24280.0	1000.0	100.0	1.0	X
7	54280.0	5000.0	100.0	1.0	X

H500D-APP-USER-1

1	-23697.0	1500.0	100.0	1.0	A
2	-18836.0	1000.0	100.0	1.0	A
3	-14583.0	1000.0	100.0	1.0	A
4	-9772.0	1000.0	100.0	1.0	A
5	-4861.0	500.0	60.0	1.0	A
6	-50.0	15.0	3.0	1.0	A
7	0.0	0.0	3.0	1.0	A

H500D-DEP-USER-1

1	0.0	0.0	5.0	1.0	D
2	50.0	0.0	15.0	1.0	D
3	1000.0	133.0	60.0	1.0	D
4	3750.0	500.0	60.0	1.0	X
5	7500.0	1000.0	100.0	1.0	X
6	24280.0	1000.0	100.0	1.0	X
7	54280.0	5000.0	100.0	1.0	X

H500D-TGO-USER-1

1	-14750.0	850.0	100.0	1.0	X
2	-14583.0	850.0	100.0	1.0	X
3	-9772.0	850.0	100.0	1.0	A
4	-4861.0	500.0	60.0	1.0	A
5	-50.0	15.0	3.0	1.0	A
6	0.0	0.0	5.0	1.0	D
7	50.0	0.0	5.0	1.0	D
8	1000.0	133.0	60.0	1.0	D
9	3750.0	500.0	60.0	1.0	X
10	7500.0	850.0	100.0	1.0	X
11	13400.0	850.0	100.0	1.0	X

SA365N-APP-USER-1

1	-23697.0	1500.0	100.0	1.0	A
2	-18836.0	1000.0	100.0	1.0	A
3	-14583.0	1000.0	100.0	1.0	A
4	-9772.0	1000.0	100.0	1.0	A
5	-4861.0	500.0	60.0	1.0	A
6	0.0	15.0	3.0	1.0	A
7	0.0	0.0	3.0	1.0	A

SA365N-DEP-USER-1

1	0.0	0.0	5.0	1.0	D
2	50.0	0.0	15.0	1.0	D
3	1000.0	133.0	60.0	1.0	D
4	3750.0	500.0	60.0	1.0	X
5	7500.0	1000.0	100.0	1.0	X
6	24280.0	1000.0	100.0	1.0	X
7	54280.0	5000.0	100.0	1.0	X

USER-DEFINED FLAP COEFFICIENTS

Acft	Flap	Op	Coeff-R	Coeff-C/D	Coeff-B
FAL50	10	DEP	0.089112	0.000000	0.000000
FAL50	20	DEP	0.108224	1.059850	0.043803
FAL50	D-40	APP	0.150688	1.087560	0.000000
FAL50	D-INTR	APP	0.129456	0.000000	0.000000
FAL50	ZERO	DEP	0.070000	0.000000	0.000000

USER-DEFINED JET THRUST COEFFICIENTS

Acft	ThrType	Coeff-E	Coeff-F	Coeff-Ga	Coeff-Gb	Coeff-H
FAL50	MaxClimb	3071.0	-3.49920	-3.97000e-03	1.38915e-06	0.000e+00
FAL50	MaxTakeOff	3412.2	-3.88800	-4.41000e-03	1.54350e-06	0.000e+00

USER-DEFINED PROP THRUST COEFFICIENTS

Name	ThrType	Efficiency	Power

USER-DEFINED GENERAL THRUST COEFFICIENTS

Acft	Type	Coeff-E	Coeff-F	Coeff-Ga	Coeff-Gb	Coeff-H	Coeff-K1	Coeff-K2

CASE FLIGHT OPERATIONS

Acft	Op	Profile	Stg	Rwy	Track	Sub	Group	Day	Evening	Night
737N17	APP	STANDARD	1	15	A	0	COM	0.0975	0.0000	0.0003
737N17	APP	STANDARD	1	15	A	1	COM	0.0781	0.0000	0.0002
737N17	APP	STANDARD	1	15	A	2	COM	0.0781	0.0000	0.0002
737N17	APP	STANDARD	1	15	A	3	COM	0.0391	0.0000	0.0001
737N17	APP	STANDARD	1	15	A	4	COM	0.0391	0.0000	0.0001
737N17	APP	STANDARD	1	15	A	5	COM	0.0112	0.0000	0.0000
737N17	APP	STANDARD	1	15	A	6	COM	0.0112	0.0000	0.0000
737N17	APP	STANDARD	1	15	A	7	COM	0.0014	0.0000	0.0000
737N17	APP	STANDARD	1	15	A	8	COM	0.0014	0.0000	0.0000
737N17	APP	STANDARD	1	15	B	0	COM	0.0597	0.0000	0.0002
737N17	APP	STANDARD	1	15	B	1	COM	0.0367	0.0000	0.0001
737N17	APP	STANDARD	1	15	B	2	COM	0.0367	0.0000	0.0001
737N17	APP	STANDARD	1	15	B	3	COM	0.0099	0.0000	0.0000
737N17	APP	STANDARD	1	15	B	4	COM	0.0099	0.0000	0.0000
737N17	APP	STANDARD	1	33	A	0	COM	0.0597	0.0000	0.0002
737N17	APP	STANDARD	1	33	A	1	COM	0.0478	0.0000	0.0001
737N17	APP	STANDARD	1	33	A	2	COM	0.0478	0.0000	0.0001
737N17	APP	STANDARD	1	33	A	3	COM	0.0239	0.0000	0.0001
737N17	APP	STANDARD	1	33	A	4	COM	0.0239	0.0000	0.0001
737N17	APP	STANDARD	1	33	A	5	COM	0.0068	0.0000	0.0000
737N17	APP	STANDARD	1	33	A	6	COM	0.0068	0.0000	0.0000
737N17	APP	STANDARD	1	33	A	7	COM	0.0009	0.0000	0.0000
737N17	APP	STANDARD	1	33	A	8	COM	0.0009	0.0000	0.0000
737N17	DEP	STANDARD	1	15	A	0	COM	0.0697	0.0000	0.0002
737N17	DEP	STANDARD	1	15	A	1	COM	0.0558	0.0000	0.0002
737N17	DEP	STANDARD	1	15	A	2	COM	0.0558	0.0000	0.0002
737N17	DEP	STANDARD	1	15	A	3	COM	0.0279	0.0000	0.0001
737N17	DEP	STANDARD	1	15	A	4	COM	0.0279	0.0000	0.0001
737N17	DEP	STANDARD	1	15	A	5	COM	0.0080	0.0000	0.0000
737N17	DEP	STANDARD	1	15	A	6	COM	0.0080	0.0000	0.0000
737N17	DEP	STANDARD	1	15	A	7	COM	0.0010	0.0000	0.0000
737N17	DEP	STANDARD	1	15	A	8	COM	0.0010	0.0000	0.0000

737N17	DEP	STANDARD	1	15	B	0	COM	0.0398	0.0000	0.0001
737N17	DEP	STANDARD	1	15	B	1	COM	0.0299	0.0000	0.0001
737N17	DEP	STANDARD	1	15	B	2	COM	0.0299	0.0000	0.0001
737N17	DEP	STANDARD	1	15	B	3	COM	0.0120	0.0000	0.0000
737N17	DEP	STANDARD	1	15	B	4	COM	0.0120	0.0000	0.0000
737N17	DEP	STANDARD	1	15	B	5	COM	0.0020	0.0000	0.0000
737N17	DEP	STANDARD	1	15	B	6	COM	0.0020	0.0000	0.0000
737N17	DEP	STANDARD	1	15	D	0	COM	0.0497	0.0000	0.0002
737N17	DEP	STANDARD	1	15	D	1	COM	0.0306	0.0000	0.0001
737N17	DEP	STANDARD	1	15	D	2	COM	0.0306	0.0000	0.0001
737N17	DEP	STANDARD	1	15	D	3	COM	0.0083	0.0000	0.0000
737N17	DEP	STANDARD	1	15	D	4	COM	0.0083	0.0000	0.0000
737N17	DEP	STANDARD	1	33	A	0	COM	0.0358	0.0000	0.0001
737N17	DEP	STANDARD	1	33	A	1	COM	0.0287	0.0000	0.0001
737N17	DEP	STANDARD	1	33	A	2	COM	0.0287	0.0000	0.0001
737N17	DEP	STANDARD	1	33	A	3	COM	0.0143	0.0000	0.0000
737N17	DEP	STANDARD	1	33	A	4	COM	0.0143	0.0000	0.0000
737N17	DEP	STANDARD	1	33	A	5	COM	0.0041	0.0000	0.0000
737N17	DEP	STANDARD	1	33	A	6	COM	0.0041	0.0000	0.0000
737N17	DEP	STANDARD	1	33	A	7	COM	0.0005	0.0000	0.0000
737N17	DEP	STANDARD	1	33	A	8	COM	0.0005	0.0000	0.0000
737N17	DEP	STANDARD	1	33	B	0	COM	0.0085	0.0000	0.0000
737N17	DEP	STANDARD	1	33	B	1	COM	0.0053	0.0000	0.0000
737N17	DEP	STANDARD	1	33	B	2	COM	0.0053	0.0000	0.0000
737N17	DEP	STANDARD	1	33	B	3	COM	0.0014	0.0000	0.0000
737N17	DEP	STANDARD	1	33	B	4	COM	0.0014	0.0000	0.0000
737N17	DEP	STANDARD	1	33	D	0	COM	0.0239	0.0000	0.0001
737N17	DEP	STANDARD	1	33	D	1	COM	0.0147	0.0000	0.0000
737N17	DEP	STANDARD	1	33	D	2	COM	0.0147	0.0000	0.0000
737N17	DEP	STANDARD	1	33	D	3	COM	0.0040	0.0000	0.0000
737N17	DEP	STANDARD	1	33	D	4	COM	0.0040	0.0000	0.0000
737N17	DEP	STANDARD	1	33	F	0	COM	0.0030	0.0000	0.0000
737N17	DEP	STANDARD	1	33	F	1	COM	0.0007	0.0000	0.0000
737N17	DEP	STANDARD	1	33	F	2	COM	0.0007	0.0000	0.0000
B206L	APP	USER	1	H3	A	0	HEL	0.1463	0.0000	0.0163
B206L	APP	USER	1	H3	B	0	HEL	0.1463	0.0000	0.0163
B206L	APP	USER	1	H4	A	0	HEL	0.1463	0.0000	0.0163
B206L	APP	USER	1	H4	B	0	HEL	0.1463	0.0000	0.0163
B206L	DEP	USER	1	H3	A	0	HEL	0.1463	0.0000	0.0163
B206L	DEP	USER	1	H3	B	0	HEL	0.1463	0.0000	0.0163
B206L	DEP	USER	1	H4	A	0	HEL	0.1463	0.0000	0.0163
B206L	DEP	USER	1	H4	B	0	HEL	0.1463	0.0000	0.0163
B222	APP	USER	1	H3	A	0	HEL	0.1463	0.0000	0.0163
B222	APP	USER	1	H3	B	0	HEL	0.1463	0.0000	0.0163
B222	APP	USER	1	H4	A	0	HEL	0.1463	0.0000	0.0163

B222	APP	USER	1	H4	B	0	HEL	0.1463	0.0000	0.0163
B222	DEP	USER	1	H3	A	0	HEL	0.1463	0.0000	0.0163
B222	DEP	USER	1	H3	B	0	HEL	0.1463	0.0000	0.0163
B222	DEP	USER	1	H4	A	0	HEL	0.1463	0.0000	0.0163
B222	DEP	USER	1	H4	B	0	HEL	0.1463	0.0000	0.0163
BEC58P	APP	STANDARD	1	15	A	0	GA	3.4884	0.0000	0.0221
BEC58P	APP	STANDARD	1	15	A	1	GA	2.7938	0.0000	0.0177
BEC58P	APP	STANDARD	1	15	A	2	GA	2.7938	0.0000	0.0177
BEC58P	APP	STANDARD	1	15	A	3	GA	1.3969	0.0000	0.0089
BEC58P	APP	STANDARD	1	15	A	4	GA	1.3969	0.0000	0.0089
BEC58P	APP	STANDARD	1	15	A	5	GA	0.3997	0.0000	0.0025
BEC58P	APP	STANDARD	1	15	A	6	GA	0.3997	0.0000	0.0025
BEC58P	APP	STANDARD	1	15	A	7	GA	0.0498	0.0000	0.0003
BEC58P	APP	STANDARD	1	15	A	8	GA	0.0498	0.0000	0.0003
BEC58P	APP	STANDARD	1	15	B	0	GA	3.3199	0.0000	0.0210
BEC58P	APP	STANDARD	1	15	B	1	GA	2.0430	0.0000	0.0129
BEC58P	APP	STANDARD	1	15	B	2	GA	2.0430	0.0000	0.0129
BEC58P	APP	STANDARD	1	15	B	3	GA	0.5533	0.0000	0.0035
BEC58P	APP	STANDARD	1	15	B	4	GA	0.5533	0.0000	0.0035
BEC58P	APP	STANDARD	1	33	A	0	GA	2.4917	0.0000	0.0158
BEC58P	APP	STANDARD	1	33	A	1	GA	1.9956	0.0000	0.0126
BEC58P	APP	STANDARD	1	33	A	2	GA	1.9956	0.0000	0.0126
BEC58P	APP	STANDARD	1	33	A	3	GA	0.9978	0.0000	0.0063
BEC58P	APP	STANDARD	1	33	A	4	GA	0.9978	0.0000	0.0063
BEC58P	APP	STANDARD	1	33	A	5	GA	0.2855	0.0000	0.0018
BEC58P	APP	STANDARD	1	33	A	6	GA	0.2855	0.0000	0.0018
BEC58P	APP	STANDARD	1	33	A	7	GA	0.0356	0.0000	0.0002
BEC58P	APP	STANDARD	1	33	A	8	GA	0.0356	0.0000	0.0002
BEC58P	DEP	STANDARD	1	15	A	0	GA	2.9070	0.0000	0.0184
BEC58P	DEP	STANDARD	1	15	A	1	GA	2.3282	0.0000	0.0147
BEC58P	DEP	STANDARD	1	15	A	2	GA	2.3282	0.0000	0.0147
BEC58P	DEP	STANDARD	1	15	A	3	GA	1.1641	0.0000	0.0074
BEC58P	DEP	STANDARD	1	15	A	4	GA	1.1641	0.0000	0.0074
BEC58P	DEP	STANDARD	1	15	A	5	GA	0.3331	0.0000	0.0021
BEC58P	DEP	STANDARD	1	15	A	6	GA	0.3331	0.0000	0.0021
BEC58P	DEP	STANDARD	1	15	A	7	GA	0.0415	0.0000	0.0003
BEC58P	DEP	STANDARD	1	15	A	8	GA	0.0415	0.0000	0.0003
BEC58P	DEP	STANDARD	1	15	B	0	GA	1.6621	0.0000	0.0105
BEC58P	DEP	STANDARD	1	15	B	1	GA	1.2471	0.0000	0.0079
BEC58P	DEP	STANDARD	1	15	B	2	GA	1.2471	0.0000	0.0079
BEC58P	DEP	STANDARD	1	15	B	3	GA	0.4990	0.0000	0.0032
BEC58P	DEP	STANDARD	1	15	B	4	GA	0.4990	0.0000	0.0032
BEC58P	DEP	STANDARD	1	15	B	5	GA	0.0830	0.0000	0.0005
BEC58P	DEP	STANDARD	1	15	B	6	GA	0.0830	0.0000	0.0005
BEC58P	DEP	STANDARD	1	15	D	0	GA	2.0749	0.0000	0.0131

BEC58P	DEP	STANDARD	1	15	D	1	GA	1.2769	0.0000	0.0081
BEC58P	DEP	STANDARD	1	15	D	2	GA	1.2769	0.0000	0.0081
BEC58P	DEP	STANDARD	1	15	D	3	GA	0.3458	0.0000	0.0022
BEC58P	DEP	STANDARD	1	15	D	4	GA	0.3458	0.0000	0.0022
BEC58P	DEP	STANDARD	1	33	A	0	GA	1.4950	0.0000	0.0095
BEC58P	DEP	STANDARD	1	33	A	1	GA	1.1973	0.0000	0.0076
BEC58P	DEP	STANDARD	1	33	A	2	GA	1.1973	0.0000	0.0076
BEC58P	DEP	STANDARD	1	33	A	3	GA	0.5987	0.0000	0.0038
BEC58P	DEP	STANDARD	1	33	A	4	GA	0.5987	0.0000	0.0038
BEC58P	DEP	STANDARD	1	33	A	5	GA	0.1713	0.0000	0.0011
BEC58P	DEP	STANDARD	1	33	A	6	GA	0.1713	0.0000	0.0011
BEC58P	DEP	STANDARD	1	33	A	7	GA	0.0213	0.0000	0.0001
BEC58P	DEP	STANDARD	1	33	A	8	GA	0.0213	0.0000	0.0001
BEC58P	DEP	STANDARD	1	33	B	0	GA	0.3557	0.0000	0.0023
BEC58P	DEP	STANDARD	1	33	B	1	GA	0.2189	0.0000	0.0014
BEC58P	DEP	STANDARD	1	33	B	2	GA	0.2189	0.0000	0.0014
BEC58P	DEP	STANDARD	1	33	B	3	GA	0.0593	0.0000	0.0004
BEC58P	DEP	STANDARD	1	33	B	4	GA	0.0593	0.0000	0.0004
BEC58P	DEP	STANDARD	1	33	D	0	GA	0.9959	0.0000	0.0063
BEC58P	DEP	STANDARD	1	33	D	1	GA	0.6129	0.0000	0.0039
BEC58P	DEP	STANDARD	1	33	D	2	GA	0.6129	0.0000	0.0039
BEC58P	DEP	STANDARD	1	33	D	3	GA	0.1660	0.0000	0.0011
BEC58P	DEP	STANDARD	1	33	D	4	GA	0.1660	0.0000	0.0011
BEC58P	DEP	STANDARD	1	33	F	0	GA	0.1245	0.0000	0.0008
BEC58P	DEP	STANDARD	1	33	F	1	GA	0.0289	0.0000	0.0002
BEC58P	DEP	STANDARD	1	33	F	2	GA	0.0289	0.0000	0.0002
BEC58P	TGO	STANDARD	1	15	A	0	GA	0.4936	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	A	1	GA	0.3037	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	A	2	GA	0.3037	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	A	3	GA	0.0823	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	A	4	GA	0.0823	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	B	0	GA	0.0133	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	B	1	GA	0.0133	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	B	2	GA	0.0133	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	B	3	GA	0.0133	0.0000	0.0000
BEC58P	TGO	STANDARD	1	15	B	4	GA	0.0133	0.0000	0.0000
BEC58P	TGO	STANDARD	1	33	A	0	GA	0.2227	0.0000	0.0000
BEC58P	TGO	STANDARD	1	33	A	1	GA	0.1370	0.0000	0.0000
BEC58P	TGO	STANDARD	1	33	A	2	GA	0.1370	0.0000	0.0000
BEC58P	TGO	STANDARD	1	33	A	3	GA	0.0371	0.0000	0.0000
BEC58P	TGO	STANDARD	1	33	A	4	GA	0.0371	0.0000	0.0000
CIT3	APP	STANDARD	1	15	A	0	GA	0.8161	0.0000	0.0012
CIT3	APP	STANDARD	1	15	A	1	GA	0.6536	0.0000	0.0009
CIT3	APP	STANDARD	1	15	A	2	GA	0.6536	0.0000	0.0009
CIT3	APP	STANDARD	1	15	A	3	GA	0.3268	0.0000	0.0005

CIT3	APP	STANDARD	1	15	A	4	GA	0.3268	0.0000	0.0005
CIT3	APP	STANDARD	1	15	A	5	GA	0.0935	0.0000	0.0001
CIT3	APP	STANDARD	1	15	A	6	GA	0.0935	0.0000	0.0001
CIT3	APP	STANDARD	1	15	A	7	GA	0.0116	0.0000	0.0000
CIT3	APP	STANDARD	1	15	A	8	GA	0.0116	0.0000	0.0000
CIT3	APP	STANDARD	1	15	B	0	GA	0.4993	0.0000	0.0007
CIT3	APP	STANDARD	1	15	B	1	GA	0.3072	0.0000	0.0005
CIT3	APP	STANDARD	1	15	B	2	GA	0.3072	0.0000	0.0005
CIT3	APP	STANDARD	1	15	B	3	GA	0.0832	0.0000	0.0001
CIT3	APP	STANDARD	1	15	B	4	GA	0.0832	0.0000	0.0001
CIT3	APP	STANDARD	1	33	A	0	GA	0.4997	0.0000	0.0007
CIT3	APP	STANDARD	1	33	A	1	GA	0.4002	0.0000	0.0006
CIT3	APP	STANDARD	1	33	A	2	GA	0.4002	0.0000	0.0006
CIT3	APP	STANDARD	1	33	A	3	GA	0.2001	0.0000	0.0003
CIT3	APP	STANDARD	1	33	A	4	GA	0.2001	0.0000	0.0003
CIT3	APP	STANDARD	1	33	A	5	GA	0.0572	0.0000	0.0001
CIT3	APP	STANDARD	1	33	A	6	GA	0.0572	0.0000	0.0001
CIT3	APP	STANDARD	1	33	A	7	GA	0.0071	0.0000	0.0000
CIT3	APP	STANDARD	1	33	A	8	GA	0.0071	0.0000	0.0000
CIT3	DEP	STANDARD	1	15	A	0	GA	0.5829	0.0000	0.0008
CIT3	DEP	STANDARD	1	15	A	1	GA	0.4669	0.0000	0.0007
CIT3	DEP	STANDARD	1	15	A	2	GA	0.4669	0.0000	0.0007
CIT3	DEP	STANDARD	1	15	A	3	GA	0.2334	0.0000	0.0003
CIT3	DEP	STANDARD	1	15	A	4	GA	0.2334	0.0000	0.0003
CIT3	DEP	STANDARD	1	15	A	5	GA	0.0668	0.0000	0.0001
CIT3	DEP	STANDARD	1	15	A	6	GA	0.0668	0.0000	0.0001
CIT3	DEP	STANDARD	1	15	A	7	GA	0.0083	0.0000	0.0000
CIT3	DEP	STANDARD	1	15	A	8	GA	0.0083	0.0000	0.0000
CIT3	DEP	STANDARD	1	15	B	0	GA	0.3333	0.0000	0.0005
CIT3	DEP	STANDARD	1	15	B	1	GA	0.2501	0.0000	0.0004
CIT3	DEP	STANDARD	1	15	B	2	GA	0.2501	0.0000	0.0004
CIT3	DEP	STANDARD	1	15	B	3	GA	0.1001	0.0000	0.0001
CIT3	DEP	STANDARD	1	15	B	4	GA	0.1001	0.0000	0.0001
CIT3	DEP	STANDARD	1	15	B	5	GA	0.0166	0.0000	0.0000
CIT3	DEP	STANDARD	1	15	B	6	GA	0.0166	0.0000	0.0000
CIT3	DEP	STANDARD	1	15	D	0	GA	0.4161	0.0000	0.0006
CIT3	DEP	STANDARD	1	15	D	1	GA	0.2560	0.0000	0.0004
CIT3	DEP	STANDARD	1	15	D	2	GA	0.2560	0.0000	0.0004
CIT3	DEP	STANDARD	1	15	D	3	GA	0.0693	0.0000	0.0001
CIT3	DEP	STANDARD	1	15	D	4	GA	0.0693	0.0000	0.0001
CIT3	DEP	STANDARD	1	33	A	0	GA	0.2998	0.0000	0.0004
CIT3	DEP	STANDARD	1	33	A	1	GA	0.2401	0.0000	0.0004
CIT3	DEP	STANDARD	1	33	A	2	GA	0.2401	0.0000	0.0004
CIT3	DEP	STANDARD	1	33	A	3	GA	0.1200	0.0000	0.0002
CIT3	DEP	STANDARD	1	33	A	4	GA	0.1200	0.0000	0.0002

CIT3	DEP	STANDARD	1	33	A	5	GA	0.0343	0.0000	0.0001
CIT3	DEP	STANDARD	1	33	A	6	GA	0.0343	0.0000	0.0001
CIT3	DEP	STANDARD	1	33	A	7	GA	0.0043	0.0000	0.0000
CIT3	DEP	STANDARD	1	33	A	8	GA	0.0043	0.0000	0.0000
CIT3	DEP	STANDARD	1	33	B	0	GA	0.0713	0.0000	0.0001
CIT3	DEP	STANDARD	1	33	B	1	GA	0.0439	0.0000	0.0001
CIT3	DEP	STANDARD	1	33	B	2	GA	0.0439	0.0000	0.0001
CIT3	DEP	STANDARD	1	33	B	3	GA	0.0119	0.0000	0.0000
CIT3	DEP	STANDARD	1	33	B	4	GA	0.0119	0.0000	0.0000
CIT3	DEP	STANDARD	1	33	D	0	GA	0.1997	0.0000	0.0003
CIT3	DEP	STANDARD	1	33	D	1	GA	0.1229	0.0000	0.0002
CIT3	DEP	STANDARD	1	33	D	2	GA	0.1229	0.0000	0.0002
CIT3	DEP	STANDARD	1	33	D	3	GA	0.0333	0.0000	0.0000
CIT3	DEP	STANDARD	1	33	D	4	GA	0.0333	0.0000	0.0000
CIT3	DEP	STANDARD	1	33	F	0	GA	0.0250	0.0000	0.0001
CIT3	DEP	STANDARD	1	33	F	1	GA	0.0058	0.0000	0.0000
CIT3	DEP	STANDARD	1	33	F	2	GA	0.0058	0.0000	0.0000
CL600	APP	STANDARD	1	15	A	0	GA	0.6654	0.0000	0.0058
CL600	APP	STANDARD	1	15	A	1	GA	0.5329	0.0000	0.0047
CL600	APP	STANDARD	1	15	A	2	GA	0.5329	0.0000	0.0047
CL600	APP	STANDARD	1	15	A	3	GA	0.2664	0.0000	0.0023
CL600	APP	STANDARD	1	15	A	4	GA	0.2664	0.0000	0.0023
CL600	APP	STANDARD	1	15	A	5	GA	0.0762	0.0000	0.0007
CL600	APP	STANDARD	1	15	A	6	GA	0.0762	0.0000	0.0007
CL600	APP	STANDARD	1	15	A	7	GA	0.0095	0.0000	0.0001
CL600	APP	STANDARD	1	15	A	8	GA	0.0095	0.0000	0.0001
CL600	APP	STANDARD	1	15	B	0	GA	0.4070	0.0000	0.0035
CL600	APP	STANDARD	1	15	B	1	GA	0.2505	0.0000	0.0022
CL600	APP	STANDARD	1	15	B	2	GA	0.2505	0.0000	0.0022
CL600	APP	STANDARD	1	15	B	3	GA	0.0678	0.0000	0.0006
CL600	APP	STANDARD	1	15	B	4	GA	0.0678	0.0000	0.0006
CL600	APP	STANDARD	1	33	A	0	GA	0.4074	0.0000	0.0036
CL600	APP	STANDARD	1	33	A	1	GA	0.3263	0.0000	0.0029
CL600	APP	STANDARD	1	33	A	2	GA	0.3263	0.0000	0.0029
CL600	APP	STANDARD	1	33	A	3	GA	0.1631	0.0000	0.0014
CL600	APP	STANDARD	1	33	A	4	GA	0.1631	0.0000	0.0014
CL600	APP	STANDARD	1	33	A	5	GA	0.0467	0.0000	0.0004
CL600	APP	STANDARD	1	33	A	6	GA	0.0467	0.0000	0.0004
CL600	APP	STANDARD	1	33	A	7	GA	0.0058	0.0000	0.0001
CL600	APP	STANDARD	1	33	A	8	GA	0.0058	0.0000	0.0001
CL600	DEP	STANDARD	1	15	A	0	GA	0.4753	0.0000	0.0042
CL600	DEP	STANDARD	1	15	A	1	GA	0.3806	0.0000	0.0033
CL600	DEP	STANDARD	1	15	A	2	GA	0.3806	0.0000	0.0033
CL600	DEP	STANDARD	1	15	A	3	GA	0.1903	0.0000	0.0017
CL600	DEP	STANDARD	1	15	A	4	GA	0.1903	0.0000	0.0017

CL600	DEP	STANDARD	1	15	A	5	GA	0.0544	0.0000	0.0005
CL600	DEP	STANDARD	1	15	A	6	GA	0.0544	0.0000	0.0005
CL600	DEP	STANDARD	1	15	A	7	GA	0.0068	0.0000	0.0001
CL600	DEP	STANDARD	1	15	A	8	GA	0.0068	0.0000	0.0001
CL600	DEP	STANDARD	1	15	B	0	GA	0.2717	0.0000	0.0024
CL600	DEP	STANDARD	1	15	B	1	GA	0.2039	0.0000	0.0018
CL600	DEP	STANDARD	1	15	B	2	GA	0.2039	0.0000	0.0018
CL600	DEP	STANDARD	1	15	B	3	GA	0.0816	0.0000	0.0007
CL600	DEP	STANDARD	1	15	B	4	GA	0.0816	0.0000	0.0007
CL600	DEP	STANDARD	1	15	B	5	GA	0.0136	0.0000	0.0001
CL600	DEP	STANDARD	1	15	B	6	GA	0.0136	0.0000	0.0001
CL600	DEP	STANDARD	1	15	D	0	GA	0.3392	0.0000	0.0030
CL600	DEP	STANDARD	1	15	D	1	GA	0.2088	0.0000	0.0018
CL600	DEP	STANDARD	1	15	D	2	GA	0.2088	0.0000	0.0018
CL600	DEP	STANDARD	1	15	D	3	GA	0.0565	0.0000	0.0005
CL600	DEP	STANDARD	1	15	D	4	GA	0.0565	0.0000	0.0005
CL600	DEP	STANDARD	1	33	A	0	GA	0.2444	0.0000	0.0021
CL600	DEP	STANDARD	1	33	A	1	GA	0.1957	0.0000	0.0017
CL600	DEP	STANDARD	1	33	A	2	GA	0.1957	0.0000	0.0017
CL600	DEP	STANDARD	1	33	A	3	GA	0.0979	0.0000	0.0009
CL600	DEP	STANDARD	1	33	A	4	GA	0.0979	0.0000	0.0009
CL600	DEP	STANDARD	1	33	A	5	GA	0.0280	0.0000	0.0002
CL600	DEP	STANDARD	1	33	A	6	GA	0.0280	0.0000	0.0002
CL600	DEP	STANDARD	1	33	A	7	GA	0.0035	0.0000	0.0000
CL600	DEP	STANDARD	1	33	A	8	GA	0.0035	0.0000	0.0000
CL600	DEP	STANDARD	1	33	B	0	GA	0.0581	0.0000	0.0005
CL600	DEP	STANDARD	1	33	B	1	GA	0.0358	0.0000	0.0003
CL600	DEP	STANDARD	1	33	B	2	GA	0.0358	0.0000	0.0003
CL600	DEP	STANDARD	1	33	B	3	GA	0.0097	0.0000	0.0001
CL600	DEP	STANDARD	1	33	B	4	GA	0.0097	0.0000	0.0001
CL600	DEP	STANDARD	1	33	D	0	GA	0.1628	0.0000	0.0014
CL600	DEP	STANDARD	1	33	D	1	GA	0.1002	0.0000	0.0009
CL600	DEP	STANDARD	1	33	D	2	GA	0.1002	0.0000	0.0009
CL600	DEP	STANDARD	1	33	D	3	GA	0.0271	0.0000	0.0002
CL600	DEP	STANDARD	1	33	D	4	GA	0.0271	0.0000	0.0002
CL600	DEP	STANDARD	1	33	F	0	GA	0.0203	0.0000	0.0002
CL600	DEP	STANDARD	1	33	F	1	GA	0.0047	0.0000	0.0000
CL600	DEP	STANDARD	1	33	F	2	GA	0.0047	0.0000	0.0000
CNA441	APP	STANDARD	1	15	A	0	COM	2.8431	0.0000	0.0485
CNA441	APP	STANDARD	1	15	A	1	COM	2.2770	0.0000	0.0389
CNA441	APP	STANDARD	1	15	A	2	COM	2.2770	0.0000	0.0389
CNA441	APP	STANDARD	1	15	A	3	COM	1.1385	0.0000	0.0194
CNA441	APP	STANDARD	1	15	A	4	COM	1.1385	0.0000	0.0194
CNA441	APP	STANDARD	1	15	A	5	COM	0.3257	0.0000	0.0056
CNA441	APP	STANDARD	1	15	A	6	COM	0.3257	0.0000	0.0056

CNA441	APP	STANDARD	1	15	A	7	COM	0.0406	0.0000	0.0007
CNA441	APP	STANDARD	1	15	A	8	COM	0.0406	0.0000	0.0007
CNA441	APP	STANDARD	1	15	B	0	COM	2.7058	0.0000	0.0462
CNA441	APP	STANDARD	1	15	B	1	COM	1.6651	0.0000	0.0284
CNA441	APP	STANDARD	1	15	B	2	COM	1.6651	0.0000	0.0284
CNA441	APP	STANDARD	1	15	B	3	COM	0.4510	0.0000	0.0077
CNA441	APP	STANDARD	1	15	B	4	COM	0.4510	0.0000	0.0077
CNA441	APP	STANDARD	1	33	A	0	COM	2.0308	0.0000	0.0347
CNA441	APP	STANDARD	1	33	A	1	COM	1.6264	0.0000	0.0278
CNA441	APP	STANDARD	1	33	A	2	COM	1.6264	0.0000	0.0278
CNA441	APP	STANDARD	1	33	A	3	COM	0.8132	0.0000	0.0139
CNA441	APP	STANDARD	1	33	A	4	COM	0.8132	0.0000	0.0139
CNA441	APP	STANDARD	1	33	A	5	COM	0.2327	0.0000	0.0040
CNA441	APP	STANDARD	1	33	A	6	COM	0.2327	0.0000	0.0040
CNA441	APP	STANDARD	1	33	A	7	COM	0.0290	0.0000	0.0005
CNA441	APP	STANDARD	1	33	A	8	COM	0.0290	0.0000	0.0005
CNA441	DEP	STANDARD	1	15	A	0	COM	2.3693	0.0000	0.0405
CNA441	DEP	STANDARD	1	15	A	1	COM	1.8975	0.0000	0.0324
CNA441	DEP	STANDARD	1	15	A	2	COM	1.8975	0.0000	0.0324
CNA441	DEP	STANDARD	1	15	A	3	COM	0.9488	0.0000	0.0162
CNA441	DEP	STANDARD	1	15	A	4	COM	0.9488	0.0000	0.0162
CNA441	DEP	STANDARD	1	15	A	5	COM	0.2714	0.0000	0.0046
CNA441	DEP	STANDARD	1	15	A	6	COM	0.2714	0.0000	0.0046
CNA441	DEP	STANDARD	1	15	A	7	COM	0.0338	0.0000	0.0006
CNA441	DEP	STANDARD	1	15	A	8	COM	0.0338	0.0000	0.0006
CNA441	DEP	STANDARD	1	15	B	0	COM	1.3546	0.0000	0.0231
CNA441	DEP	STANDARD	1	15	B	1	COM	1.0164	0.0000	0.0173
CNA441	DEP	STANDARD	1	15	B	2	COM	1.0164	0.0000	0.0173
CNA441	DEP	STANDARD	1	15	B	3	COM	0.4067	0.0000	0.0069
CNA441	DEP	STANDARD	1	15	B	4	COM	0.4067	0.0000	0.0069
CNA441	DEP	STANDARD	1	15	B	5	COM	0.0676	0.0000	0.0012
CNA441	DEP	STANDARD	1	15	B	6	COM	0.0676	0.0000	0.0012
CNA441	DEP	STANDARD	1	15	D	0	COM	1.6911	0.0000	0.0289
CNA441	DEP	STANDARD	1	15	D	1	COM	1.0407	0.0000	0.0178
CNA441	DEP	STANDARD	1	15	D	2	COM	1.0407	0.0000	0.0178
CNA441	DEP	STANDARD	1	15	D	3	COM	0.2819	0.0000	0.0048
CNA441	DEP	STANDARD	1	15	D	4	COM	0.2819	0.0000	0.0048
CNA441	DEP	STANDARD	1	33	A	0	COM	1.2185	0.0000	0.0208
CNA441	DEP	STANDARD	1	33	A	1	COM	0.9759	0.0000	0.0167
CNA441	DEP	STANDARD	1	33	A	2	COM	0.9759	0.0000	0.0167
CNA441	DEP	STANDARD	1	33	A	3	COM	0.4879	0.0000	0.0083
CNA441	DEP	STANDARD	1	33	A	4	COM	0.4879	0.0000	0.0083
CNA441	DEP	STANDARD	1	33	A	5	COM	0.1396	0.0000	0.0024
CNA441	DEP	STANDARD	1	33	A	6	COM	0.1396	0.0000	0.0024
CNA441	DEP	STANDARD	1	33	A	7	COM	0.0174	0.0000	0.0003

CNA441	DEP	STANDARD	1	33	A	8	COM	0.0174	0.0000	0.0003
CNA441	DEP	STANDARD	1	33	B	0	COM	0.2899	0.0000	0.0050
CNA441	DEP	STANDARD	1	33	B	1	COM	0.1784	0.0000	0.0030
CNA441	DEP	STANDARD	1	33	B	2	COM	0.1784	0.0000	0.0030
CNA441	DEP	STANDARD	1	33	B	3	COM	0.0483	0.0000	0.0008
CNA441	DEP	STANDARD	1	33	B	4	COM	0.0483	0.0000	0.0008
CNA441	DEP	STANDARD	1	33	D	0	COM	0.8117	0.0000	0.0138
CNA441	DEP	STANDARD	1	33	D	1	COM	0.4995	0.0000	0.0085
CNA441	DEP	STANDARD	1	33	D	2	COM	0.4995	0.0000	0.0085
CNA441	DEP	STANDARD	1	33	D	3	COM	0.1353	0.0000	0.0023
CNA441	DEP	STANDARD	1	33	D	4	COM	0.1353	0.0000	0.0023
CNA441	DEP	STANDARD	1	33	F	0	COM	0.1015	0.0000	0.0017
CNA441	DEP	STANDARD	1	33	F	1	COM	0.0236	0.0000	0.0004
CNA441	DEP	STANDARD	1	33	F	2	COM	0.0236	0.0000	0.0004
CNA500	APP	STANDARD	1	15	A	0	GA	0.8161	0.0000	0.0012
CNA500	APP	STANDARD	1	15	A	1	GA	0.6536	0.0000	0.0009
CNA500	APP	STANDARD	1	15	A	2	GA	0.6536	0.0000	0.0009
CNA500	APP	STANDARD	1	15	A	3	GA	0.3268	0.0000	0.0005
CNA500	APP	STANDARD	1	15	A	4	GA	0.3268	0.0000	0.0005
CNA500	APP	STANDARD	1	15	A	5	GA	0.0935	0.0000	0.0001
CNA500	APP	STANDARD	1	15	A	6	GA	0.0935	0.0000	0.0001
CNA500	APP	STANDARD	1	15	A	7	GA	0.0116	0.0000	0.0000
CNA500	APP	STANDARD	1	15	A	8	GA	0.0116	0.0000	0.0000
CNA500	APP	STANDARD	1	15	B	0	GA	0.4993	0.0000	0.0007
CNA500	APP	STANDARD	1	15	B	1	GA	0.3072	0.0000	0.0005
CNA500	APP	STANDARD	1	15	B	2	GA	0.3072	0.0000	0.0005
CNA500	APP	STANDARD	1	15	B	3	GA	0.0832	0.0000	0.0001
CNA500	APP	STANDARD	1	15	B	4	GA	0.0832	0.0000	0.0001
CNA500	APP	STANDARD	1	33	A	0	GA	0.4997	0.0000	0.0007
CNA500	APP	STANDARD	1	33	A	1	GA	0.4002	0.0000	0.0006
CNA500	APP	STANDARD	1	33	A	2	GA	0.4002	0.0000	0.0006
CNA500	APP	STANDARD	1	33	A	3	GA	0.2001	0.0000	0.0003
CNA500	APP	STANDARD	1	33	A	4	GA	0.2001	0.0000	0.0003
CNA500	APP	STANDARD	1	33	A	5	GA	0.0572	0.0000	0.0001
CNA500	APP	STANDARD	1	33	A	6	GA	0.0572	0.0000	0.0001
CNA500	APP	STANDARD	1	33	A	7	GA	0.0071	0.0000	0.0000
CNA500	APP	STANDARD	1	33	A	8	GA	0.0071	0.0000	0.0000
CNA500	DEP	STANDARD	1	15	A	0	GA	0.5829	0.0000	0.0008
CNA500	DEP	STANDARD	1	15	A	1	GA	0.4669	0.0000	0.0007
CNA500	DEP	STANDARD	1	15	A	2	GA	0.4669	0.0000	0.0007
CNA500	DEP	STANDARD	1	15	A	3	GA	0.2334	0.0000	0.0003
CNA500	DEP	STANDARD	1	15	A	4	GA	0.2334	0.0000	0.0003
CNA500	DEP	STANDARD	1	15	A	5	GA	0.0668	0.0000	0.0001
CNA500	DEP	STANDARD	1	15	A	6	GA	0.0668	0.0000	0.0001
CNA500	DEP	STANDARD	1	15	A	7	GA	0.0083	0.0000	0.0000

CNA500	DEP	STANDARD	1	15	A	8	GA	0.0083	0.0000	0.0000
CNA500	DEP	STANDARD	1	15	B	0	GA	0.3333	0.0000	0.0005
CNA500	DEP	STANDARD	1	15	B	1	GA	0.2501	0.0000	0.0004
CNA500	DEP	STANDARD	1	15	B	2	GA	0.2501	0.0000	0.0004
CNA500	DEP	STANDARD	1	15	B	3	GA	0.1001	0.0000	0.0001
CNA500	DEP	STANDARD	1	15	B	4	GA	0.1001	0.0000	0.0001
CNA500	DEP	STANDARD	1	15	B	5	GA	0.0166	0.0000	0.0000
CNA500	DEP	STANDARD	1	15	B	6	GA	0.0166	0.0000	0.0000
CNA500	DEP	STANDARD	1	15	D	0	GA	0.4161	0.0000	0.0006
CNA500	DEP	STANDARD	1	15	D	1	GA	0.2560	0.0000	0.0004
CNA500	DEP	STANDARD	1	15	D	2	GA	0.2560	0.0000	0.0004
CNA500	DEP	STANDARD	1	15	D	3	GA	0.0693	0.0000	0.0001
CNA500	DEP	STANDARD	1	15	D	4	GA	0.0693	0.0000	0.0001
CNA500	DEP	STANDARD	1	33	A	0	GA	0.2998	0.0000	0.0004
CNA500	DEP	STANDARD	1	33	A	1	GA	0.2401	0.0000	0.0004
CNA500	DEP	STANDARD	1	33	A	2	GA	0.2401	0.0000	0.0004
CNA500	DEP	STANDARD	1	33	A	3	GA	0.1200	0.0000	0.0002
CNA500	DEP	STANDARD	1	33	A	4	GA	0.1200	0.0000	0.0002
CNA500	DEP	STANDARD	1	33	A	5	GA	0.0343	0.0000	0.0001
CNA500	DEP	STANDARD	1	33	A	6	GA	0.0343	0.0000	0.0001
CNA500	DEP	STANDARD	1	33	A	7	GA	0.0043	0.0000	0.0000
CNA500	DEP	STANDARD	1	33	A	8	GA	0.0043	0.0000	0.0000
CNA500	DEP	STANDARD	1	33	B	0	GA	0.0713	0.0000	0.0001
CNA500	DEP	STANDARD	1	33	B	1	GA	0.0439	0.0000	0.0001
CNA500	DEP	STANDARD	1	33	B	2	GA	0.0439	0.0000	0.0001
CNA500	DEP	STANDARD	1	33	B	3	GA	0.0119	0.0000	0.0000
CNA500	DEP	STANDARD	1	33	B	4	GA	0.0119	0.0000	0.0000
CNA500	DEP	STANDARD	1	33	D	0	GA	0.1997	0.0000	0.0003
CNA500	DEP	STANDARD	1	33	D	1	GA	0.1229	0.0000	0.0002
CNA500	DEP	STANDARD	1	33	D	2	GA	0.1229	0.0000	0.0002
CNA500	DEP	STANDARD	1	33	D	3	GA	0.0333	0.0000	0.0000
CNA500	DEP	STANDARD	1	33	D	4	GA	0.0333	0.0000	0.0000
CNA500	DEP	STANDARD	1	33	F	0	GA	0.0250	0.0000	0.0001
CNA500	DEP	STANDARD	1	33	F	1	GA	0.0058	0.0000	0.0000
CNA500	DEP	STANDARD	1	33	F	2	GA	0.0058	0.0000	0.0000
DC93LW	APP	STANDARD	1	15	A	0	COM	0.1746	0.0000	0.0020
DC93LW	APP	STANDARD	1	15	A	1	COM	0.1398	0.0000	0.0016
DC93LW	APP	STANDARD	1	15	A	2	COM	0.1398	0.0000	0.0016
DC93LW	APP	STANDARD	1	15	A	3	COM	0.0699	0.0000	0.0008
DC93LW	APP	STANDARD	1	15	A	4	COM	0.0699	0.0000	0.0008
DC93LW	APP	STANDARD	1	15	A	5	COM	0.0200	0.0000	0.0002
DC93LW	APP	STANDARD	1	15	A	6	COM	0.0200	0.0000	0.0002
DC93LW	APP	STANDARD	1	15	A	7	COM	0.0025	0.0000	0.0000
DC93LW	APP	STANDARD	1	15	A	8	COM	0.0025	0.0000	0.0000
DC93LW	APP	STANDARD	1	15	B	0	COM	0.1068	0.0000	0.0012

DC93LW	APP	STANDARD	1	15	B	1	COM	0.0657	0.0000	0.0008
DC93LW	APP	STANDARD	1	15	B	2	COM	0.0657	0.0000	0.0008
DC93LW	APP	STANDARD	1	15	B	3	COM	0.0178	0.0000	0.0002
DC93LW	APP	STANDARD	1	15	B	4	COM	0.0178	0.0000	0.0002
DC93LW	APP	STANDARD	1	33	A	0	COM	0.1069	0.0000	0.0013
DC93LW	APP	STANDARD	1	33	A	1	COM	0.0856	0.0000	0.0010
DC93LW	APP	STANDARD	1	33	A	2	COM	0.0856	0.0000	0.0010
DC93LW	APP	STANDARD	1	33	A	3	COM	0.0428	0.0000	0.0005
DC93LW	APP	STANDARD	1	33	A	4	COM	0.0428	0.0000	0.0005
DC93LW	APP	STANDARD	1	33	A	5	COM	0.0122	0.0000	0.0001
DC93LW	APP	STANDARD	1	33	A	6	COM	0.0122	0.0000	0.0001
DC93LW	APP	STANDARD	1	33	A	7	COM	0.0015	0.0000	0.0000
DC93LW	APP	STANDARD	1	33	A	8	COM	0.0015	0.0000	0.0000
DC93LW	DEP	STANDARD	1	15	A	0	COM	0.1247	0.0000	0.0014
DC93LW	DEP	STANDARD	1	15	A	1	COM	0.0999	0.0000	0.0012
DC93LW	DEP	STANDARD	1	15	A	2	COM	0.0999	0.0000	0.0012
DC93LW	DEP	STANDARD	1	15	A	3	COM	0.0499	0.0000	0.0006
DC93LW	DEP	STANDARD	1	15	A	4	COM	0.0499	0.0000	0.0006
DC93LW	DEP	STANDARD	1	15	A	5	COM	0.0143	0.0000	0.0002
DC93LW	DEP	STANDARD	1	15	A	6	COM	0.0143	0.0000	0.0002
DC93LW	DEP	STANDARD	1	15	A	7	COM	0.0018	0.0000	0.0000
DC93LW	DEP	STANDARD	1	15	A	8	COM	0.0018	0.0000	0.0000
DC93LW	DEP	STANDARD	1	15	B	0	COM	0.0713	0.0000	0.0008
DC93LW	DEP	STANDARD	1	15	B	1	COM	0.0535	0.0000	0.0006
DC93LW	DEP	STANDARD	1	15	B	2	COM	0.0535	0.0000	0.0006
DC93LW	DEP	STANDARD	1	15	B	3	COM	0.0214	0.0000	0.0003
DC93LW	DEP	STANDARD	1	15	B	4	COM	0.0214	0.0000	0.0003
DC93LW	DEP	STANDARD	1	15	B	5	COM	0.0036	0.0000	0.0000
DC93LW	DEP	STANDARD	1	15	B	6	COM	0.0036	0.0000	0.0000
DC93LW	DEP	STANDARD	1	15	D	0	COM	0.0890	0.0000	0.0011
DC93LW	DEP	STANDARD	1	15	D	1	COM	0.0548	0.0000	0.0006
DC93LW	DEP	STANDARD	1	15	D	2	COM	0.0548	0.0000	0.0006
DC93LW	DEP	STANDARD	1	15	D	3	COM	0.0148	0.0000	0.0002
DC93LW	DEP	STANDARD	1	15	D	4	COM	0.0148	0.0000	0.0002
DC93LW	DEP	STANDARD	1	33	A	0	COM	0.0641	0.0000	0.0007
DC93LW	DEP	STANDARD	1	33	A	1	COM	0.0514	0.0000	0.0006
DC93LW	DEP	STANDARD	1	33	A	2	COM	0.0514	0.0000	0.0006
DC93LW	DEP	STANDARD	1	33	A	3	COM	0.0257	0.0000	0.0003
DC93LW	DEP	STANDARD	1	33	A	4	COM	0.0257	0.0000	0.0003
DC93LW	DEP	STANDARD	1	33	A	5	COM	0.0073	0.0000	0.0001
DC93LW	DEP	STANDARD	1	33	A	6	COM	0.0073	0.0000	0.0001
DC93LW	DEP	STANDARD	1	33	A	7	COM	0.0009	0.0000	0.0000
DC93LW	DEP	STANDARD	1	33	A	8	COM	0.0009	0.0000	0.0000
DC93LW	DEP	STANDARD	1	33	B	0	COM	0.0152	0.0000	0.0002
DC93LW	DEP	STANDARD	1	33	B	1	COM	0.0094	0.0000	0.0001

DC93LW	DEP	STANDARD	1	33	B	2	COM	0.0094	0.0000	0.0001
DC93LW	DEP	STANDARD	1	33	B	3	COM	0.0025	0.0000	0.0000
DC93LW	DEP	STANDARD	1	33	B	4	COM	0.0025	0.0000	0.0000
DC93LW	DEP	STANDARD	1	33	D	0	COM	0.0427	0.0000	0.0005
DC93LW	DEP	STANDARD	1	33	D	1	COM	0.0263	0.0000	0.0003
DC93LW	DEP	STANDARD	1	33	D	2	COM	0.0263	0.0000	0.0003
DC93LW	DEP	STANDARD	1	33	D	3	COM	0.0071	0.0000	0.0001
DC93LW	DEP	STANDARD	1	33	D	4	COM	0.0071	0.0000	0.0001
DC93LW	DEP	STANDARD	1	33	F	0	COM	0.0053	0.0000	0.0001
DC93LW	DEP	STANDARD	1	33	F	1	COM	0.0012	0.0000	0.0000
DC93LW	DEP	STANDARD	1	33	F	2	COM	0.0012	0.0000	0.0000
DHC6	APP	STANDARD	1	15	A	0	COM	0.6636	0.0000	0.0216
DHC6	APP	STANDARD	1	15	A	1	COM	0.5315	0.0000	0.0173
DHC6	APP	STANDARD	1	15	A	2	COM	0.5315	0.0000	0.0173
DHC6	APP	STANDARD	1	15	A	3	COM	0.2657	0.0000	0.0086
DHC6	APP	STANDARD	1	15	A	4	COM	0.2657	0.0000	0.0086
DHC6	APP	STANDARD	1	15	A	5	COM	0.0760	0.0000	0.0025
DHC6	APP	STANDARD	1	15	A	6	COM	0.0760	0.0000	0.0025
DHC6	APP	STANDARD	1	15	A	7	COM	0.0095	0.0000	0.0003
DHC6	APP	STANDARD	1	15	A	8	COM	0.0095	0.0000	0.0003
DHC6	APP	STANDARD	1	15	B	0	COM	0.6316	0.0000	0.0205
DHC6	APP	STANDARD	1	15	B	1	COM	0.3887	0.0000	0.0126
DHC6	APP	STANDARD	1	15	B	2	COM	0.3887	0.0000	0.0126
DHC6	APP	STANDARD	1	15	B	3	COM	0.1053	0.0000	0.0034
DHC6	APP	STANDARD	1	15	B	4	COM	0.1053	0.0000	0.0034
DHC6	APP	STANDARD	1	33	A	0	COM	0.4740	0.0000	0.0154
DHC6	APP	STANDARD	1	33	A	1	COM	0.3796	0.0000	0.0123
DHC6	APP	STANDARD	1	33	A	2	COM	0.3796	0.0000	0.0123
DHC6	APP	STANDARD	1	33	A	3	COM	0.1898	0.0000	0.0062
DHC6	APP	STANDARD	1	33	A	4	COM	0.1898	0.0000	0.0062
DHC6	APP	STANDARD	1	33	A	5	COM	0.0543	0.0000	0.0018
DHC6	APP	STANDARD	1	33	A	6	COM	0.0543	0.0000	0.0018
DHC6	APP	STANDARD	1	33	A	7	COM	0.0068	0.0000	0.0002
DHC6	APP	STANDARD	1	33	A	8	COM	0.0068	0.0000	0.0002
DHC6	DEP	STANDARD	1	15	A	0	COM	0.5530	0.0000	0.0180
DHC6	DEP	STANDARD	1	15	A	1	COM	0.4429	0.0000	0.0144
DHC6	DEP	STANDARD	1	15	A	2	COM	0.4429	0.0000	0.0144
DHC6	DEP	STANDARD	1	15	A	3	COM	0.2215	0.0000	0.0072
DHC6	DEP	STANDARD	1	15	A	4	COM	0.2215	0.0000	0.0072
DHC6	DEP	STANDARD	1	15	A	5	COM	0.0634	0.0000	0.0021
DHC6	DEP	STANDARD	1	15	A	6	COM	0.0634	0.0000	0.0021
DHC6	DEP	STANDARD	1	15	A	7	COM	0.0079	0.0000	0.0003
DHC6	DEP	STANDARD	1	15	A	8	COM	0.0079	0.0000	0.0003
DHC6	DEP	STANDARD	1	15	B	0	COM	0.3162	0.0000	0.0103
DHC6	DEP	STANDARD	1	15	B	1	COM	0.2372	0.0000	0.0077

DHC6	DEP	STANDARD	1	15	B	2	COM	0.2372	0.0000	0.0077
DHC6	DEP	STANDARD	1	15	B	3	COM	0.0949	0.0000	0.0031
DHC6	DEP	STANDARD	1	15	B	4	COM	0.0949	0.0000	0.0031
DHC6	DEP	STANDARD	1	15	B	5	COM	0.0158	0.0000	0.0005
DHC6	DEP	STANDARD	1	15	B	6	COM	0.0158	0.0000	0.0005
DHC6	DEP	STANDARD	1	15	D	0	COM	0.3947	0.0000	0.0128
DHC6	DEP	STANDARD	1	15	D	1	COM	0.2429	0.0000	0.0079
DHC6	DEP	STANDARD	1	15	D	2	COM	0.2429	0.0000	0.0079
DHC6	DEP	STANDARD	1	15	D	3	COM	0.0658	0.0000	0.0021
DHC6	DEP	STANDARD	1	15	D	4	COM	0.0658	0.0000	0.0021
DHC6	DEP	STANDARD	1	33	A	0	COM	0.2844	0.0000	0.0092
DHC6	DEP	STANDARD	1	33	A	1	COM	0.2278	0.0000	0.0074
DHC6	DEP	STANDARD	1	33	A	2	COM	0.2278	0.0000	0.0074
DHC6	DEP	STANDARD	1	33	A	3	COM	0.1139	0.0000	0.0037
DHC6	DEP	STANDARD	1	33	A	4	COM	0.1139	0.0000	0.0037
DHC6	DEP	STANDARD	1	33	A	5	COM	0.0326	0.0000	0.0011
DHC6	DEP	STANDARD	1	33	A	6	COM	0.0326	0.0000	0.0011
DHC6	DEP	STANDARD	1	33	A	7	COM	0.0041	0.0000	0.0001
DHC6	DEP	STANDARD	1	33	A	8	COM	0.0041	0.0000	0.0001
DHC6	DEP	STANDARD	1	33	B	0	COM	0.0677	0.0000	0.0022
DHC6	DEP	STANDARD	1	33	B	1	COM	0.0416	0.0000	0.0013
DHC6	DEP	STANDARD	1	33	B	2	COM	0.0416	0.0000	0.0013
DHC6	DEP	STANDARD	1	33	B	3	COM	0.0113	0.0000	0.0004
DHC6	DEP	STANDARD	1	33	B	4	COM	0.0113	0.0000	0.0004
DHC6	DEP	STANDARD	1	33	D	0	COM	0.1895	0.0000	0.0062
DHC6	DEP	STANDARD	1	33	D	1	COM	0.1166	0.0000	0.0038
DHC6	DEP	STANDARD	1	33	D	2	COM	0.1166	0.0000	0.0038
DHC6	DEP	STANDARD	1	33	D	3	COM	0.0316	0.0000	0.0010
DHC6	DEP	STANDARD	1	33	D	4	COM	0.0316	0.0000	0.0010
DHC6	DEP	STANDARD	1	33	F	0	COM	0.0237	0.0000	0.0008
DHC6	DEP	STANDARD	1	33	F	1	COM	0.0055	0.0000	0.0002
DHC6	DEP	STANDARD	1	33	F	2	COM	0.0055	0.0000	0.0002
FAL20	APP	STANDARD	1	15	A	0	GA	0.3658	0.0000	0.0064
FAL20	APP	STANDARD	1	15	A	1	GA	0.2930	0.0000	0.0052
FAL20	APP	STANDARD	1	15	A	2	GA	0.2930	0.0000	0.0052
FAL20	APP	STANDARD	1	15	A	3	GA	0.1465	0.0000	0.0026
FAL20	APP	STANDARD	1	15	A	4	GA	0.1465	0.0000	0.0026
FAL20	APP	STANDARD	1	15	A	5	GA	0.0419	0.0000	0.0007
FAL20	APP	STANDARD	1	15	A	6	GA	0.0419	0.0000	0.0007
FAL20	APP	STANDARD	1	15	A	7	GA	0.0052	0.0000	0.0001
FAL20	APP	STANDARD	1	15	A	8	GA	0.0052	0.0000	0.0001
FAL20	APP	STANDARD	1	15	B	0	GA	0.2238	0.0000	0.0039
FAL20	APP	STANDARD	1	15	B	1	GA	0.1377	0.0000	0.0024
FAL20	APP	STANDARD	1	15	B	2	GA	0.1377	0.0000	0.0024
FAL20	APP	STANDARD	1	15	B	3	GA	0.0373	0.0000	0.0007

FAL20	APP	STANDARD	1	15	B	4	GA	0.0373	0.0000	0.0007
FAL20	APP	STANDARD	1	33	A	0	GA	0.2240	0.0000	0.0040
FAL20	APP	STANDARD	1	33	A	1	GA	0.1794	0.0000	0.0032
FAL20	APP	STANDARD	1	33	A	2	GA	0.1794	0.0000	0.0032
FAL20	APP	STANDARD	1	33	A	3	GA	0.0897	0.0000	0.0016
FAL20	APP	STANDARD	1	33	A	4	GA	0.0897	0.0000	0.0016
FAL20	APP	STANDARD	1	33	A	5	GA	0.0257	0.0000	0.0005
FAL20	APP	STANDARD	1	33	A	6	GA	0.0257	0.0000	0.0005
FAL20	APP	STANDARD	1	33	A	7	GA	0.0032	0.0000	0.0001
FAL20	APP	STANDARD	1	33	A	8	GA	0.0032	0.0000	0.0001
FAL20	DEP	STANDARD	1	15	A	0	GA	0.2613	0.0000	0.0046
FAL20	DEP	STANDARD	1	15	A	1	GA	0.2093	0.0000	0.0037
FAL20	DEP	STANDARD	1	15	A	2	GA	0.2093	0.0000	0.0037
FAL20	DEP	STANDARD	1	15	A	3	GA	0.1046	0.0000	0.0018
FAL20	DEP	STANDARD	1	15	A	4	GA	0.1046	0.0000	0.0018
FAL20	DEP	STANDARD	1	15	A	5	GA	0.0299	0.0000	0.0005
FAL20	DEP	STANDARD	1	15	A	6	GA	0.0299	0.0000	0.0005
FAL20	DEP	STANDARD	1	15	A	7	GA	0.0037	0.0000	0.0001
FAL20	DEP	STANDARD	1	15	A	8	GA	0.0037	0.0000	0.0001
FAL20	DEP	STANDARD	1	15	B	0	GA	0.1494	0.0000	0.0026
FAL20	DEP	STANDARD	1	15	B	1	GA	0.1121	0.0000	0.0020
FAL20	DEP	STANDARD	1	15	B	2	GA	0.1121	0.0000	0.0020
FAL20	DEP	STANDARD	1	15	B	3	GA	0.0449	0.0000	0.0008
FAL20	DEP	STANDARD	1	15	B	4	GA	0.0449	0.0000	0.0008
FAL20	DEP	STANDARD	1	15	B	5	GA	0.0075	0.0000	0.0001
FAL20	DEP	STANDARD	1	15	B	6	GA	0.0075	0.0000	0.0001
FAL20	DEP	STANDARD	1	15	D	0	GA	0.1865	0.0000	0.0033
FAL20	DEP	STANDARD	1	15	D	1	GA	0.1148	0.0000	0.0020
FAL20	DEP	STANDARD	1	15	D	2	GA	0.1148	0.0000	0.0020
FAL20	DEP	STANDARD	1	15	D	3	GA	0.0311	0.0000	0.0005
FAL20	DEP	STANDARD	1	15	D	4	GA	0.0311	0.0000	0.0005
FAL20	DEP	STANDARD	1	33	A	0	GA	0.1344	0.0000	0.0024
FAL20	DEP	STANDARD	1	33	A	1	GA	0.1076	0.0000	0.0019
FAL20	DEP	STANDARD	1	33	A	2	GA	0.1076	0.0000	0.0019
FAL20	DEP	STANDARD	1	33	A	3	GA	0.0538	0.0000	0.0010
FAL20	DEP	STANDARD	1	33	A	4	GA	0.0538	0.0000	0.0010
FAL20	DEP	STANDARD	1	33	A	5	GA	0.0154	0.0000	0.0003
FAL20	DEP	STANDARD	1	33	A	6	GA	0.0154	0.0000	0.0003
FAL20	DEP	STANDARD	1	33	A	7	GA	0.0019	0.0000	0.0000
FAL20	DEP	STANDARD	1	33	A	8	GA	0.0019	0.0000	0.0000
FAL20	DEP	STANDARD	1	33	B	0	GA	0.0320	0.0000	0.0005
FAL20	DEP	STANDARD	1	33	B	1	GA	0.0197	0.0000	0.0003
FAL20	DEP	STANDARD	1	33	B	2	GA	0.0197	0.0000	0.0003
FAL20	DEP	STANDARD	1	33	B	3	GA	0.0053	0.0000	0.0001
FAL20	DEP	STANDARD	1	33	B	4	GA	0.0053	0.0000	0.0001

FAL20	DEP	STANDARD	1	33	D	0	GA	0.0895	0.0000	0.0016
FAL20	DEP	STANDARD	1	33	D	1	GA	0.0551	0.0000	0.0010
FAL20	DEP	STANDARD	1	33	D	2	GA	0.0551	0.0000	0.0010
FAL20	DEP	STANDARD	1	33	D	3	GA	0.0149	0.0000	0.0003
FAL20	DEP	STANDARD	1	33	D	4	GA	0.0149	0.0000	0.0003
FAL20	DEP	STANDARD	1	33	F	0	GA	0.0112	0.0000	0.0002
FAL20	DEP	STANDARD	1	33	F	1	GA	0.0026	0.0000	0.0000
FAL20	DEP	STANDARD	1	33	F	2	GA	0.0026	0.0000	0.0000
FAL50	APP	STANDARD	1	15	A	0	GA	0.0710	0.0000	0.0002
FAL50	APP	STANDARD	1	15	A	1	GA	0.0569	0.0000	0.0002
FAL50	APP	STANDARD	1	15	A	2	GA	0.0569	0.0000	0.0002
FAL50	APP	STANDARD	1	15	A	3	GA	0.0284	0.0000	0.0001
FAL50	APP	STANDARD	1	15	A	4	GA	0.0284	0.0000	0.0001
FAL50	APP	STANDARD	1	15	A	5	GA	0.0081	0.0000	0.0000
FAL50	APP	STANDARD	1	15	A	6	GA	0.0081	0.0000	0.0000
FAL50	APP	STANDARD	1	15	A	7	GA	0.0010	0.0000	0.0000
FAL50	APP	STANDARD	1	15	A	8	GA	0.0010	0.0000	0.0000
FAL50	APP	STANDARD	1	15	B	0	GA	0.0434	0.0000	0.0001
FAL50	APP	STANDARD	1	15	B	1	GA	0.0267	0.0000	0.0001
FAL50	APP	STANDARD	1	15	B	2	GA	0.0267	0.0000	0.0001
FAL50	APP	STANDARD	1	15	B	3	GA	0.0072	0.0000	0.0000
FAL50	APP	STANDARD	1	15	B	4	GA	0.0072	0.0000	0.0000
FAL50	APP	STANDARD	1	33	A	0	GA	0.0435	0.0000	0.0001
FAL50	APP	STANDARD	1	33	A	1	GA	0.0348	0.0000	0.0001
FAL50	APP	STANDARD	1	33	A	2	GA	0.0348	0.0000	0.0001
FAL50	APP	STANDARD	1	33	A	3	GA	0.0174	0.0000	0.0001
FAL50	APP	STANDARD	1	33	A	4	GA	0.0174	0.0000	0.0001
FAL50	APP	STANDARD	1	33	A	5	GA	0.0050	0.0000	0.0000
FAL50	APP	STANDARD	1	33	A	6	GA	0.0050	0.0000	0.0000
FAL50	APP	STANDARD	1	33	A	7	GA	0.0006	0.0000	0.0000
FAL50	APP	STANDARD	1	33	A	8	GA	0.0006	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	A	0	GA	0.0507	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	A	1	GA	0.0406	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	A	2	GA	0.0406	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	A	3	GA	0.0203	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	A	4	GA	0.0203	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	A	5	GA	0.0058	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	A	6	GA	0.0058	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	A	7	GA	0.0007	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	A	8	GA	0.0007	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	B	0	GA	0.0290	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	B	1	GA	0.0218	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	B	2	GA	0.0218	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	B	3	GA	0.0087	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	B	4	GA	0.0087	0.0000	0.0000

FAL50	DEP	STANDARD	1	15	B	5	GA	0.0014	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	B	6	GA	0.0014	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	D	0	GA	0.0362	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	D	1	GA	0.0223	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	D	2	GA	0.0223	0.0000	0.0001
FAL50	DEP	STANDARD	1	15	D	3	GA	0.0060	0.0000	0.0000
FAL50	DEP	STANDARD	1	15	D	4	GA	0.0060	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	A	0	GA	0.0261	0.0000	0.0001
FAL50	DEP	STANDARD	1	33	A	1	GA	0.0209	0.0000	0.0001
FAL50	DEP	STANDARD	1	33	A	2	GA	0.0209	0.0000	0.0001
FAL50	DEP	STANDARD	1	33	A	3	GA	0.0104	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	A	4	GA	0.0104	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	A	5	GA	0.0030	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	A	6	GA	0.0030	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	A	7	GA	0.0004	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	A	8	GA	0.0004	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	B	0	GA	0.0062	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	B	1	GA	0.0038	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	B	2	GA	0.0038	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	B	3	GA	0.0010	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	B	4	GA	0.0010	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	D	0	GA	0.0174	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	D	1	GA	0.0107	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	D	2	GA	0.0107	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	D	3	GA	0.0029	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	D	4	GA	0.0029	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	F	0	GA	0.0022	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	F	1	GA	0.0005	0.0000	0.0000
FAL50	DEP	STANDARD	1	33	F	2	GA	0.0005	0.0000	0.0000
GASEPF	APP	STANDARD	1	15	A	0	GA	3.9898	0.0000	0.0618
GASEPF	APP	STANDARD	1	15	A	1	GA	3.1954	0.0000	0.0495
GASEPF	APP	STANDARD	1	15	A	2	GA	3.1954	0.0000	0.0495
GASEPF	APP	STANDARD	1	15	A	3	GA	1.5977	0.0000	0.0248
GASEPF	APP	STANDARD	1	15	A	4	GA	1.5977	0.0000	0.0248
GASEPF	APP	STANDARD	1	15	A	5	GA	0.4571	0.0000	0.0071
GASEPF	APP	STANDARD	1	15	A	6	GA	0.4571	0.0000	0.0071
GASEPF	APP	STANDARD	1	15	A	7	GA	0.0570	0.0000	0.0009
GASEPF	APP	STANDARD	1	15	A	8	GA	0.0570	0.0000	0.0009
GASEPF	APP	STANDARD	1	15	B	0	GA	2.8478	0.0000	0.0441
GASEPF	APP	STANDARD	1	15	B	1	GA	1.7525	0.0000	0.0272
GASEPF	APP	STANDARD	1	15	B	2	GA	1.7525	0.0000	0.0272
GASEPF	APP	STANDARD	1	15	B	3	GA	0.4746	0.0000	0.0074
GASEPF	APP	STANDARD	1	15	B	4	GA	0.4746	0.0000	0.0074
GASEPF	APP	STANDARD	1	15	C	0	GA	1.4239	0.0000	0.0221
GASEPF	APP	STANDARD	1	15	C	1	GA	0.8762	0.0000	0.0136

GASEPF	APP	STANDARD	1	15	C	2	GA	0.8762	0.0000	0.0136
GASEPF	APP	STANDARD	1	15	C	3	GA	0.2373	0.0000	0.0037
GASEPF	APP	STANDARD	1	15	C	4	GA	0.2373	0.0000	0.0037
GASEPF	APP	STANDARD	1	15	D	0	GA	1.4239	0.0000	0.0221
GASEPF	APP	STANDARD	1	15	D	1	GA	0.8762	0.0000	0.0136
GASEPF	APP	STANDARD	1	15	D	2	GA	0.8762	0.0000	0.0136
GASEPF	APP	STANDARD	1	15	D	3	GA	0.2373	0.0000	0.0037
GASEPF	APP	STANDARD	1	15	D	4	GA	0.2373	0.0000	0.0037
GASEPF	APP	STANDARD	1	15	E	0	GA	1.4239	0.0000	0.0221
GASEPF	APP	STANDARD	1	15	E	1	GA	0.8762	0.0000	0.0136
GASEPF	APP	STANDARD	1	15	E	2	GA	0.8762	0.0000	0.0136
GASEPF	APP	STANDARD	1	15	E	3	GA	0.2373	0.0000	0.0037
GASEPF	APP	STANDARD	1	15	E	4	GA	0.2373	0.0000	0.0037
GASEPF	APP	STANDARD	1	15	F	0	GA	1.4239	0.0000	0.0221
GASEPF	APP	STANDARD	1	15	F	1	GA	0.8762	0.0000	0.0136
GASEPF	APP	STANDARD	1	15	F	2	GA	0.8762	0.0000	0.0136
GASEPF	APP	STANDARD	1	15	F	3	GA	0.2373	0.0000	0.0037
GASEPF	APP	STANDARD	1	15	F	4	GA	0.2373	0.0000	0.0037
GASEPF	APP	STANDARD	1	33	A	0	GA	3.4199	0.0000	0.0530
GASEPF	APP	STANDARD	1	33	A	1	GA	2.7389	0.0000	0.0424
GASEPF	APP	STANDARD	1	33	A	2	GA	2.7389	0.0000	0.0424
GASEPF	APP	STANDARD	1	33	A	3	GA	1.3694	0.0000	0.0212
GASEPF	APP	STANDARD	1	33	A	4	GA	1.3694	0.0000	0.0212
GASEPF	APP	STANDARD	1	33	A	5	GA	0.3918	0.0000	0.0061
GASEPF	APP	STANDARD	1	33	A	6	GA	0.3918	0.0000	0.0061
GASEPF	APP	STANDARD	1	33	A	7	GA	0.0488	0.0000	0.0008
GASEPF	APP	STANDARD	1	33	A	8	GA	0.0488	0.0000	0.0008
GASEPF	APP	STANDARD	1	33	B	0	GA	1.2205	0.0000	0.0189
GASEPF	APP	STANDARD	1	33	B	1	GA	0.7511	0.0000	0.0116
GASEPF	APP	STANDARD	1	33	B	2	GA	0.7511	0.0000	0.0116
GASEPF	APP	STANDARD	1	33	B	3	GA	0.2034	0.0000	0.0032
GASEPF	APP	STANDARD	1	33	B	4	GA	0.2034	0.0000	0.0032
GASEPF	DEP	STANDARD	1	15	A	0	GA	0.4987	0.0000	0.0077
GASEPF	DEP	STANDARD	1	15	A	1	GA	0.3994	0.0000	0.0062
GASEPF	DEP	STANDARD	1	15	A	2	GA	0.3994	0.0000	0.0062
GASEPF	DEP	STANDARD	1	15	A	3	GA	0.1997	0.0000	0.0031
GASEPF	DEP	STANDARD	1	15	A	4	GA	0.1997	0.0000	0.0031
GASEPF	DEP	STANDARD	1	15	A	5	GA	0.0571	0.0000	0.0009
GASEPF	DEP	STANDARD	1	15	A	6	GA	0.0571	0.0000	0.0009
GASEPF	DEP	STANDARD	1	15	A	7	GA	0.0071	0.0000	0.0001
GASEPF	DEP	STANDARD	1	15	A	8	GA	0.0071	0.0000	0.0001
GASEPF	DEP	STANDARD	1	15	B	0	GA	1.1406	0.0000	0.0177
GASEPF	DEP	STANDARD	1	15	B	1	GA	0.8558	0.0000	0.0133
GASEPF	DEP	STANDARD	1	15	B	2	GA	0.8558	0.0000	0.0133
GASEPF	DEP	STANDARD	1	15	B	3	GA	0.3425	0.0000	0.0053

GASEPF	DEP	STANDARD	1	15	B	4	GA	0.3425	0.0000	0.0053
GASEPF	DEP	STANDARD	1	15	B	5	GA	0.0570	0.0000	0.0009
GASEPF	DEP	STANDARD	1	15	B	6	GA	0.0570	0.0000	0.0009
GASEPF	DEP	STANDARD	1	15	C	0	GA	5.4860	0.0000	0.0850
GASEPF	DEP	STANDARD	1	15	C	1	GA	4.3937	0.0000	0.0681
GASEPF	DEP	STANDARD	1	15	C	2	GA	4.3937	0.0000	0.0681
GASEPF	DEP	STANDARD	1	15	C	3	GA	2.1968	0.0000	0.0340
GASEPF	DEP	STANDARD	1	15	C	4	GA	2.1968	0.0000	0.0340
GASEPF	DEP	STANDARD	1	15	C	5	GA	0.6285	0.0000	0.0097
GASEPF	DEP	STANDARD	1	15	C	6	GA	0.6285	0.0000	0.0097
GASEPF	DEP	STANDARD	1	15	C	7	GA	0.0783	0.0000	0.0012
GASEPF	DEP	STANDARD	1	15	C	8	GA	0.0783	0.0000	0.0012
GASEPF	DEP	STANDARD	1	15	D	0	GA	0.7119	0.0000	0.0110
GASEPF	DEP	STANDARD	1	15	D	1	GA	0.4381	0.0000	0.0068
GASEPF	DEP	STANDARD	1	15	D	2	GA	0.4381	0.0000	0.0068
GASEPF	DEP	STANDARD	1	15	D	3	GA	0.1187	0.0000	0.0018
GASEPF	DEP	STANDARD	1	15	D	4	GA	0.1187	0.0000	0.0018
GASEPF	DEP	STANDARD	1	15	E	0	GA	1.1406	0.0000	0.0177
GASEPF	DEP	STANDARD	1	15	E	1	GA	0.8558	0.0000	0.0133
GASEPF	DEP	STANDARD	1	15	E	2	GA	0.8558	0.0000	0.0133
GASEPF	DEP	STANDARD	1	15	E	3	GA	0.3425	0.0000	0.0053
GASEPF	DEP	STANDARD	1	15	E	4	GA	0.3425	0.0000	0.0053
GASEPF	DEP	STANDARD	1	15	E	5	GA	0.0570	0.0000	0.0009
GASEPF	DEP	STANDARD	1	15	E	6	GA	0.0570	0.0000	0.0009
GASEPF	DEP	STANDARD	1	15	F	0	GA	2.1358	0.0000	0.0331
GASEPF	DEP	STANDARD	1	15	F	1	GA	1.3144	0.0000	0.0204
GASEPF	DEP	STANDARD	1	15	F	2	GA	1.3144	0.0000	0.0204
GASEPF	DEP	STANDARD	1	15	F	3	GA	0.3560	0.0000	0.0055
GASEPF	DEP	STANDARD	1	15	F	4	GA	0.3560	0.0000	0.0055
GASEPF	DEP	STANDARD	1	33	A	0	GA	1.7099	0.0000	0.0265
GASEPF	DEP	STANDARD	1	33	A	1	GA	1.3694	0.0000	0.0212
GASEPF	DEP	STANDARD	1	33	A	2	GA	1.3694	0.0000	0.0212
GASEPF	DEP	STANDARD	1	33	A	3	GA	0.6847	0.0000	0.0106
GASEPF	DEP	STANDARD	1	33	A	4	GA	0.6847	0.0000	0.0106
GASEPF	DEP	STANDARD	1	33	A	5	GA	0.1959	0.0000	0.0030
GASEPF	DEP	STANDARD	1	33	A	6	GA	0.1959	0.0000	0.0030
GASEPF	DEP	STANDARD	1	33	A	7	GA	0.0244	0.0000	0.0004
GASEPF	DEP	STANDARD	1	33	A	8	GA	0.0244	0.0000	0.0004
GASEPF	DEP	STANDARD	1	33	B	0	GA	0.9154	0.0000	0.0142
GASEPF	DEP	STANDARD	1	33	B	1	GA	0.5633	0.0000	0.0087
GASEPF	DEP	STANDARD	1	33	B	2	GA	0.5633	0.0000	0.0087
GASEPF	DEP	STANDARD	1	33	B	3	GA	0.1526	0.0000	0.0024
GASEPF	DEP	STANDARD	1	33	B	4	GA	0.1526	0.0000	0.0024
GASEPF	DEP	STANDARD	1	33	C	0	GA	0.9154	0.0000	0.0142
GASEPF	DEP	STANDARD	1	33	C	1	GA	0.5633	0.0000	0.0087

GASEPF	DEP	STANDARD	1	33	C	2	GA	0.5633	0.0000	0.0087
GASEPF	DEP	STANDARD	1	33	C	3	GA	0.1526	0.0000	0.0024
GASEPF	DEP	STANDARD	1	33	C	4	GA	0.1526	0.0000	0.0024
GASEPF	DEP	STANDARD	1	33	D	0	GA	1.2205	0.0000	0.0189
GASEPF	DEP	STANDARD	1	33	D	1	GA	0.7511	0.0000	0.0116
GASEPF	DEP	STANDARD	1	33	D	2	GA	0.7511	0.0000	0.0116
GASEPF	DEP	STANDARD	1	33	D	3	GA	0.2034	0.0000	0.0032
GASEPF	DEP	STANDARD	1	33	D	4	GA	0.2034	0.0000	0.0032
GASEPF	DEP	STANDARD	1	33	E	0	GA	0.6102	0.0000	0.0094
GASEPF	DEP	STANDARD	1	33	E	1	GA	0.3755	0.0000	0.0058
GASEPF	DEP	STANDARD	1	33	E	2	GA	0.3755	0.0000	0.0058
GASEPF	DEP	STANDARD	1	33	E	3	GA	0.1017	0.0000	0.0016
GASEPF	DEP	STANDARD	1	33	E	4	GA	0.1017	0.0000	0.0016
GASEPF	TGO	STANDARD	1	15	A	0	GA	1.9743	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	A	1	GA	1.2150	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	A	2	GA	1.2150	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	A	3	GA	0.3291	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	A	4	GA	0.3291	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	B	0	GA	0.0533	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	B	1	GA	0.0533	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	B	2	GA	0.0533	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	B	3	GA	0.0533	0.0000	0.0000
GASEPF	TGO	STANDARD	1	15	B	4	GA	0.0533	0.0000	0.0000
GASEPF	TGO	STANDARD	1	33	A	0	GA	0.8907	0.0000	0.0000
GASEPF	TGO	STANDARD	1	33	A	1	GA	0.5481	0.0000	0.0000
GASEPF	TGO	STANDARD	1	33	A	2	GA	0.5481	0.0000	0.0000
GASEPF	TGO	STANDARD	1	33	A	3	GA	0.1484	0.0000	0.0000
GASEPF	TGO	STANDARD	1	33	A	4	GA	0.1484	0.0000	0.0000
GASEPV	APP	STANDARD	1	15	A	0	GA	3.9898	0.0000	0.0618
GASEPV	APP	STANDARD	1	15	A	1	GA	3.1954	0.0000	0.0495
GASEPV	APP	STANDARD	1	15	A	2	GA	3.1954	0.0000	0.0495
GASEPV	APP	STANDARD	1	15	A	3	GA	1.5977	0.0000	0.0248
GASEPV	APP	STANDARD	1	15	A	4	GA	1.5977	0.0000	0.0248
GASEPV	APP	STANDARD	1	15	A	5	GA	0.4571	0.0000	0.0071
GASEPV	APP	STANDARD	1	15	A	6	GA	0.4571	0.0000	0.0071
GASEPV	APP	STANDARD	1	15	A	7	GA	0.0570	0.0000	0.0009
GASEPV	APP	STANDARD	1	15	A	8	GA	0.0570	0.0000	0.0009
GASEPV	APP	STANDARD	1	15	B	0	GA	2.8478	0.0000	0.0441
GASEPV	APP	STANDARD	1	15	B	1	GA	1.7525	0.0000	0.0272
GASEPV	APP	STANDARD	1	15	B	2	GA	1.7525	0.0000	0.0272
GASEPV	APP	STANDARD	1	15	B	3	GA	0.4746	0.0000	0.0074
GASEPV	APP	STANDARD	1	15	B	4	GA	0.4746	0.0000	0.0074
GASEPV	APP	STANDARD	1	15	C	0	GA	1.4239	0.0000	0.0221
GASEPV	APP	STANDARD	1	15	C	1	GA	0.8762	0.0000	0.0136
GASEPV	APP	STANDARD	1	15	C	2	GA	0.8762	0.0000	0.0136

GASEPV	APP	STANDARD	1	15	C	3	GA	0.2373	0.0000	0.0037
GASEPV	APP	STANDARD	1	15	C	4	GA	0.2373	0.0000	0.0037
GASEPV	APP	STANDARD	1	15	D	0	GA	1.4239	0.0000	0.0221
GASEPV	APP	STANDARD	1	15	D	1	GA	0.8762	0.0000	0.0136
GASEPV	APP	STANDARD	1	15	D	2	GA	0.8762	0.0000	0.0136
GASEPV	APP	STANDARD	1	15	D	3	GA	0.2373	0.0000	0.0037
GASEPV	APP	STANDARD	1	15	D	4	GA	0.2373	0.0000	0.0037
GASEPV	APP	STANDARD	1	15	E	0	GA	1.4239	0.0000	0.0221
GASEPV	APP	STANDARD	1	15	E	1	GA	0.8762	0.0000	0.0136
GASEPV	APP	STANDARD	1	15	E	2	GA	0.8762	0.0000	0.0136
GASEPV	APP	STANDARD	1	15	E	3	GA	0.2373	0.0000	0.0037
GASEPV	APP	STANDARD	1	15	E	4	GA	0.2373	0.0000	0.0037
GASEPV	APP	STANDARD	1	15	F	0	GA	1.4239	0.0000	0.0221
GASEPV	APP	STANDARD	1	15	F	1	GA	0.8762	0.0000	0.0136
GASEPV	APP	STANDARD	1	15	F	2	GA	0.8762	0.0000	0.0136
GASEPV	APP	STANDARD	1	15	F	3	GA	0.2373	0.0000	0.0037
GASEPV	APP	STANDARD	1	15	F	4	GA	0.2373	0.0000	0.0037
GASEPV	APP	STANDARD	1	33	A	0	GA	3.4199	0.0000	0.0530
GASEPV	APP	STANDARD	1	33	A	1	GA	2.7389	0.0000	0.0424
GASEPV	APP	STANDARD	1	33	A	2	GA	2.7389	0.0000	0.0424
GASEPV	APP	STANDARD	1	33	A	3	GA	1.3694	0.0000	0.0212
GASEPV	APP	STANDARD	1	33	A	4	GA	1.3694	0.0000	0.0212
GASEPV	APP	STANDARD	1	33	A	5	GA	0.3918	0.0000	0.0061
GASEPV	APP	STANDARD	1	33	A	6	GA	0.3918	0.0000	0.0061
GASEPV	APP	STANDARD	1	33	A	7	GA	0.0488	0.0000	0.0008
GASEPV	APP	STANDARD	1	33	A	8	GA	0.0488	0.0000	0.0008
GASEPV	APP	STANDARD	1	33	B	0	GA	1.2205	0.0000	0.0189
GASEPV	APP	STANDARD	1	33	B	1	GA	0.7511	0.0000	0.0116
GASEPV	APP	STANDARD	1	33	B	2	GA	0.7511	0.0000	0.0116
GASEPV	APP	STANDARD	1	33	B	3	GA	0.2034	0.0000	0.0032
GASEPV	APP	STANDARD	1	33	B	4	GA	0.2034	0.0000	0.0032
GASEPV	DEP	STANDARD	1	15	A	0	GA	0.4987	0.0000	0.0077
GASEPV	DEP	STANDARD	1	15	A	1	GA	0.3994	0.0000	0.0062
GASEPV	DEP	STANDARD	1	15	A	2	GA	0.3994	0.0000	0.0062
GASEPV	DEP	STANDARD	1	15	A	3	GA	0.1997	0.0000	0.0031
GASEPV	DEP	STANDARD	1	15	A	4	GA	0.1997	0.0000	0.0031
GASEPV	DEP	STANDARD	1	15	A	5	GA	0.0571	0.0000	0.0009
GASEPV	DEP	STANDARD	1	15	A	6	GA	0.0571	0.0000	0.0009
GASEPV	DEP	STANDARD	1	15	A	7	GA	0.0071	0.0000	0.0001
GASEPV	DEP	STANDARD	1	15	A	8	GA	0.0071	0.0000	0.0001
GASEPV	DEP	STANDARD	1	15	B	0	GA	1.1406	0.0000	0.0177
GASEPV	DEP	STANDARD	1	15	B	1	GA	0.8558	0.0000	0.0133
GASEPV	DEP	STANDARD	1	15	B	2	GA	0.8558	0.0000	0.0133
GASEPV	DEP	STANDARD	1	15	B	3	GA	0.3425	0.0000	0.0053
GASEPV	DEP	STANDARD	1	15	B	4	GA	0.3425	0.0000	0.0053

GASEPV	DEP	STANDARD	1	15	B	5	GA	0.0570	0.0000	0.0009
GASEPV	DEP	STANDARD	1	15	B	6	GA	0.0570	0.0000	0.0009
GASEPV	DEP	STANDARD	1	15	C	0	GA	5.4860	0.0000	0.0850
GASEPV	DEP	STANDARD	1	15	C	1	GA	4.3937	0.0000	0.0681
GASEPV	DEP	STANDARD	1	15	C	2	GA	4.3937	0.0000	0.0681
GASEPV	DEP	STANDARD	1	15	C	3	GA	2.1968	0.0000	0.0340
GASEPV	DEP	STANDARD	1	15	C	4	GA	2.1968	0.0000	0.0340
GASEPV	DEP	STANDARD	1	15	C	5	GA	0.6285	0.0000	0.0097
GASEPV	DEP	STANDARD	1	15	C	6	GA	0.6285	0.0000	0.0097
GASEPV	DEP	STANDARD	1	15	C	7	GA	0.0783	0.0000	0.0012
GASEPV	DEP	STANDARD	1	15	C	8	GA	0.0783	0.0000	0.0012
GASEPV	DEP	STANDARD	1	15	D	0	GA	0.7119	0.0000	0.0110
GASEPV	DEP	STANDARD	1	15	D	1	GA	0.4381	0.0000	0.0068
GASEPV	DEP	STANDARD	1	15	D	2	GA	0.4381	0.0000	0.0068
GASEPV	DEP	STANDARD	1	15	D	3	GA	0.1187	0.0000	0.0018
GASEPV	DEP	STANDARD	1	15	D	4	GA	0.1187	0.0000	0.0018
GASEPV	DEP	STANDARD	1	15	E	0	GA	1.1406	0.0000	0.0177
GASEPV	DEP	STANDARD	1	15	E	1	GA	0.8558	0.0000	0.0133
GASEPV	DEP	STANDARD	1	15	E	2	GA	0.8558	0.0000	0.0133
GASEPV	DEP	STANDARD	1	15	E	3	GA	0.3425	0.0000	0.0053
GASEPV	DEP	STANDARD	1	15	E	4	GA	0.3425	0.0000	0.0053
GASEPV	DEP	STANDARD	1	15	E	5	GA	0.0570	0.0000	0.0009
GASEPV	DEP	STANDARD	1	15	E	6	GA	0.0570	0.0000	0.0009
GASEPV	DEP	STANDARD	1	15	F	0	GA	2.1358	0.0000	0.0331
GASEPV	DEP	STANDARD	1	15	F	1	GA	1.3144	0.0000	0.0204
GASEPV	DEP	STANDARD	1	15	F	2	GA	1.3144	0.0000	0.0204
GASEPV	DEP	STANDARD	1	15	F	3	GA	0.3560	0.0000	0.0055
GASEPV	DEP	STANDARD	1	15	F	4	GA	0.3560	0.0000	0.0055
GASEPV	DEP	STANDARD	1	33	A	0	GA	1.7099	0.0000	0.0265
GASEPV	DEP	STANDARD	1	33	A	1	GA	1.3694	0.0000	0.0212
GASEPV	DEP	STANDARD	1	33	A	2	GA	1.3694	0.0000	0.0212
GASEPV	DEP	STANDARD	1	33	A	3	GA	0.6847	0.0000	0.0106
GASEPV	DEP	STANDARD	1	33	A	4	GA	0.6847	0.0000	0.0106
GASEPV	DEP	STANDARD	1	33	A	5	GA	0.1959	0.0000	0.0030
GASEPV	DEP	STANDARD	1	33	A	6	GA	0.1959	0.0000	0.0030
GASEPV	DEP	STANDARD	1	33	A	7	GA	0.0244	0.0000	0.0004
GASEPV	DEP	STANDARD	1	33	A	8	GA	0.0244	0.0000	0.0004
GASEPV	DEP	STANDARD	1	33	B	0	GA	0.9154	0.0000	0.0142
GASEPV	DEP	STANDARD	1	33	B	1	GA	0.5633	0.0000	0.0087
GASEPV	DEP	STANDARD	1	33	B	2	GA	0.5633	0.0000	0.0087
GASEPV	DEP	STANDARD	1	33	B	3	GA	0.1526	0.0000	0.0024
GASEPV	DEP	STANDARD	1	33	B	4	GA	0.1526	0.0000	0.0024
GASEPV	DEP	STANDARD	1	33	C	0	GA	0.9154	0.0000	0.0142
GASEPV	DEP	STANDARD	1	33	C	1	GA	0.5633	0.0000	0.0087
GASEPV	DEP	STANDARD	1	33	C	2	GA	0.5633	0.0000	0.0087

GASEPV	DEP	STANDARD	1	33	C	3	GA	0.1526	0.0000	0.0024
GASEPV	DEP	STANDARD	1	33	C	4	GA	0.1526	0.0000	0.0024
GASEPV	DEP	STANDARD	1	33	D	0	GA	1.2205	0.0000	0.0189
GASEPV	DEP	STANDARD	1	33	D	1	GA	0.7511	0.0000	0.0116
GASEPV	DEP	STANDARD	1	33	D	2	GA	0.7511	0.0000	0.0116
GASEPV	DEP	STANDARD	1	33	D	3	GA	0.2034	0.0000	0.0032
GASEPV	DEP	STANDARD	1	33	D	4	GA	0.2034	0.0000	0.0032
GASEPV	DEP	STANDARD	1	33	E	0	GA	0.6102	0.0000	0.0094
GASEPV	DEP	STANDARD	1	33	E	1	GA	0.3755	0.0000	0.0058
GASEPV	DEP	STANDARD	1	33	E	2	GA	0.3755	0.0000	0.0058
GASEPV	DEP	STANDARD	1	33	E	3	GA	0.1017	0.0000	0.0016
GASEPV	DEP	STANDARD	1	33	E	4	GA	0.1017	0.0000	0.0016
GASEPV	TGO	STANDARD	1	15	A	0	GA	1.9743	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	A	1	GA	1.2150	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	A	2	GA	1.2150	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	A	3	GA	0.3291	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	A	4	GA	0.3291	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	B	0	GA	0.0533	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	B	1	GA	0.0533	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	B	2	GA	0.0533	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	B	3	GA	0.0533	0.0000	0.0000
GASEPV	TGO	STANDARD	1	15	B	4	GA	0.0533	0.0000	0.0000
GASEPV	TGO	STANDARD	1	33	A	0	GA	0.8907	0.0000	0.0000
GASEPV	TGO	STANDARD	1	33	A	1	GA	0.5481	0.0000	0.0000
GASEPV	TGO	STANDARD	1	33	A	2	GA	0.5481	0.0000	0.0000
GASEPV	TGO	STANDARD	1	33	A	3	GA	0.1484	0.0000	0.0000
GASEPV	TGO	STANDARD	1	33	A	4	GA	0.1484	0.0000	0.0000
GIIB	APP	STANDARD	1	15	A	0	GA	0.1515	0.0000	0.0004
GIIB	APP	STANDARD	1	15	A	1	GA	0.1213	0.0000	0.0004
GIIB	APP	STANDARD	1	15	A	2	GA	0.1213	0.0000	0.0004
GIIB	APP	STANDARD	1	15	A	3	GA	0.0607	0.0000	0.0002
GIIB	APP	STANDARD	1	15	A	4	GA	0.0607	0.0000	0.0002
GIIB	APP	STANDARD	1	15	A	5	GA	0.0174	0.0000	0.0001
GIIB	APP	STANDARD	1	15	A	6	GA	0.0174	0.0000	0.0001
GIIB	APP	STANDARD	1	15	A	7	GA	0.0022	0.0000	0.0000
GIIB	APP	STANDARD	1	15	A	8	GA	0.0022	0.0000	0.0000
GIIB	APP	STANDARD	1	15	B	0	GA	0.0927	0.0000	0.0003
GIIB	APP	STANDARD	1	15	B	1	GA	0.0570	0.0000	0.0002
GIIB	APP	STANDARD	1	15	B	2	GA	0.0570	0.0000	0.0002
GIIB	APP	STANDARD	1	15	B	3	GA	0.0154	0.0000	0.0000
GIIB	APP	STANDARD	1	15	B	4	GA	0.0154	0.0000	0.0000
GIIB	APP	STANDARD	1	33	A	0	GA	0.0927	0.0000	0.0003
GIIB	APP	STANDARD	1	33	A	1	GA	0.0743	0.0000	0.0002
GIIB	APP	STANDARD	1	33	A	2	GA	0.0743	0.0000	0.0002
GIIB	APP	STANDARD	1	33	A	3	GA	0.0371	0.0000	0.0001

GIIB	APP	STANDARD	1	33	A	4	GA	0.0371	0.0000	0.0001
GIIB	APP	STANDARD	1	33	A	5	GA	0.0106	0.0000	0.0000
GIIB	APP	STANDARD	1	33	A	6	GA	0.0106	0.0000	0.0000
GIIB	APP	STANDARD	1	33	A	7	GA	0.0013	0.0000	0.0000
GIIB	APP	STANDARD	1	33	A	8	GA	0.0013	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	15	A	0	GA	0.1082	0.0000	0.0003
GIIB	DEP	QF_FLEX	1	15	A	1	GA	0.0866	0.0000	0.0002
GIIB	DEP	QF_FLEX	1	15	A	2	GA	0.0866	0.0000	0.0002
GIIB	DEP	QF_FLEX	1	15	A	3	GA	0.0433	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	15	A	4	GA	0.0433	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	15	A	5	GA	0.0124	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	15	A	6	GA	0.0124	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	15	A	7	GA	0.0015	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	15	A	8	GA	0.0015	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	15	B	0	GA	0.0619	0.0000	0.0002
GIIB	DEP	QF_FLEX	1	15	B	1	GA	0.0464	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	15	B	2	GA	0.0464	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	15	B	3	GA	0.0186	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	15	B	4	GA	0.0186	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	15	B	5	GA	0.0031	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	15	B	6	GA	0.0031	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	15	D	0	GA	0.0772	0.0000	0.0002
GIIB	DEP	QF_FLEX	1	15	D	1	GA	0.0475	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	15	D	2	GA	0.0475	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	15	D	3	GA	0.0129	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	15	D	4	GA	0.0129	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	A	0	GA	0.0557	0.0000	0.0002
GIIB	DEP	QF_FLEX	1	33	A	1	GA	0.0446	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	33	A	2	GA	0.0446	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	33	A	3	GA	0.0223	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	33	A	4	GA	0.0223	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	33	A	5	GA	0.0064	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	A	6	GA	0.0064	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	A	7	GA	0.0008	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	A	8	GA	0.0008	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	B	0	GA	0.0132	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	B	1	GA	0.0081	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	B	2	GA	0.0081	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	B	3	GA	0.0022	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	B	4	GA	0.0022	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	D	0	GA	0.0371	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	33	D	1	GA	0.0228	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	33	D	2	GA	0.0228	0.0000	0.0001
GIIB	DEP	QF_FLEX	1	33	D	3	GA	0.0062	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	D	4	GA	0.0062	0.0000	0.0000

GIIB	DEP	QF_FLEX	1	33	F	0	GA	0.0046	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	F	1	GA	0.0011	0.0000	0.0000
GIIB	DEP	QF_FLEX	1	33	F	2	GA	0.0011	0.0000	0.0000
GIV	APP	STANDARD	1	15	A	0	GA	0.1680	0.0000	0.0010
GIV	APP	STANDARD	1	15	A	1	GA	0.1346	0.0000	0.0008
GIV	APP	STANDARD	1	15	A	2	GA	0.1346	0.0000	0.0008
GIV	APP	STANDARD	1	15	A	3	GA	0.0673	0.0000	0.0004
GIV	APP	STANDARD	1	15	A	4	GA	0.0673	0.0000	0.0004
GIV	APP	STANDARD	1	15	A	5	GA	0.0193	0.0000	0.0001
GIV	APP	STANDARD	1	15	A	6	GA	0.0193	0.0000	0.0001
GIV	APP	STANDARD	1	15	A	7	GA	0.0024	0.0000	0.0000
GIV	APP	STANDARD	1	15	A	8	GA	0.0024	0.0000	0.0000
GIV	APP	STANDARD	1	15	B	0	GA	0.1028	0.0000	0.0006
GIV	APP	STANDARD	1	15	B	1	GA	0.0633	0.0000	0.0004
GIV	APP	STANDARD	1	15	B	2	GA	0.0633	0.0000	0.0004
GIV	APP	STANDARD	1	15	B	3	GA	0.0171	0.0000	0.0001
GIV	APP	STANDARD	1	15	B	4	GA	0.0171	0.0000	0.0001
GIV	APP	STANDARD	1	33	A	0	GA	0.1029	0.0000	0.0006
GIV	APP	STANDARD	1	33	A	1	GA	0.0824	0.0000	0.0005
GIV	APP	STANDARD	1	33	A	2	GA	0.0824	0.0000	0.0005
GIV	APP	STANDARD	1	33	A	3	GA	0.0412	0.0000	0.0002
GIV	APP	STANDARD	1	33	A	4	GA	0.0412	0.0000	0.0002
GIV	APP	STANDARD	1	33	A	5	GA	0.0118	0.0000	0.0001
GIV	APP	STANDARD	1	33	A	6	GA	0.0118	0.0000	0.0001
GIV	APP	STANDARD	1	33	A	7	GA	0.0015	0.0000	0.0000
GIV	APP	STANDARD	1	33	A	8	GA	0.0015	0.0000	0.0000
GIV	DEP	STANDARD	1	15	A	0	GA	0.1200	0.0000	0.0007
GIV	DEP	STANDARD	1	15	A	1	GA	0.0961	0.0000	0.0006
GIV	DEP	STANDARD	1	15	A	2	GA	0.0961	0.0000	0.0006
GIV	DEP	STANDARD	1	15	A	3	GA	0.0481	0.0000	0.0003
GIV	DEP	STANDARD	1	15	A	4	GA	0.0481	0.0000	0.0003
GIV	DEP	STANDARD	1	15	A	5	GA	0.0138	0.0000	0.0001
GIV	DEP	STANDARD	1	15	A	6	GA	0.0138	0.0000	0.0001
GIV	DEP	STANDARD	1	15	A	7	GA	0.0017	0.0000	0.0000
GIV	DEP	STANDARD	1	15	A	8	GA	0.0017	0.0000	0.0000
GIV	DEP	STANDARD	1	15	B	0	GA	0.0686	0.0000	0.0004
GIV	DEP	STANDARD	1	15	B	1	GA	0.0515	0.0000	0.0003
GIV	DEP	STANDARD	1	15	B	2	GA	0.0515	0.0000	0.0003
GIV	DEP	STANDARD	1	15	B	3	GA	0.0206	0.0000	0.0001
GIV	DEP	STANDARD	1	15	B	4	GA	0.0206	0.0000	0.0001
GIV	DEP	STANDARD	1	15	B	5	GA	0.0034	0.0000	0.0000
GIV	DEP	STANDARD	1	15	B	6	GA	0.0034	0.0000	0.0000
GIV	DEP	STANDARD	1	15	D	0	GA	0.0857	0.0000	0.0005
GIV	DEP	STANDARD	1	15	D	1	GA	0.0527	0.0000	0.0003
GIV	DEP	STANDARD	1	15	D	2	GA	0.0527	0.0000	0.0003

GIV	DEP	STANDARD	1	15	D	3	GA	0.0143	0.0000	0.0001
GIV	DEP	STANDARD	1	15	D	4	GA	0.0143	0.0000	0.0001
GIV	DEP	STANDARD	1	33	A	0	GA	0.0617	0.0000	0.0004
GIV	DEP	STANDARD	1	33	A	1	GA	0.0494	0.0000	0.0003
GIV	DEP	STANDARD	1	33	A	2	GA	0.0494	0.0000	0.0003
GIV	DEP	STANDARD	1	33	A	3	GA	0.0247	0.0000	0.0001
GIV	DEP	STANDARD	1	33	A	4	GA	0.0247	0.0000	0.0001
GIV	DEP	STANDARD	1	33	A	5	GA	0.0071	0.0000	0.0000
GIV	DEP	STANDARD	1	33	A	6	GA	0.0071	0.0000	0.0000
GIV	DEP	STANDARD	1	33	A	7	GA	0.0009	0.0000	0.0000
GIV	DEP	STANDARD	1	33	A	8	GA	0.0009	0.0000	0.0000
GIV	DEP	STANDARD	1	33	B	0	GA	0.0147	0.0000	0.0001
GIV	DEP	STANDARD	1	33	B	1	GA	0.0090	0.0000	0.0000
GIV	DEP	STANDARD	1	33	B	2	GA	0.0090	0.0000	0.0000
GIV	DEP	STANDARD	1	33	B	3	GA	0.0025	0.0000	0.0000
GIV	DEP	STANDARD	1	33	B	4	GA	0.0025	0.0000	0.0000
GIV	DEP	STANDARD	1	33	D	0	GA	0.0411	0.0000	0.0002
GIV	DEP	STANDARD	1	33	D	1	GA	0.0253	0.0000	0.0001
GIV	DEP	STANDARD	1	33	D	2	GA	0.0253	0.0000	0.0001
GIV	DEP	STANDARD	1	33	D	3	GA	0.0069	0.0000	0.0000
GIV	DEP	STANDARD	1	33	D	4	GA	0.0069	0.0000	0.0000
GIV	DEP	STANDARD	1	33	F	0	GA	0.0051	0.0000	0.0000
GIV	DEP	STANDARD	1	33	F	1	GA	0.0012	0.0000	0.0000
GIV	DEP	STANDARD	1	33	F	2	GA	0.0012	0.0000	0.0000
GV	APP	STANDARD	1	15	A	0	GA	0.0891	0.0000	0.0001
GV	APP	STANDARD	1	15	A	1	GA	0.0714	0.0000	0.0001
GV	APP	STANDARD	1	15	A	2	GA	0.0714	0.0000	0.0001
GV	APP	STANDARD	1	15	A	3	GA	0.0357	0.0000	0.0001
GV	APP	STANDARD	1	15	A	4	GA	0.0357	0.0000	0.0001
GV	APP	STANDARD	1	15	A	5	GA	0.0102	0.0000	0.0000
GV	APP	STANDARD	1	15	A	6	GA	0.0102	0.0000	0.0000
GV	APP	STANDARD	1	15	A	7	GA	0.0013	0.0000	0.0000
GV	APP	STANDARD	1	15	A	8	GA	0.0013	0.0000	0.0000
GV	APP	STANDARD	1	15	B	0	GA	0.0545	0.0000	0.0001
GV	APP	STANDARD	1	15	B	1	GA	0.0336	0.0000	0.0000
GV	APP	STANDARD	1	15	B	2	GA	0.0336	0.0000	0.0000
GV	APP	STANDARD	1	15	B	3	GA	0.0091	0.0000	0.0000
GV	APP	STANDARD	1	15	B	4	GA	0.0091	0.0000	0.0000
GV	APP	STANDARD	1	33	A	0	GA	0.0546	0.0000	0.0001
GV	APP	STANDARD	1	33	A	1	GA	0.0437	0.0000	0.0001
GV	APP	STANDARD	1	33	A	2	GA	0.0437	0.0000	0.0001
GV	APP	STANDARD	1	33	A	3	GA	0.0218	0.0000	0.0000
GV	APP	STANDARD	1	33	A	4	GA	0.0218	0.0000	0.0000
GV	APP	STANDARD	1	33	A	5	GA	0.0063	0.0000	0.0000
GV	APP	STANDARD	1	33	A	6	GA	0.0063	0.0000	0.0000

GV	APP	STANDARD	1	33	A	7	GA	0.0008	0.0000	0.0000
GV	APP	STANDARD	1	33	A	8	GA	0.0008	0.0000	0.0000
GV	DEP	STANDARD	1	15	A	0	GA	0.0637	0.0000	0.0001
GV	DEP	STANDARD	1	15	A	1	GA	0.0510	0.0000	0.0001
GV	DEP	STANDARD	1	15	A	2	GA	0.0510	0.0000	0.0001
GV	DEP	STANDARD	1	15	A	3	GA	0.0255	0.0000	0.0000
GV	DEP	STANDARD	1	15	A	4	GA	0.0255	0.0000	0.0000
GV	DEP	STANDARD	1	15	A	5	GA	0.0073	0.0000	0.0000
GV	DEP	STANDARD	1	15	A	6	GA	0.0073	0.0000	0.0000
GV	DEP	STANDARD	1	15	A	7	GA	0.0009	0.0000	0.0000
GV	DEP	STANDARD	1	15	A	8	GA	0.0009	0.0000	0.0000
GV	DEP	STANDARD	1	15	B	0	GA	0.0364	0.0000	0.0001
GV	DEP	STANDARD	1	15	B	1	GA	0.0273	0.0000	0.0000
GV	DEP	STANDARD	1	15	B	2	GA	0.0273	0.0000	0.0000
GV	DEP	STANDARD	1	15	B	3	GA	0.0109	0.0000	0.0000
GV	DEP	STANDARD	1	15	B	4	GA	0.0109	0.0000	0.0000
GV	DEP	STANDARD	1	15	B	5	GA	0.0018	0.0000	0.0000
GV	DEP	STANDARD	1	15	B	6	GA	0.0018	0.0000	0.0000
GV	DEP	STANDARD	1	15	D	0	GA	0.0454	0.0000	0.0001
GV	DEP	STANDARD	1	15	D	1	GA	0.0280	0.0000	0.0000
GV	DEP	STANDARD	1	15	D	2	GA	0.0280	0.0000	0.0000
GV	DEP	STANDARD	1	15	D	3	GA	0.0076	0.0000	0.0000
GV	DEP	STANDARD	1	15	D	4	GA	0.0076	0.0000	0.0000
GV	DEP	STANDARD	1	33	A	0	GA	0.0327	0.0000	0.0001
GV	DEP	STANDARD	1	33	A	1	GA	0.0262	0.0000	0.0000
GV	DEP	STANDARD	1	33	A	2	GA	0.0262	0.0000	0.0000
GV	DEP	STANDARD	1	33	A	3	GA	0.0131	0.0000	0.0000
GV	DEP	STANDARD	1	33	A	4	GA	0.0131	0.0000	0.0000
GV	DEP	STANDARD	1	33	A	5	GA	0.0037	0.0000	0.0000
GV	DEP	STANDARD	1	33	A	6	GA	0.0037	0.0000	0.0000
GV	DEP	STANDARD	1	33	A	7	GA	0.0005	0.0000	0.0000
GV	DEP	STANDARD	1	33	A	8	GA	0.0005	0.0000	0.0000
GV	DEP	STANDARD	1	33	B	0	GA	0.0078	0.0000	0.0000
GV	DEP	STANDARD	1	33	B	1	GA	0.0048	0.0000	0.0000
GV	DEP	STANDARD	1	33	B	2	GA	0.0048	0.0000	0.0000
GV	DEP	STANDARD	1	33	B	3	GA	0.0013	0.0000	0.0000
GV	DEP	STANDARD	1	33	B	4	GA	0.0013	0.0000	0.0000
GV	DEP	STANDARD	1	33	D	0	GA	0.0218	0.0000	0.0000
GV	DEP	STANDARD	1	33	D	1	GA	0.0134	0.0000	0.0000
GV	DEP	STANDARD	1	33	D	2	GA	0.0134	0.0000	0.0000
GV	DEP	STANDARD	1	33	D	3	GA	0.0036	0.0000	0.0000
GV	DEP	STANDARD	1	33	D	4	GA	0.0036	0.0000	0.0000
GV	DEP	STANDARD	1	33	F	0	GA	0.0027	0.0000	0.0000
GV	DEP	STANDARD	1	33	F	1	GA	0.0006	0.0000	0.0000
GV	DEP	STANDARD	1	33	F	2	GA	0.0006	0.0000	0.0000

H500D	APP	USER	1	H3	A	0	HEL	0.3055	0.0000	0.0000
H500D	APP	USER	1	H3	B	0	HEL	0.3055	0.0000	0.0000
H500D	APP	USER	1	H4	A	0	HEL	0.3055	0.0000	0.0000
H500D	APP	USER	1	H4	B	0	HEL	0.3055	0.0000	0.0000
H500D	DEP	USER	1	H3	A	0	HEL	0.3055	0.0000	0.0000
H500D	DEP	USER	1	H3	B	0	HEL	0.3055	0.0000	0.0000
H500D	DEP	USER	1	H4	A	0	HEL	0.3055	0.0000	0.0000
H500D	DEP	USER	1	H4	B	0	HEL	0.3055	0.0000	0.0000
H500D	TGO	USER	1	H1	A	0	HEL	1.3322	0.0000	0.0000
H500D	TGO	USER	1	H2	A	0	HEL	0.5709	0.0000	0.0000
LEAR25	APP	STANDARD	1	15	A	0	GA	0.7893	0.0000	0.0408
LEAR25	APP	STANDARD	1	15	A	1	GA	0.6321	0.0000	0.0327
LEAR25	APP	STANDARD	1	15	A	2	GA	0.6321	0.0000	0.0327
LEAR25	APP	STANDARD	1	15	A	3	GA	0.3161	0.0000	0.0163
LEAR25	APP	STANDARD	1	15	A	4	GA	0.3161	0.0000	0.0163
LEAR25	APP	STANDARD	1	15	A	5	GA	0.0904	0.0000	0.0047
LEAR25	APP	STANDARD	1	15	A	6	GA	0.0904	0.0000	0.0047
LEAR25	APP	STANDARD	1	15	A	7	GA	0.0113	0.0000	0.0006
LEAR25	APP	STANDARD	1	15	A	8	GA	0.0113	0.0000	0.0006
LEAR25	APP	STANDARD	1	15	B	0	GA	0.4829	0.0000	0.0250
LEAR25	APP	STANDARD	1	15	B	1	GA	0.2972	0.0000	0.0154
LEAR25	APP	STANDARD	1	15	B	2	GA	0.2972	0.0000	0.0154
LEAR25	APP	STANDARD	1	15	B	3	GA	0.0805	0.0000	0.0042
LEAR25	APP	STANDARD	1	15	B	4	GA	0.0805	0.0000	0.0042
LEAR25	APP	STANDARD	1	33	A	0	GA	0.4832	0.0000	0.0250
LEAR25	APP	STANDARD	1	33	A	1	GA	0.3870	0.0000	0.0200
LEAR25	APP	STANDARD	1	33	A	2	GA	0.3870	0.0000	0.0200
LEAR25	APP	STANDARD	1	33	A	3	GA	0.1935	0.0000	0.0100
LEAR25	APP	STANDARD	1	33	A	4	GA	0.1935	0.0000	0.0100
LEAR25	APP	STANDARD	1	33	A	5	GA	0.0554	0.0000	0.0029
LEAR25	APP	STANDARD	1	33	A	6	GA	0.0554	0.0000	0.0029
LEAR25	APP	STANDARD	1	33	A	7	GA	0.0069	0.0000	0.0004
LEAR25	APP	STANDARD	1	33	A	8	GA	0.0069	0.0000	0.0004
LEAR25	DEP	STANDARD	1	15	A	0	GA	0.5638	0.0000	0.0292
LEAR25	DEP	STANDARD	1	15	A	1	GA	0.4515	0.0000	0.0233
LEAR25	DEP	STANDARD	1	15	A	2	GA	0.4515	0.0000	0.0233
LEAR25	DEP	STANDARD	1	15	A	3	GA	0.2258	0.0000	0.0117
LEAR25	DEP	STANDARD	1	15	A	4	GA	0.2258	0.0000	0.0117
LEAR25	DEP	STANDARD	1	15	A	5	GA	0.0646	0.0000	0.0033
LEAR25	DEP	STANDARD	1	15	A	6	GA	0.0646	0.0000	0.0033
LEAR25	DEP	STANDARD	1	15	A	7	GA	0.0080	0.0000	0.0004
LEAR25	DEP	STANDARD	1	15	A	8	GA	0.0080	0.0000	0.0004
LEAR25	DEP	STANDARD	1	15	B	0	GA	0.3223	0.0000	0.0167
LEAR25	DEP	STANDARD	1	15	B	1	GA	0.2419	0.0000	0.0125
LEAR25	DEP	STANDARD	1	15	B	2	GA	0.2419	0.0000	0.0125

LEAR25	DEP	STANDARD	1	15	B	3	GA	0.0968	0.0000	0.0050
LEAR25	DEP	STANDARD	1	15	B	4	GA	0.0968	0.0000	0.0050
LEAR25	DEP	STANDARD	1	15	B	5	GA	0.0161	0.0000	0.0008
LEAR25	DEP	STANDARD	1	15	B	6	GA	0.0161	0.0000	0.0008
LEAR25	DEP	STANDARD	1	15	D	0	GA	0.4024	0.0000	0.0208
LEAR25	DEP	STANDARD	1	15	D	1	GA	0.2476	0.0000	0.0128
LEAR25	DEP	STANDARD	1	15	D	2	GA	0.2476	0.0000	0.0128
LEAR25	DEP	STANDARD	1	15	D	3	GA	0.0671	0.0000	0.0035
LEAR25	DEP	STANDARD	1	15	D	4	GA	0.0671	0.0000	0.0035
LEAR25	DEP	STANDARD	1	33	A	0	GA	0.2899	0.0000	0.0150
LEAR25	DEP	STANDARD	1	33	A	1	GA	0.2322	0.0000	0.0120
LEAR25	DEP	STANDARD	1	33	A	2	GA	0.2322	0.0000	0.0120
LEAR25	DEP	STANDARD	1	33	A	3	GA	0.1161	0.0000	0.0060
LEAR25	DEP	STANDARD	1	33	A	4	GA	0.1161	0.0000	0.0060
LEAR25	DEP	STANDARD	1	33	A	5	GA	0.0332	0.0000	0.0017
LEAR25	DEP	STANDARD	1	33	A	6	GA	0.0332	0.0000	0.0017
LEAR25	DEP	STANDARD	1	33	A	7	GA	0.0041	0.0000	0.0002
LEAR25	DEP	STANDARD	1	33	A	8	GA	0.0041	0.0000	0.0002
LEAR25	DEP	STANDARD	1	33	B	0	GA	0.0690	0.0000	0.0035
LEAR25	DEP	STANDARD	1	33	B	1	GA	0.0425	0.0000	0.0022
LEAR25	DEP	STANDARD	1	33	B	2	GA	0.0425	0.0000	0.0022
LEAR25	DEP	STANDARD	1	33	B	3	GA	0.0115	0.0000	0.0006
LEAR25	DEP	STANDARD	1	33	B	4	GA	0.0115	0.0000	0.0006
LEAR25	DEP	STANDARD	1	33	D	0	GA	0.1932	0.0000	0.0100
LEAR25	DEP	STANDARD	1	33	D	1	GA	0.1189	0.0000	0.0061
LEAR25	DEP	STANDARD	1	33	D	2	GA	0.1189	0.0000	0.0061
LEAR25	DEP	STANDARD	1	33	D	3	GA	0.0322	0.0000	0.0017
LEAR25	DEP	STANDARD	1	33	D	4	GA	0.0322	0.0000	0.0017
LEAR25	DEP	STANDARD	1	33	F	0	GA	0.0242	0.0000	0.0012
LEAR25	DEP	STANDARD	1	33	F	1	GA	0.0056	0.0000	0.0003
LEAR25	DEP	STANDARD	1	33	F	2	GA	0.0056	0.0000	0.0003
LEAR35	APP	STANDARD	1	15	A	0	GA	1.6060	0.0000	0.0478
LEAR35	APP	STANDARD	1	15	A	1	GA	1.2862	0.0000	0.0383
LEAR35	APP	STANDARD	1	15	A	2	GA	1.2862	0.0000	0.0383
LEAR35	APP	STANDARD	1	15	A	3	GA	0.6431	0.0000	0.0192
LEAR35	APP	STANDARD	1	15	A	4	GA	0.6431	0.0000	0.0192
LEAR35	APP	STANDARD	1	15	A	5	GA	0.1840	0.0000	0.0055
LEAR35	APP	STANDARD	1	15	A	6	GA	0.1840	0.0000	0.0055
LEAR35	APP	STANDARD	1	15	A	7	GA	0.0229	0.0000	0.0007
LEAR35	APP	STANDARD	1	15	A	8	GA	0.0229	0.0000	0.0007
LEAR35	APP	STANDARD	1	15	B	0	GA	0.9825	0.0000	0.0293
LEAR35	APP	STANDARD	1	15	B	1	GA	0.6046	0.0000	0.0180
LEAR35	APP	STANDARD	1	15	B	2	GA	0.6046	0.0000	0.0180
LEAR35	APP	STANDARD	1	15	B	3	GA	0.1638	0.0000	0.0049
LEAR35	APP	STANDARD	1	15	B	4	GA	0.1638	0.0000	0.0049

LEAR35	APP	STANDARD	1	33	A	0	GA	0.9832	0.0000	0.0293
LEAR35	APP	STANDARD	1	33	A	1	GA	0.7875	0.0000	0.0235
LEAR35	APP	STANDARD	1	33	A	2	GA	0.7875	0.0000	0.0235
LEAR35	APP	STANDARD	1	33	A	3	GA	0.3937	0.0000	0.0117
LEAR35	APP	STANDARD	1	33	A	4	GA	0.3937	0.0000	0.0117
LEAR35	APP	STANDARD	1	33	A	5	GA	0.1126	0.0000	0.0034
LEAR35	APP	STANDARD	1	33	A	6	GA	0.1126	0.0000	0.0034
LEAR35	APP	STANDARD	1	33	A	7	GA	0.0140	0.0000	0.0004
LEAR35	APP	STANDARD	1	33	A	8	GA	0.0140	0.0000	0.0004
LEAR35	DEP	STANDARD	1	15	A	0	GA	1.1471	0.0000	0.0342
LEAR35	DEP	STANDARD	1	15	A	1	GA	0.9187	0.0000	0.0274
LEAR35	DEP	STANDARD	1	15	A	2	GA	0.9187	0.0000	0.0274
LEAR35	DEP	STANDARD	1	15	A	3	GA	0.4593	0.0000	0.0137
LEAR35	DEP	STANDARD	1	15	A	4	GA	0.4593	0.0000	0.0137
LEAR35	DEP	STANDARD	1	15	A	5	GA	0.1314	0.0000	0.0039
LEAR35	DEP	STANDARD	1	15	A	6	GA	0.1314	0.0000	0.0039
LEAR35	DEP	STANDARD	1	15	A	7	GA	0.0164	0.0000	0.0005
LEAR35	DEP	STANDARD	1	15	A	8	GA	0.0164	0.0000	0.0005
LEAR35	DEP	STANDARD	1	15	B	0	GA	0.6559	0.0000	0.0195
LEAR35	DEP	STANDARD	1	15	B	1	GA	0.4921	0.0000	0.0147
LEAR35	DEP	STANDARD	1	15	B	2	GA	0.4921	0.0000	0.0147
LEAR35	DEP	STANDARD	1	15	B	3	GA	0.1969	0.0000	0.0059
LEAR35	DEP	STANDARD	1	15	B	4	GA	0.1969	0.0000	0.0059
LEAR35	DEP	STANDARD	1	15	B	5	GA	0.0328	0.0000	0.0010
LEAR35	DEP	STANDARD	1	15	B	6	GA	0.0328	0.0000	0.0010
LEAR35	DEP	STANDARD	1	15	D	0	GA	0.8188	0.0000	0.0244
LEAR35	DEP	STANDARD	1	15	D	1	GA	0.5039	0.0000	0.0150
LEAR35	DEP	STANDARD	1	15	D	2	GA	0.5039	0.0000	0.0150
LEAR35	DEP	STANDARD	1	15	D	3	GA	0.1365	0.0000	0.0041
LEAR35	DEP	STANDARD	1	15	D	4	GA	0.1365	0.0000	0.0041
LEAR35	DEP	STANDARD	1	33	A	0	GA	0.5899	0.0000	0.0176
LEAR35	DEP	STANDARD	1	33	A	1	GA	0.4725	0.0000	0.0141
LEAR35	DEP	STANDARD	1	33	A	2	GA	0.4725	0.0000	0.0141
LEAR35	DEP	STANDARD	1	33	A	3	GA	0.2362	0.0000	0.0070
LEAR35	DEP	STANDARD	1	33	A	4	GA	0.2362	0.0000	0.0070
LEAR35	DEP	STANDARD	1	33	A	5	GA	0.0676	0.0000	0.0020
LEAR35	DEP	STANDARD	1	33	A	6	GA	0.0676	0.0000	0.0020
LEAR35	DEP	STANDARD	1	33	A	7	GA	0.0084	0.0000	0.0003
LEAR35	DEP	STANDARD	1	33	A	8	GA	0.0084	0.0000	0.0003
LEAR35	DEP	STANDARD	1	33	B	0	GA	0.1404	0.0000	0.0042
LEAR35	DEP	STANDARD	1	33	B	1	GA	0.0864	0.0000	0.0026
LEAR35	DEP	STANDARD	1	33	B	2	GA	0.0864	0.0000	0.0026
LEAR35	DEP	STANDARD	1	33	B	3	GA	0.0234	0.0000	0.0007
LEAR35	DEP	STANDARD	1	33	B	4	GA	0.0234	0.0000	0.0007
LEAR35	DEP	STANDARD	1	33	D	0	GA	0.3930	0.0000	0.0117

LEAR35	DEP	STANDARD	1	33	D	1	GA	0.2418	0.0000	0.0072
LEAR35	DEP	STANDARD	1	33	D	2	GA	0.2418	0.0000	0.0072
LEAR35	DEP	STANDARD	1	33	D	3	GA	0.0655	0.0000	0.0019
LEAR35	DEP	STANDARD	1	33	D	4	GA	0.0655	0.0000	0.0019
LEAR35	DEP	STANDARD	1	33	F	0	GA	0.0491	0.0000	0.0014
LEAR35	DEP	STANDARD	1	33	F	1	GA	0.0114	0.0000	0.0003
LEAR35	DEP	STANDARD	1	33	F	2	GA	0.0114	0.0000	0.0003

CASE RUNUP OPERATIONS

Acft	RunupId	X(nmi)	Y(nmi)	Head	Thrust	Dur(sec)	Day	Evening	Night

CASE GRID DEFINITIONS

Name	Type	X(nmi)	Y(nmi)	Ang(deg)	DisI(nmi)	DisJ(nmi)	NI	NJ	Thrsh	dAmb	(hr)
01	Standard	0.2465	-0.6192	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
02	Standard	-0.2743	0.7532	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
03	Standard	-0.3151	-1.1322	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
04	Standard	-0.0704	0.9288	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
05	Standard	1.2300	-1.3119	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
06	Standard	-0.6158	0.9686	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
CONTOUR	Contour	-8.0000	-8.0000	0.0	16.0000	16.0000	2	2	85.0	0.0	0.00

CASE RUN OPTIONS

Run Type : Single-Metric
NoiseMetric : DNL
Do Terrain : Yes
Do Contour : Yes
Refinement : 11
Tolerance : 0.50
Low Cutoff : 55.0
High Cutoff : 75.0
Ground Type : All-Soft-Ground
Do Population : No
Do Locations : No
Do Standard : Yes
Do Detailed : No
Compute System Metrics:
DNL : No
CNEL : No
LAEQ : No
LAEQD : No
LAEQN : No
SEL : Yes
LAMAX : Yes
TALA : No
NEF : No

WECPNL : No
EPNL : No
PNLTM : No
TAPNL : No
CEXP : No
LCMAX : No
TALC : No

TECHNICAL INFORMATION PAPER

GLOSSARY OF NOISE COMPATIBILITY TERMS

TECHNICAL INFORMATION PAPER

GLOSSARY OF NOISE COMPATIBILITY TERMS

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

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

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

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

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

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

CNEL - The 24-hour average sound level, in A-weighted decibels, obtained after the addition of 4.77 decibels to sound levels between 7 p.m. and 10 p.m. and 10 decibels to sound levels between 10 p.m. and 7 a.m., as averaged over a span of one year. In California, it is the required metric for determining the cumulative exposure of individuals to aircraft noise. Also see "Leq" and "DNL".

COMMUNITY NOISE EQUIVALENT LEVEL - See CNEL.

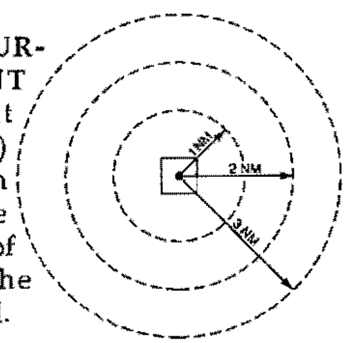
CROSSWIND LEG - A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

DAY-NIGHT AVERAGE SOUND LEVEL - See DNL.

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

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

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



DNL - The 24-hour average sound level, in A-weighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise. Also see "Leq."

DOWNWIND LEG - A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

DURATION - Length of time, in seconds, a noise event such as an aircraft flyover is experienced. (May refer to the length of time a noise event exceeds a specified dB threshold level.)

EASEMENT - The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

EQUIVALENT SOUND LEVEL - See Leq.

FINAL APPROACH - A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FIXED BASE OPERATOR (FBO) - A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair and maintenance.

GLIDE SLOPE (GS) - Provides vertical guidance for aircraft during approach and landing. The glide slope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS, or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM - See "GPS."

GPS - GLOBAL POSITIONING SYSTEM - A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude. The accuracy of the system can be further refined by using a ground receiver at a known location to calculate the error in the satellite range data. This is known as Differential GPS (DGPS).

GROUND EFFECT - The attenuation attributed to absorption or reflection of noise by man-made or natural features on the ground surface.

HOURLY NOISE LEVEL (HNL) - A noise summation metric which considers primarily those single events which exceed a specified threshold or duration during one hour.

INSTRUMENT APPROACH - A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR) -Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

INSTRUMENT LANDING SYSTEM (ILS) - A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

Ldn - (See DNL). Ldn used in place of DNL in mathematical equations only.

Leq - Equivalent Sound Level. The steady A-weighted sound level over any specified period (not necessarily 24 hours) that has the same acoustic energy as the fluctuating noise during that period (with no consideration of a night-time weighting.) It is a measure of cumulative acoustical energy. Because the time interval may vary, it should be specified by a subscript (such as Leq 8) for an 8-hour exposure to workplace noise) or be clearly understood.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

RUNWAY USE PROGRAM (FORMAL) - An approved noise abatement program which is defined and acknowledged in a Letter of Understanding between FAA - Flight Standards, FAA - Air Traffic Service, the airport proprietor, and the users. Once established, participation in the program is mandatory for aircraft operators and pilots as provided for in F.A.R. Section 91.87.

RUNWAY USE PROGRAM (INFORMAL) - An approved noise abatement program which does not require a Letter of Understanding and participation in the program is voluntary for aircraft operators/pilots.

SEL - Sound Exposure Level. SEL expressed in dB, is a measure of the effect of duration and magnitude for a single-event measured in A-weighted sound level above a specified threshold which is at least 10 dB below the maximum value. In typical aircraft noise model calculations, SEL is used in computing aircraft acoustical contribution to the Equivalent Sound Level (Leq), the Day-Night Sound Level (DNL), and the Community Noise Equivalent Level (CNEL).

SINGLE EVENT - An occurrence of audible noise usually above a specified minimum noise level caused by an intrusive source such as an aircraft overflight, passing train, or ship's horn.

SLANT-RANGE DISTANCE - The straight line distance between an aircraft and a point on the ground.

SOUND EXPOSURE LEVEL - See SEL.

TACTICAL AIR NAVIGATION (TACAN) - An ultra-high frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

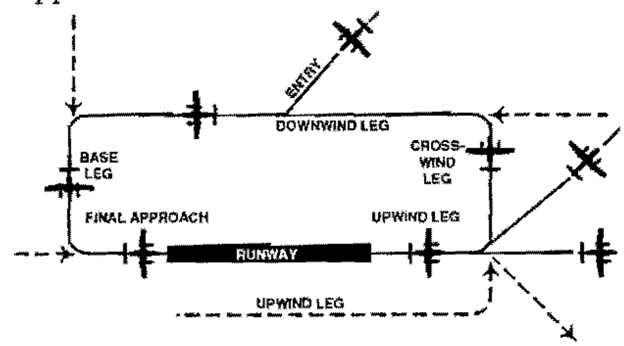
TERMINAL RADAR SERVICE AREA (TRSA) - Airspace surrounding designated airports wherein ATC provides radar vectoring, sequencing, and separation on a full-time basis for all IFR and participating VFR aircraft. Service provided in a TRSA is called Stage III Service.

THRESHOLD - Decibel level below which single event information is not printed out on the noise monitoring equipment tapes. The noise levels below the threshold are, however, considered in the accumulation of hourly and daily noise levels.

TIME ABOVE (TA) - The 24-hour TA noise metric provides the duration in minutes for which aircraft-related noise exceeds specified A-weighted sound levels. It is expressed in minutes per 24-hour period.

TOUCHDOWN ZONE LIGHTING (TDZ) - Two rows of transverse light bars located symmetrically about the runway centerline normally at 100 foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN - The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.

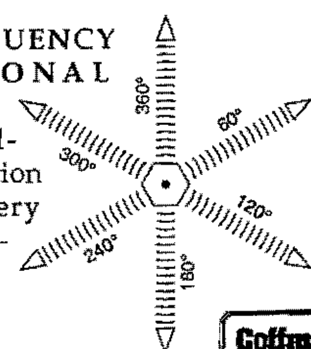


UNICOM - A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG - A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

VECTOR - A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION (VOR) - A ground-based electric navigation aid transmitting very high frequency navigation signals, 360



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

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

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

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

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

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

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

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

YEARLY DAY-NIGHT AVERAGE SOUND LEVEL - See DNL.

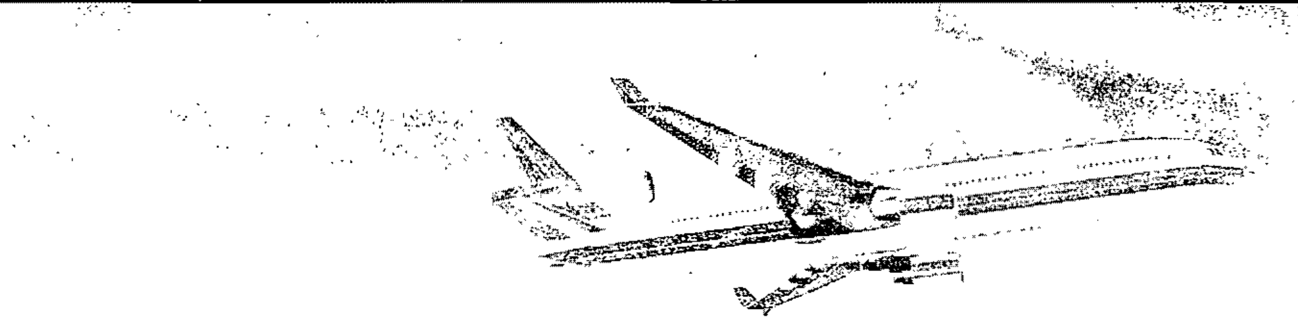
Coffman Associates
Airport Consultants

Coffman Associates
Airport Consultants

TECHNICAL INFORMATION PAPER

THE MEASUREMENT AND ANALYSIS OF SOUND

TECHNICAL INFORMATION PAPER



THE MEASUREMENT AND ANALYSIS OF SOUND

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

NOISE - UNWANTED SOUND

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

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

MEASUREMENT OF SOUND

A person's ability to hear a sound depends on its character as compared with all other sounds in the environment. Three characteristics of sound to which people respond are subject to objective measurement: magnitude or loudness; the frequency spectrum; and the time variation of the sound.

LOUDNESS

The unit used to measure the magnitude of sound is the decibel. Decibels are used to measure loudness in the same way that "inches" and "degrees" are used to measure length and temperature. Unlike the linear length and temperature scales, the decibel scale is logarithmic. By definition, a sound which has ten times the mean square sound pressure of the reference sound is 10 decibels (dB) greater than the reference sound. A sound which has 100 times (10 x 10 or 10^2) the mean square sound pressure of the reference sound is 20 dB greater (10 x 2).

The logarithmic scale is convenient because the mean square sound pressures of normal interest extend over a range of 11 trillion to one. This huge number (a 1 followed by 14 zeros or 10^{14}) is much more conveniently represented on the logarithmic scale as 140 dB (10 x 14).

The use of the logarithmic decibel scale requires different arithmetic than we use with linear scales. For example, if two equally loud but independent noise sources operate simultaneously, the measured mean square sound pressure from both sources will be twice as great as either source operating alone. When expressed on the decibel scale, however, the sound pressure level from the combined sources is only 3 dB higher than the level produced by either source alone. Furthermore, if we have two sounds of different magnitude from independent sources, then the level of the sum will never be more than 3 dB above the level produced by the greater source alone.

The equation below describes the mathematics of sound level summation:

$$S_t=10\ log \sum_i 10^{SI/10}$$

where S_t is the total sound level, in decibels, and S_i is the sound level of the individual sources.

A simpler process of summation is also available and often used where a level of accuracy of less than one decibel is not required. **Table 1** lists additive factors

TABLE 1
Additive Factors forSummation of Two Sound Levels

Difference in Sound Level (dB)	Add to Larger Level (dB)
0	3.0
1	2.5
2	2.1
3	1.8
4	1.5
5	1.2
6	1.0
7	0.8
8	0.6
9	0.5
10	0.4
12	0.3
14	0.2
16	0.1
Greater than 16	0

Source: HUD 1985, p.51.

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

Example of Sound Level Summation

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

59 dB + 60 dB + 66.5 dB = 68 dB

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

Example Of Sound
Level Averaging

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

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

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

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

Exhibit A presents examples of various noise sources at different noise levels, comparing the decibel scale with the relative sound energy and the human perception of loudness. In the exhibit, 60 dB is taken as the reference or "normal" sound level. A sound of 70 dB, involving ten times the sound energy, is perceived as twice as loud. A sound of 80 dB contains 100 times the sound energy and is perceived as four times as loud as 60 dB. Similarly, a sound of 50 dB contains ten times less sound energy than 60 dB and is perceived as half as loud.

FREQUENCY WEIGHTING

Two sounds with the same sound pressure level may "sound" quite different (e.g. a rumble versus a hiss) because of differing distributions of sound energy in the audible frequency range. The distribution of sound energy as a function of frequency is known as the "frequency spectrum". The spectrum is important to the measurement of sound because the human ear is more sensitive to sounds at some frequencies than others. People hear best in the frequency range of 1,000 to 5,000 cycles per second (Hertz) than at very much lower or higher frequencies. If the magnitude of a sound is to be measured so that it is proportional to its perception by a human, it is necessary to weight more heavily that part of the sound energy spectrum humans hear most easily.

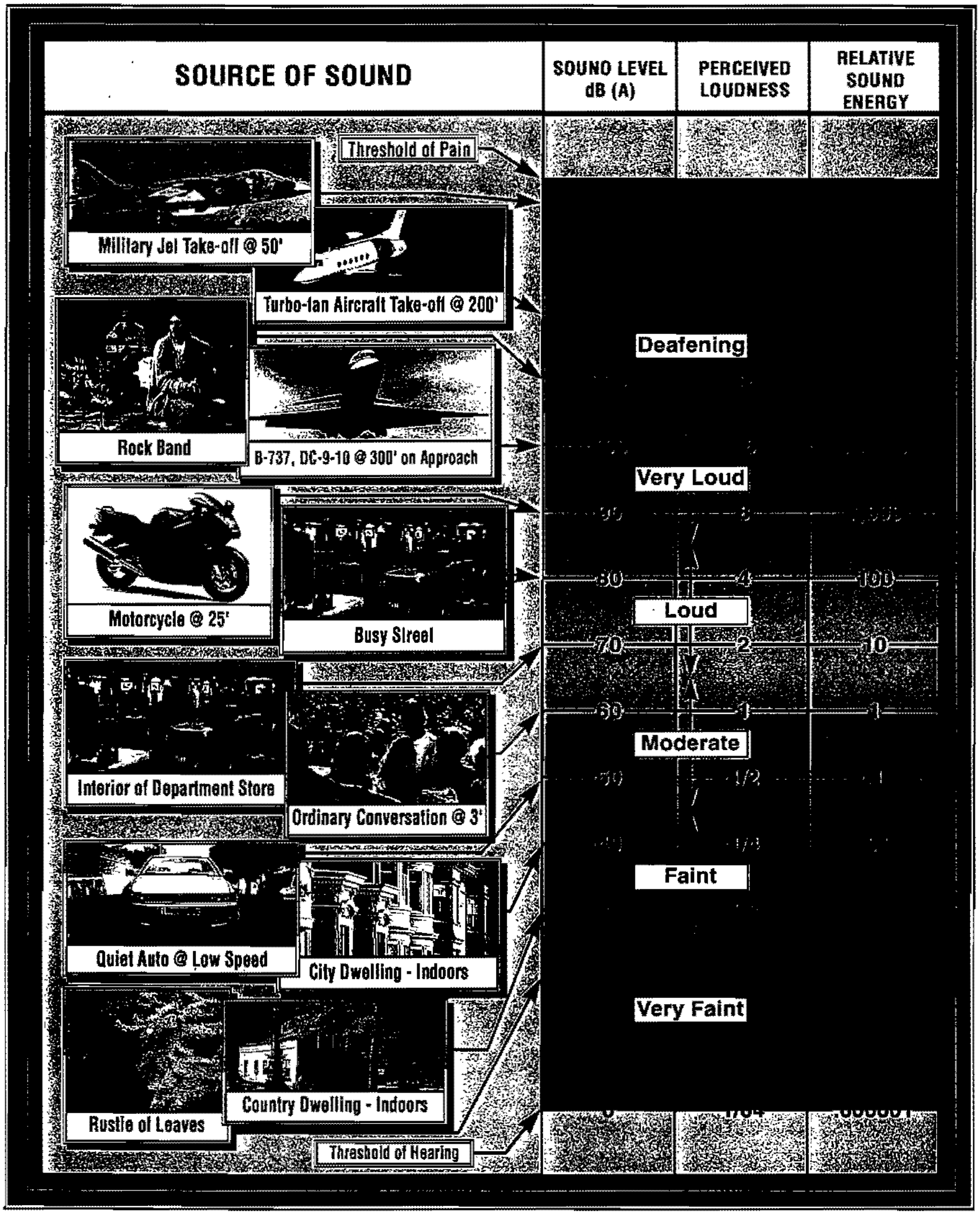
Over the years, many different sound measurement scales have been developed, including the A-weighted scale (and also the B, C, D, and E-weighted scales). A-weighting, developed in the 1930s, is the most commonly used scale for approximating the frequency spectrum to which humans are sensitive. Because of its universality, it was adopted by the U.S. Environmental Protection Agency and other government agencies for the description of sound in the environment.

The zero value on the A-weighted scale is the reference pressure of 20 micronewtons per square meter (or micro-pascals). This value approximates the smallest sound pressure that can be detected by a human. The average sound level of a whisper at a distance of 1 meter is 40 dB; the sound level of a normal voice at 1 meter is 57 dB; a shout at 1 meter is 85 dB; and the threshold of pain is 130 dB.

TIME VARIATION OF SOUND LEVEL

Generally, the magnitude of sound in the environment varies randomly over time. Of course, there are many exceptions. For example, the sound of a waterfall is steady with time, as is the sound of a room air conditioner or the sound inside a car or airplane cruising at a constant speed. But, in most places, the loudness of outdoor sound is constantly changing because it is influenced by sounds from many sources.

While the continuous variation of sound levels can be measured, recorded, and presented, comparisons of sounds at different times or at different places is very difficult without some way of reducing the time variation. One way of doing this



Source: Coffman Associates 1990

Coffman Associates Airport Consultants

Sound Exhibit A
TYPICAL SOUND LEVELS

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

KEY DESCRIPTORS OF SOUND

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

Sound Level

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

Sound Exposure Level

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

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

Equivalent Sound Level

The equivalent sound level (Leq) is simply the logarithm of the average value of the sound exposure during a stated time period. It is typically used for durations of one hour, eight hours, or 24 hours. In airport noise compatibility studies, use of the Leq term applies to 24-hour periods unless otherwise noted. It is often used to describe sounds with respect to their potential for interfering with human activity.

Day-Night Sound Level

A special form of Leq is the day-night sound level, abbreviated as DNL in discussions and Ldn in equations. DNL is calculated by summing the sound exposure during daytime hours (0700 - 2200) plus 10 times the sound exposure occurring during nighttime hours (2200 - 0700) and averaging this sum by the number of seconds during a 24-hour day. The multiplication factor of 10 applied to nighttime sound is often referred to as a 10 decibel penalty. It is intended to account for the increased annoyance attributable to noise during the night when ambient levels are lower and people are trying to sleep.

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

Where the basic element of sound measurement is Leq, DNL is calculated from:

$$Ldn = 10Log\frac{1}{24}\left(\sum_{d=1}^{15}10^{(Leq(d))/10}+\sum_{n=1}^{9}10^{(Leq(n)+10)/10}\right)$$

where DNL is represented mathematically as Ldn, and Leq(d) and Leq(n) are the daytime and nighttime hour values combined. This expression is convenient where Leq values for only a few hours are available and the values for the remainder of the day can be predicted from a knowledge of day/night variation in levels. The hourly Leq values are summed for the 15 hours from 0700 to 2200 and added to the sum of hourly Leq figures for the 9 nighttime hours with a 10 dB penalty added to the nighttime Leqs.

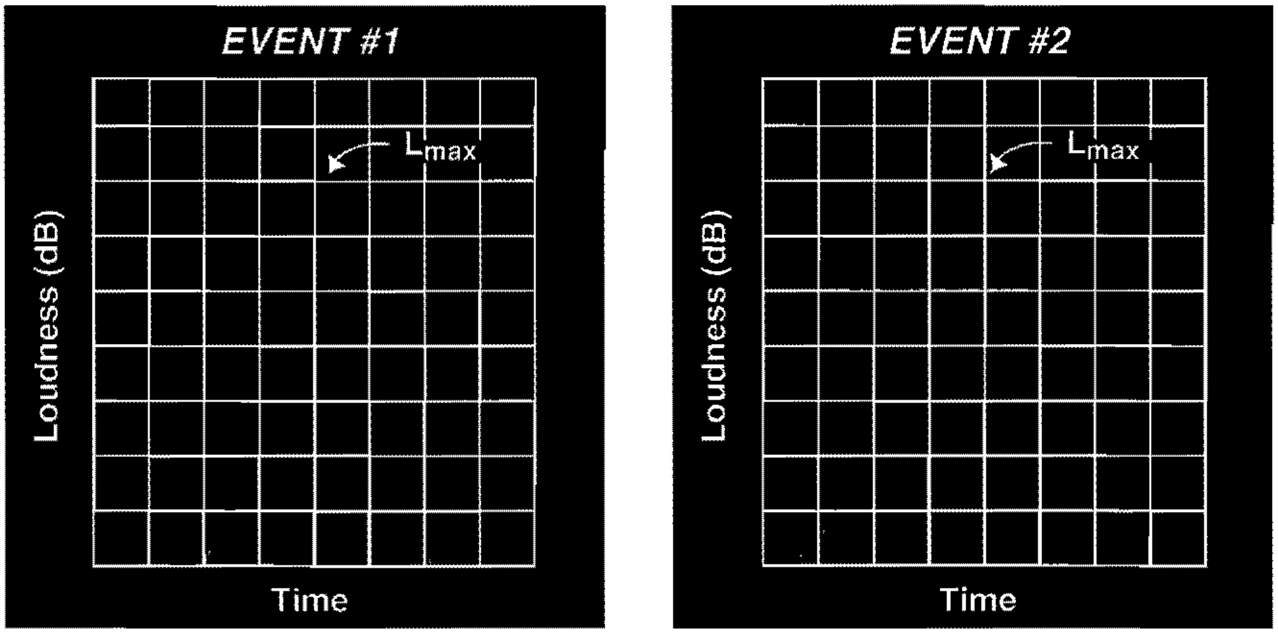
Another way of computing DNL is described in this equation:

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

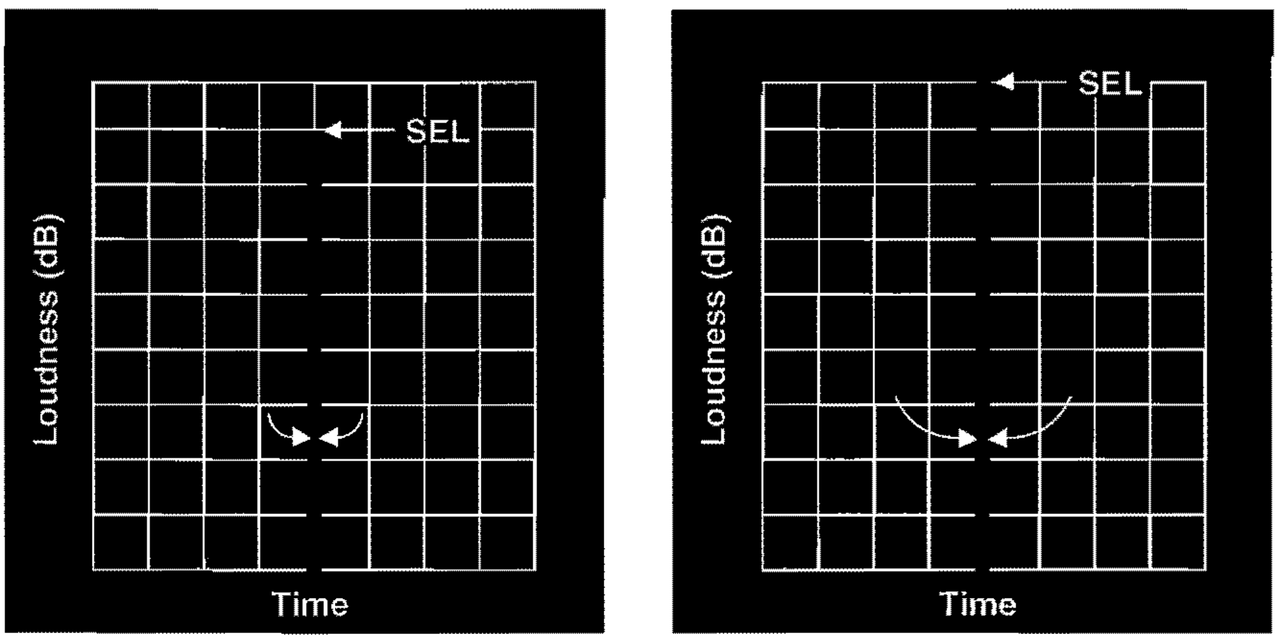
where LA is the time-varying, A-weighted sound level, measured with equipment meeting the requirements for sound level meters (as specified in a standard such as ANSI SI.4-1971), and dt

Coffman Associates Airport Consultants

SOUND-B-9/11/98

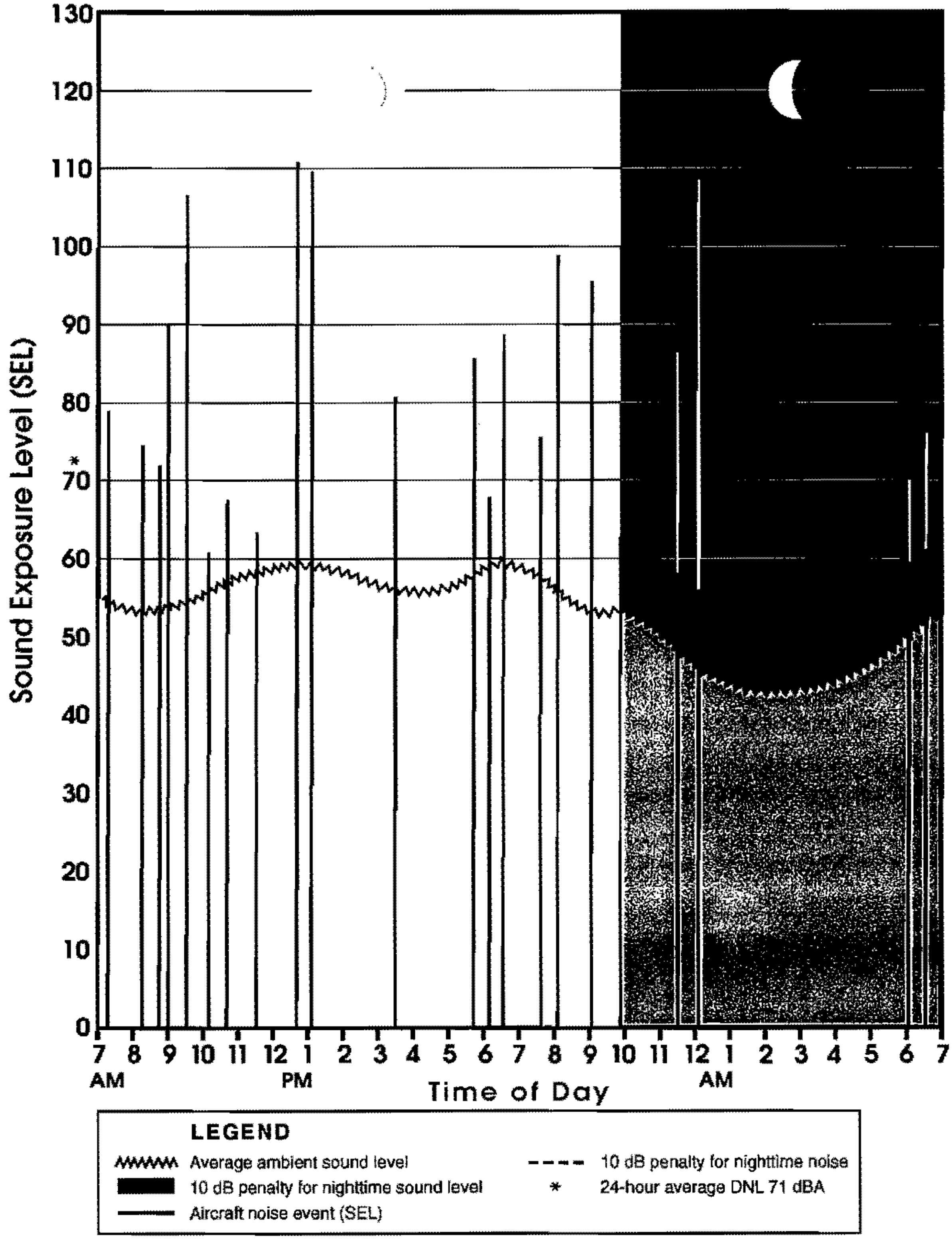


Two sound events with the same maximum sound level (L_{max}).



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

Coffman Associates
Airport Consultants



Source: Coffman Associates 1990

Coffman Associates Airport Consultants

Sound Exhibit C
TYPICAL NOISE PATTERN AND DNL SUMMATION

is the duration of time in seconds. The averaging constant of 86,400 is the number of seconds in a day. The integrals are taken over the daytime (0700 - 2200) and the nighttime (2200 - 0700) periods, respectively. If the sound level is sampled at a rate of once per second rather than measured continuously, the equation still applies if the samples replace LA and the integrals are changed to summations.

Use of the DNL metric to describe aircraft noise is required for all airport noise studies developed under the regulations of F.A.R. Part 150. In addition, DNL is preferred by all federal agencies as the appropriate single measure of cumulative sound exposure. These agencies include the FAA, the Federal Highway Administration, Environmental Protection Agency, Department of Defense, and Department of Housing and Urban Development.

One might think of the DNL metric as a summary description of the "noise climate" of an area. DNL accumulates the noise energy from passing aircraft in the same way that a precipitation gauge accumulates rain from passing storms. This analogy is presented in **Exhibit D.** Rain usually starts as a light sprinkle, building in intensity as the squall line passes over, then diminishing as the squall moves on. At the end of a 24-hour period, a rain gauge indicates the total rainfall received for that day, although the rain fell only during brief, sometimes intense, showers. Over a year, total precipitation is summarized in inches. When snow falls, it is converted to its equivalent measure as water. Although the total volume of precipitation during the year may be billions or trillions of gallons of water, its volume is expressed in inches because it provides for easier summation and description. We have learned how to use total annual precipitation to describe the climate of an area and make predictions about the environment.

Aircraft noise is similar to precipitation. The noise level from a single overflight begins quietly and builds in intensity as the aircraft draws closer. The sound of the aircraft is loudest as it passes over the receiver, diminishing as it passes. The total noise occurring during the event is accumulated and described as a Sound Exposure Level (SEL). Over a 24-hour period, the SELs can be summed, adding a special 10-decibel factor for nighttime noise, yielding a DNL value. The DNL developed over a long period of time, for example one year, defines the noise environment of the area, allowing us to make predictions about the average response of people living in areas exposed to various DNL levels.

HELPFUL RULES-OF-THUMB

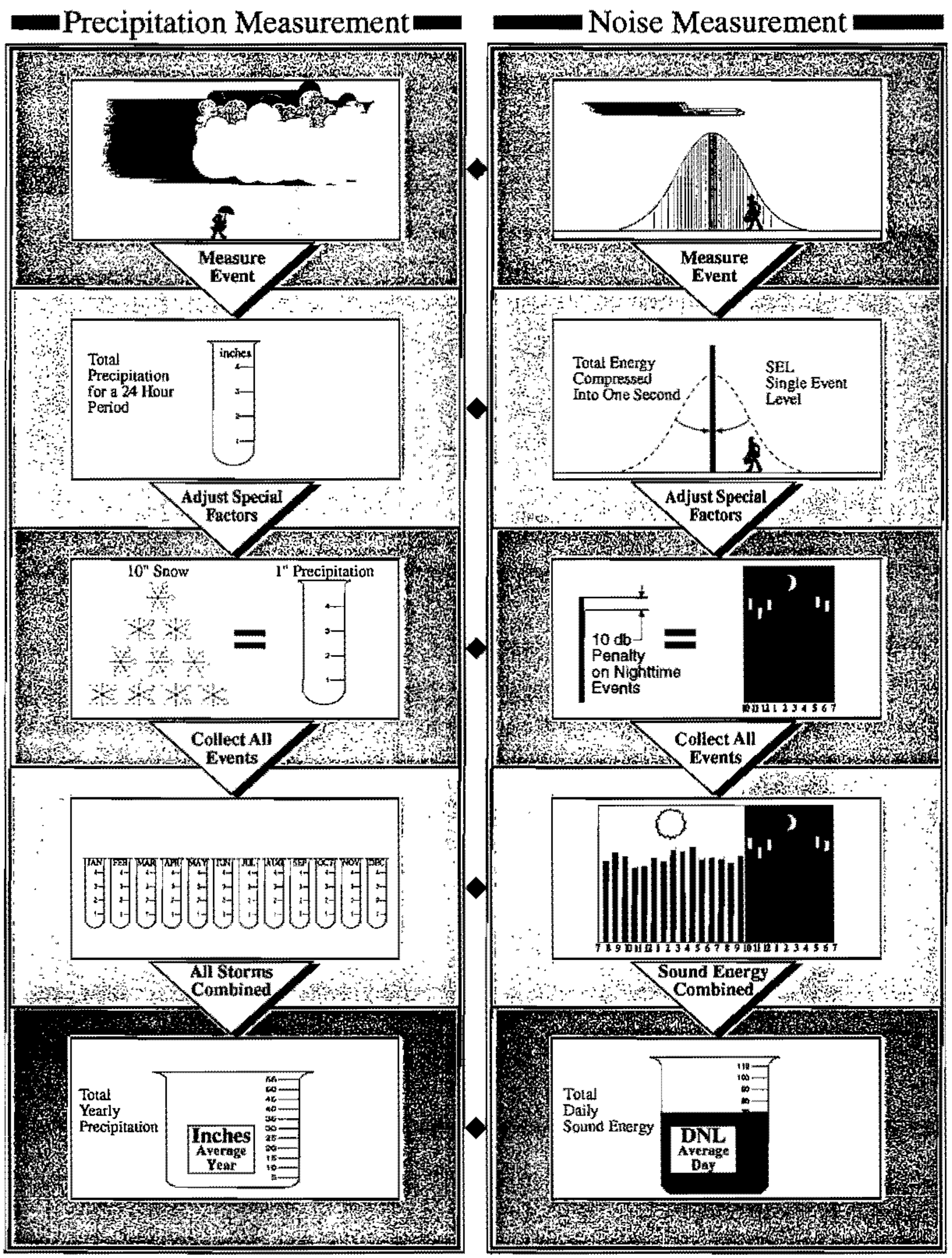
Despite the complex mathematics involved in noise analysis, several simple rules-of-thumb can help in understanding the noise evaluation process.

- *When sound events are averaged, the loud events dominate the calculation.*
- *A 10 decibel change in noise is equal to a tenfold change in sound energy. For example, the noise from ten aircraft is ten decibels louder than the noise from one*

aircraft of the same type, operated in the same way.

- *Most people perceive an increase of 10 decibels as a relative doubling of the sound level.*
- *The DNL metric assumes one nighttime operation (between 10:00 p.m. and 7:00 a.m.) is equal in impact to ten daytime operations by the same aircraft.*
- *A doubling of aircraft operations results in a three decibel noise increase if done by the same aircraft operated in the same way.*

SOUND-D-3/15/94



Source: Coffman Associates 1990

Coffman Associates
Airport Consultants

Sound Exhibit D
PRECIPITATION AND NOISE MEASUREMENT COMPARISON

References

Kryter, K.D. 1984. *Physiological, Psychological, and Social Effects of Noise,* NASA Reference Publication 1115.

Newman, Steven J. and Kristy R. Beattie, 1985. *Aviation Noise Effects.* Prepared for U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Washington, D.C., Report No. FAA-EE-85-2, March 1985.

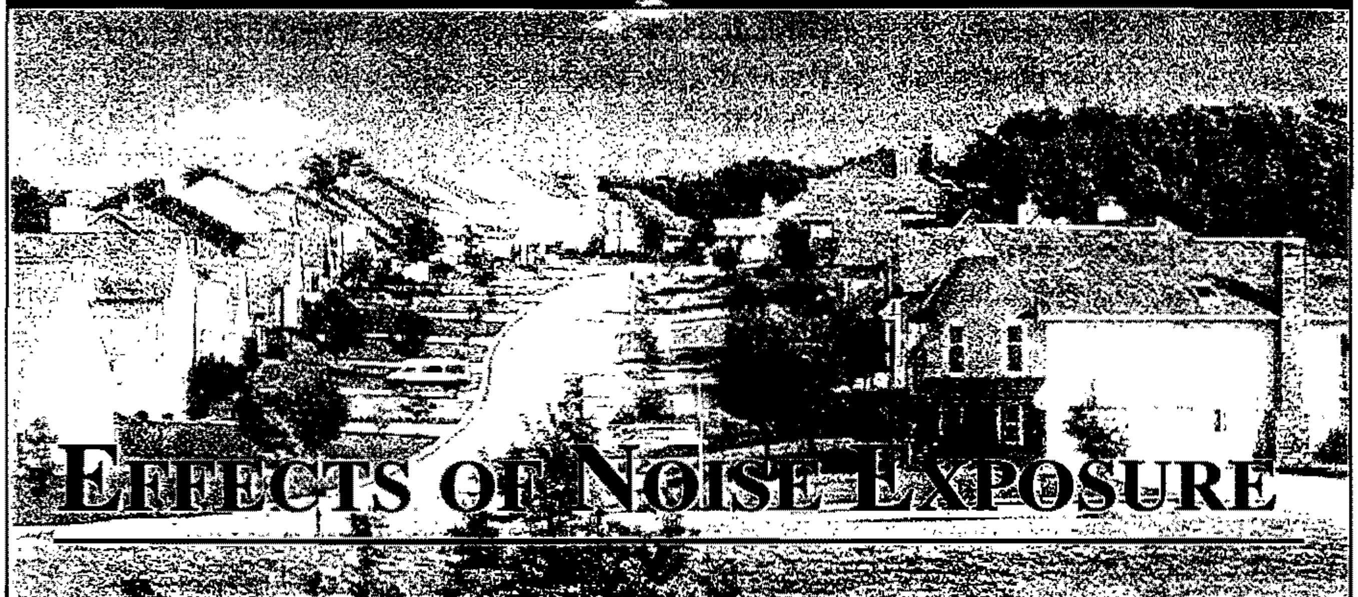
HUD (U.S. Department of Housing and Urban Development) 1985. *The Noise Guidebook,* HUD-953-CPD Washington, D.C., Superintendent of Documents, U.S. Government Printing Office, March 1985.

TECHNICAL INFORMATION PAPER

EFFECTS OF NOISE EXPOSURE

Coffman Associates Airport Consultants

ECHNICAL NFORMATION APER



EFFECTS OF NOISE EXPOSURE

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

EFFECTS ON HEARING

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

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

The Occupational Safety and Health Administration (OSHA) has established standards for permissible noise exposure in the work place to guard against the risk of hearing loss. Hearing protection is required when noise levels exceed the legal limits. The standards, shown in **Table 1**, establish a sliding scale of permissible noise levels by duration of exposure. The standards permit noise levels of up to 90 dBA for eight hours per day without requiring hearing

Coffman Associates Airport Consultants

protection. The regulations also require employers to establish hearing conservation programs where noise levels exceed 85 Leq during the 8-hour workday. This involves the monitoring of work place noise, the testing of employees' hearing, the provision of hearing protectors to employees at risk of hearing loss, and the establishment of a training program to inform employees about the effects of work place noise on hearing and the effectiveness of hearing protection devices.

TABLE 1
Permissible Noise Exposures,
OSHA Standards

Duration per day, hours	Sound Level dBA slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

Source: 29 CFR Ch. XVII, Section 1910.95 (b)

Experience at other airports has shown that even at sites with cumulative noise exposure near 75 DNL, the total time noise levels exceed 80 dBA typically ranges from 10 to 20 minutes, far below the critical hearing damage thresholds (Coffman Associates 1993, pp. 2-11). This supports the conclusion that airport noise in areas off airport property is far too low to be considered potentially damaging to hearing.

With respect to the risk of hearing loss, the authors of an authoritative summary of the research conclude: "Those most at risk [of hearing loss] are personnel in the transportation industry, especially airport ground staff. Beyond this group, it is unlikely that the general public will be exposed to sustained high levels of transportation noise sufficient to result in hearing loss. Transportation noise control in the community can therefore not be justified on the grounds of hearing protection." (See Taylor and Wilkins 1987.)

NON-AUDITORY HEALTH EFFECTS

It is sometimes claimed that aviation noise can harm the general physical and mental health of airport neighbors. Effects on the cardiovascular system, mortality rates, birth weights, achievement scores, and psychiatric admissions have been examined in the research literature. The question of pathological effects remains unsettled because of conflicting findings based on differing methodologies and uneven study quality. It is quite possible that the contribution of noise to pathological effects is so low that it has not been clearly isolated. While research is continuing, there is insufficient scientific evidence to support these concerns (Newman and Beattie 1985, pp. 59-62).

Coffman Associates Airport Consultants

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

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

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

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

SLEEP DISTURBANCE

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

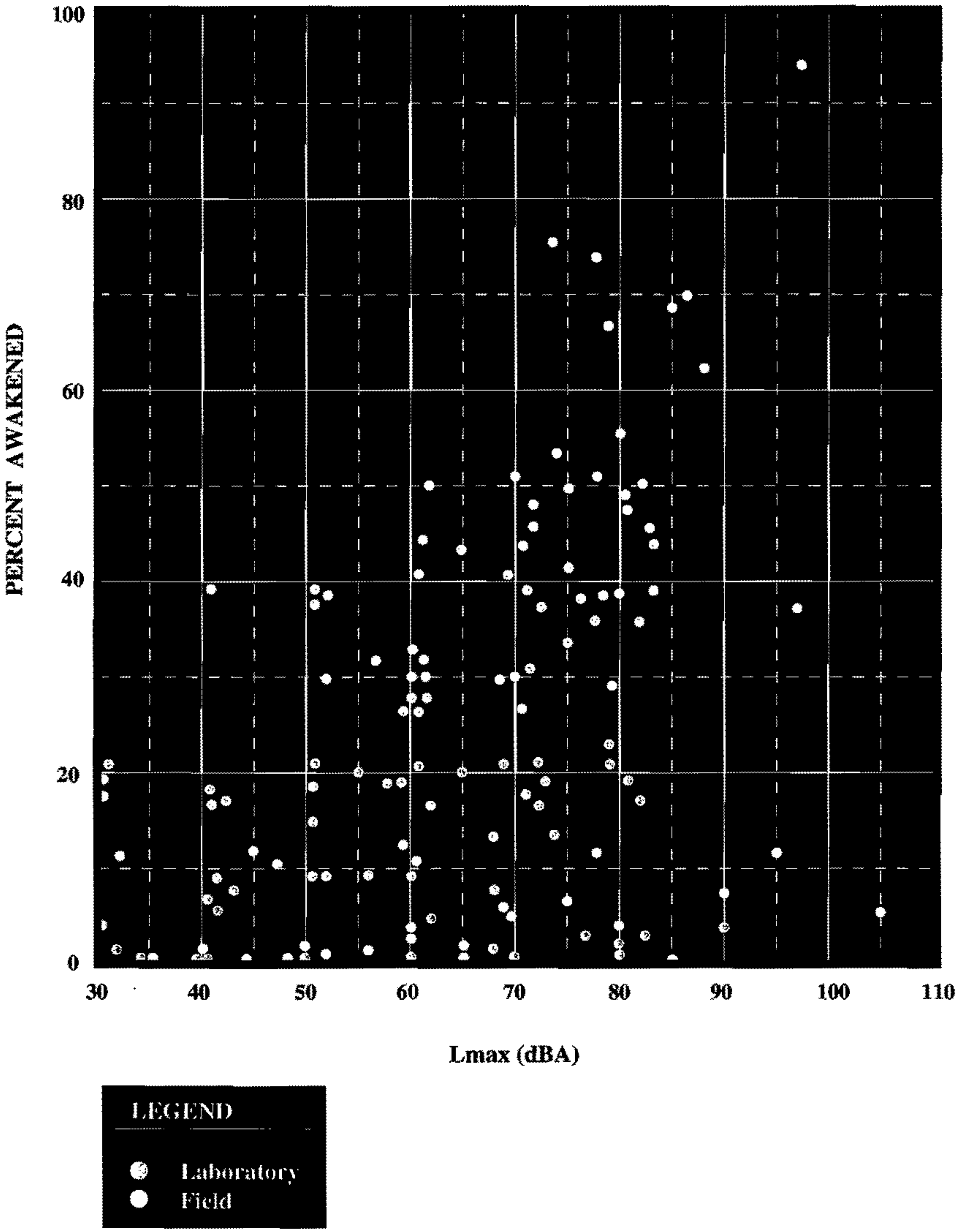
Reviews of laboratory research on sleep disturbance report that the level of noise which can cause awakenings or interfere with falling asleep ranges from 35 dBA to 80 dBA, depending on the sleep stage and variability among individuals (Newman and Beattie 1985, pp. 51-58; Kryter 1984, pp. 422-431). There is evidence that older people tend to be much more sensitive to noise-induced awakenings than younger people. Research has shown that, when measured through awakenings, people tend to become somewhat accustomed to noise. On the other hand, electroencephalograms, which reveal information about sleep stages, show little habituation to noise. Kryter describes these responses to noise as "alerting responses." He suggests that because they occur unconsciously, they may simply be reflexive responses, reflecting normal physiological functions which are probably not a cause of stress to the organism.

Most studies of sleep disturbance have been conducted under controlled laboratory conditions. The laboratory studies do not allow generalizations about the potential for sleep disturbance in an actual airport setting, and more importantly, the impact of these disturbances on the residents. Furthermore, the range of sound levels required to cause sleep disturbance, ranging from a whisper to a shout (35 dB to 80 dB), and the prevalence of sleep disruption in the absence of any noise, greatly complicates the making of reasonable generalizations about the effect of noise on sleep.

Fortunately, some studies have examined the effect of nighttime noise on sleep disturbance in actual community settings. One report summarizes the results of eight studies conducted in homes (Fields 1986). Four studies examined aircraft noise, the others highway noise. In all of them, sleep disturbance was correlated with cumulative noise exposure metrics such as Leq and L10. All studies showed a distinct tendency for increased sleep disturbance as cumulative noise exposure increased. The reviewer notes, however, that sleep disturbance was very common, regardless of noise levels, and that many factors contributed to it. He points out that, "the prevalence of sleep disturbance in the absence of noise means that considerable caution must be exercised in interpreting any reports of sleep disturbance in noisy areas."

A recent review of the literature, Pearsons, et al. (1990), compared the data and findings of laboratory and field studies conducted in the homes of subjects. They found that noise-induced awakenings in the home were much less prevalent than in the laboratory. They also found that much higher noise levels were required to induce awakenings in the home than in the laboratory. **Exhibit A** compares the percentage of people awakened at different sound levels in laboratory and field studies. The graph clearly shows a marked tendency for people in laboratory settings to be much more sensitive to noise than in their homes. The reason for the large difference is apparently that people in their homes are fully habituated to their environment, including the noise levels.

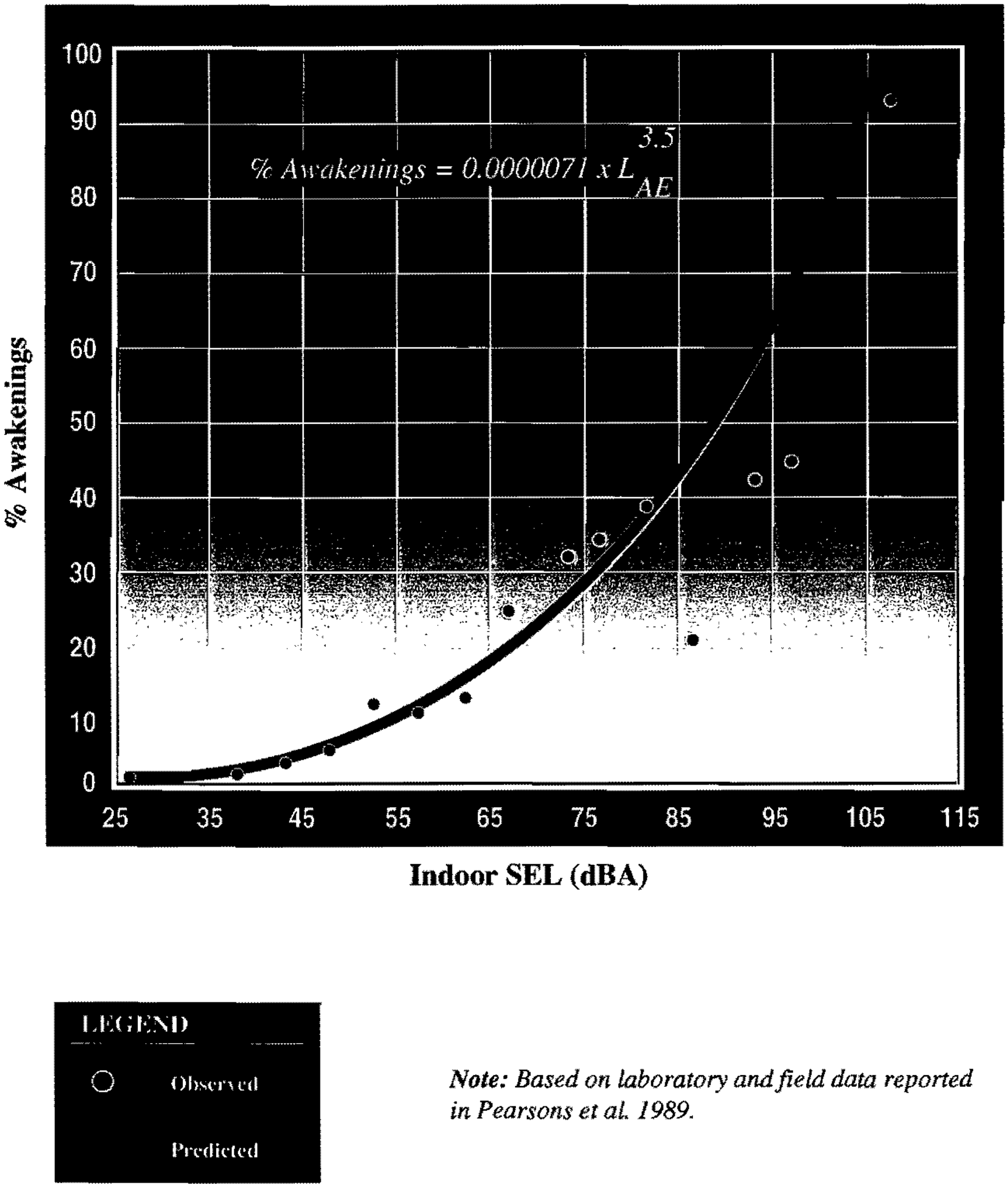
Finegold et al. (1994) reviewed the data in the Pearsons report of 1990 and developed a regression analysis. As shown in **Exhibit B**, an exponential curve was found to fit the categorized data reasonably well. They recommend that this curve be used as a provisional



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

Coffman Associates Airport Consultants

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



Source: Finegold et al. 1994.

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

Coffman Associates Airport Consultants

Effects Exhibit B
FINEGOLD'S SLEEP DISTURBANCE CURVE

means of predicting potential sleep disturbance from aircraft noise. They caution that because the curve was derived using Pearsons' laboratory, as well as in-home, data, the predictions of sleep disruption in an actual community setting derived from this curve are likely to be high.

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

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

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

DORA concluded with the following answers to the policy-related questions: (1) A significant increase in reports of sleep arousal will occur at noise levels at or above 65 Leq; (2) A significant increase in the number of people reporting difficulty in getting to sleep will occur at noise levels at or above 70 Leq. Kryter disagrees with these findings. He believes that a more careful reflection upon the data leads to the conclusion that noise levels approximately 10 decibels lower would represent the appropriate thresholds — 55 and 60 Leq.

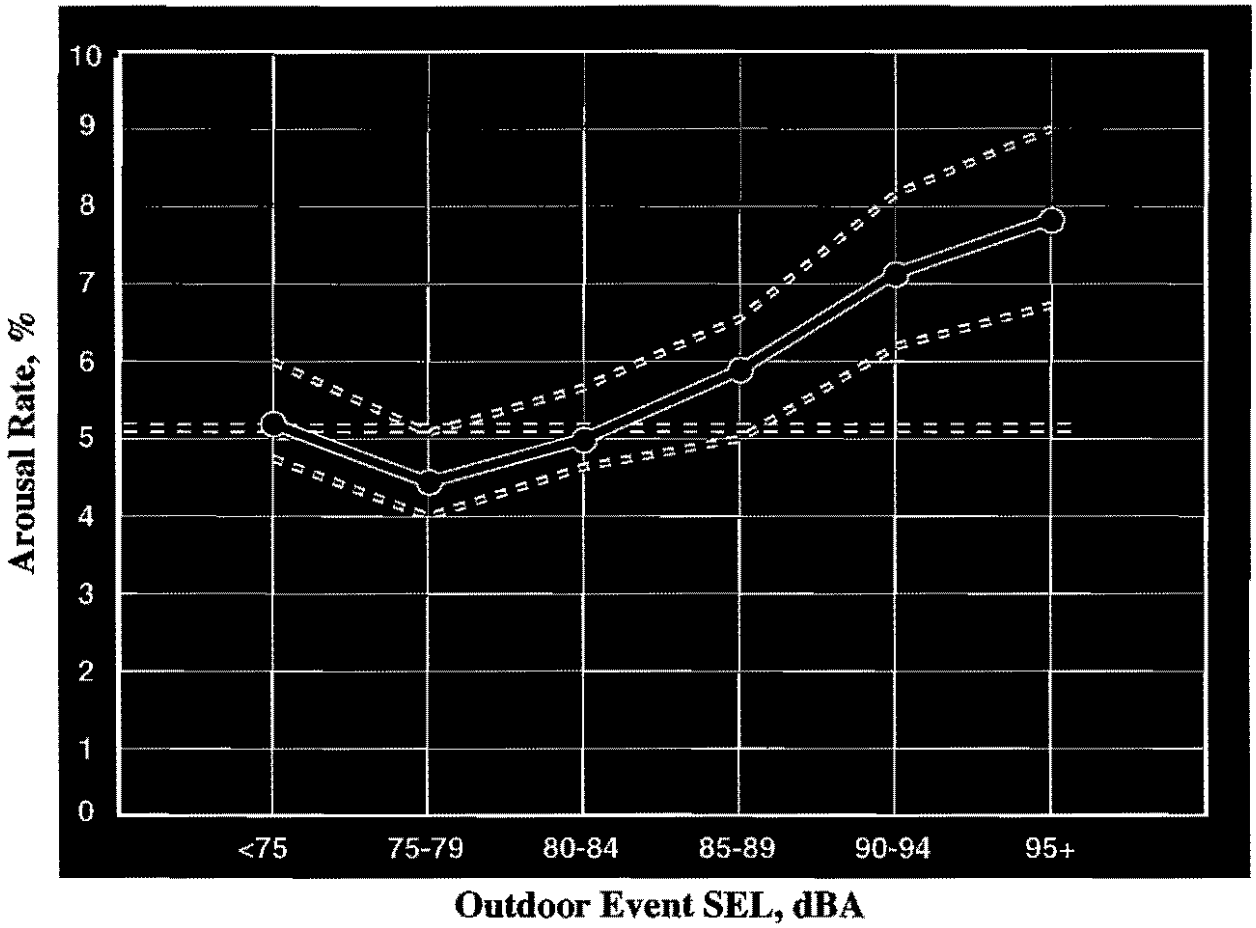
At any airport, the 65 DNL contour developed from total daily aircraft activity will be larger than the 55 Leq developed from nighttime activity only. (At an airport with only nighttime use, the 65 DNL contour will be identical with the 55 Leq contour because of the effect of the 10 dB penalty in the DNL metric.) Thus, the 65 DNL contour defines a noise impact envelope which encompasses all of the area within which significant sleep disturbance may be expected based on Kryter's interpretation of the DORA findings discussed above.

A recent study was conducted by the British Civil Aviation Authority to examine the relationship of nighttime aircraft noise and sleep disturbance near four major airports — Heathrow, Gatwick, Stansted, and Manchester (Ollerhead, et al. 1992). A total of 400 subjects were monitored for a total of 5,742 subject-nights. Nightly awakenings were found to be very common as part of natural sleep patterns. Researchers found that for aircraft noise events below 90 SEL, as measured outdoors, there was likely to be no measurable increase in rates of sleep disturbance. (The indoor level can be roughly estimated as approximately 20 to 25 decibels less than the outdoor level.) Where noise events ranged from 90 to 100 SEL, a very small rate of increase in disturbance was possible. Overall, rates of sleep disturbance were found to be more closely correlated with sleep stage than with periods of peak aircraft activity. That is, sleep was more likely to be disrupted, from any cause, during light stages than during heavy stages.

Exhibit C shows the relationship between arousal from sleep and outdoor sound exposure levels (SELs) found in the 1992 British study. The results have been statistically adjusted to control for the effects of individual variability in sleep disturbance. The study found that the arousal rate for the average person, with no aircraft noise, was 5.1 percent. Aircraft noise of less than SEL 90 dBA was found not to be statistically significant as a cause of sleep disturbance. (According to the study, this would correspond to an Lmax of approximately 81 dBA. Lmax is the loudest sound the human ear would actually hear during the 90 SEL noise event. The interior Lmax would be approximately 20 to 25 decibels less — roughly 56 to 61 dBA.) The 95 percent prediction interval is shown on the graph not to rise above the 5.1 percent base arousal rate until it is above 90 dBA. Again, it should be emphasized that these conclusions relate to the average person. More easily aroused people will be disturbed at lower noise levels, but they are also more likely to be aroused from other sources (Ollerhead, et al. 1992).

STRUCTURAL DAMAGE

Structural vibration from aircraft noise in the low frequency ranges is sometimes a concern of airport neighbors. While vibration contributes to annoyance reported by residents near airports, especially when it is accompanied by high audible sound levels, it rarely carries enough energy to damage safely constructed structures. High-impulse sounds such as blasting, sonic booms, and artillery fire are more likely to cause damage than continuous sounds such as aircraft noise. A document published by the National Academy of Sciences suggested that one may conservatively consider noise levels above 130 dB lasting more than one second as potentially damaging to structures (CHABA 1977). Aircraft noise of this magnitude occurs on the ramp and run-



LEGEND

Baseline Arousal Rate in absence of aircraft noise.

Arousal Rate during aircraft noise events.

95 percent prediction interval.

Note: Estimates controlled for the effects of individual arousability

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

Coffman Associates Airport Consultants

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

way and seldom, if ever, occurs beyond the boundaries of a commercial or general aviation airport.

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

OTHER ANNOYANCES

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

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

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

In the case of conversation disruption, nine percent were greatly annoyed by noise of 60 DNL in the Swiss study. About 12 to 16 percent of those in the Swiss and German studies considered themselves to be greatly disturbed by aircraft noise of 65 DNL. At 75 DNL, 40 to 50 percent considered themselves greatly disturbed. In the French study, 23 percent considered themselves moderately disturbed by aircraft noise at 60 DNL, 35 percent at 65 DNL, and 75 percent at 75 DNL. In the British study, 37 percent were mildly disturbed by aircraft noise at 60 DNL, 50 percent at 65 DNL, and about 72 percent at 75 DNL.

Regarding interference with television and radio listening, about 13 percent in the Swiss study were greatly disturbed by aircraft noise above 60 DNL, 21 percent at 65 DNL, and 40 percent at 75 DNL. In the British and French studies, 42 to 45 percent were mildly to moderately disturbed by noise at 60 DNL, 55 percent at 65 DNL, and 75 to 82 percent at 75 DNL.

In some cases, noise is only an indirect indicator of the real concern of airport neighbors — safety. The sound of approaching aircraft may cause fear in some people about the possibility of a crash. This fear is a factor motivating some complaints of annoyance in neighborhoods near airports around the country. (See Richards and Ollerhead 1973; FAA 1977; Kryter 1984, p. 533.) This effect tends to be most pronounced in areas directly beneath frequently used flight tracks (Gjestland 1989).

The EPA has also found that continuous exposure to high noise levels can affect work performance, especially in high-stress occupations. Based on the FAA's land use compatibility guidelines, discussed in the Technical Information Paper on Noise and Land Use Compatibility, these adverse affects are most likely to occur within the 75 DNL contour.

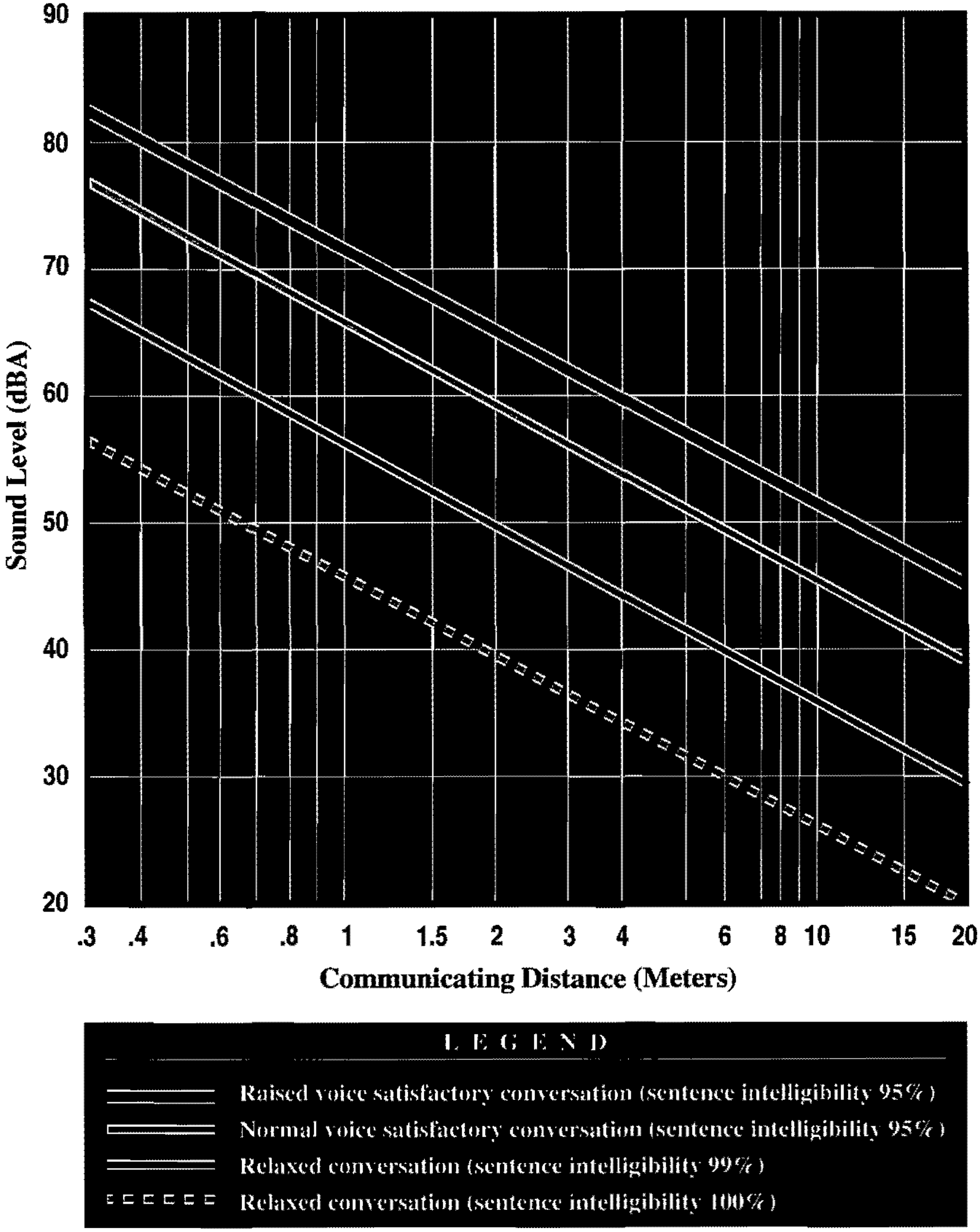
Individual human response to noise is highly variable and is influenced by many factors. These include emotional variables, feelings about the necessity or preventability of the noise, judgments about the value of the activity creating the noise, an individual's activity at the time the noise is heard, general sensitivity to noise, beliefs about the impact of noise on health, and feelings of fear associated with the noise. Physical factors influencing an individual's reaction to noise include the background noise in the community, the time of day, the season of the year, the predictability of the noise, and the individual's control over the noise source.

AVERAGE COMMUNITY RESPONSE TO NOISE

Although individual responses to noise can vary greatly, the average response among a group of people is much less variable. This enables us to generalize about the average impacts of aircraft noise on a community despite the wide variations in individual response.

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

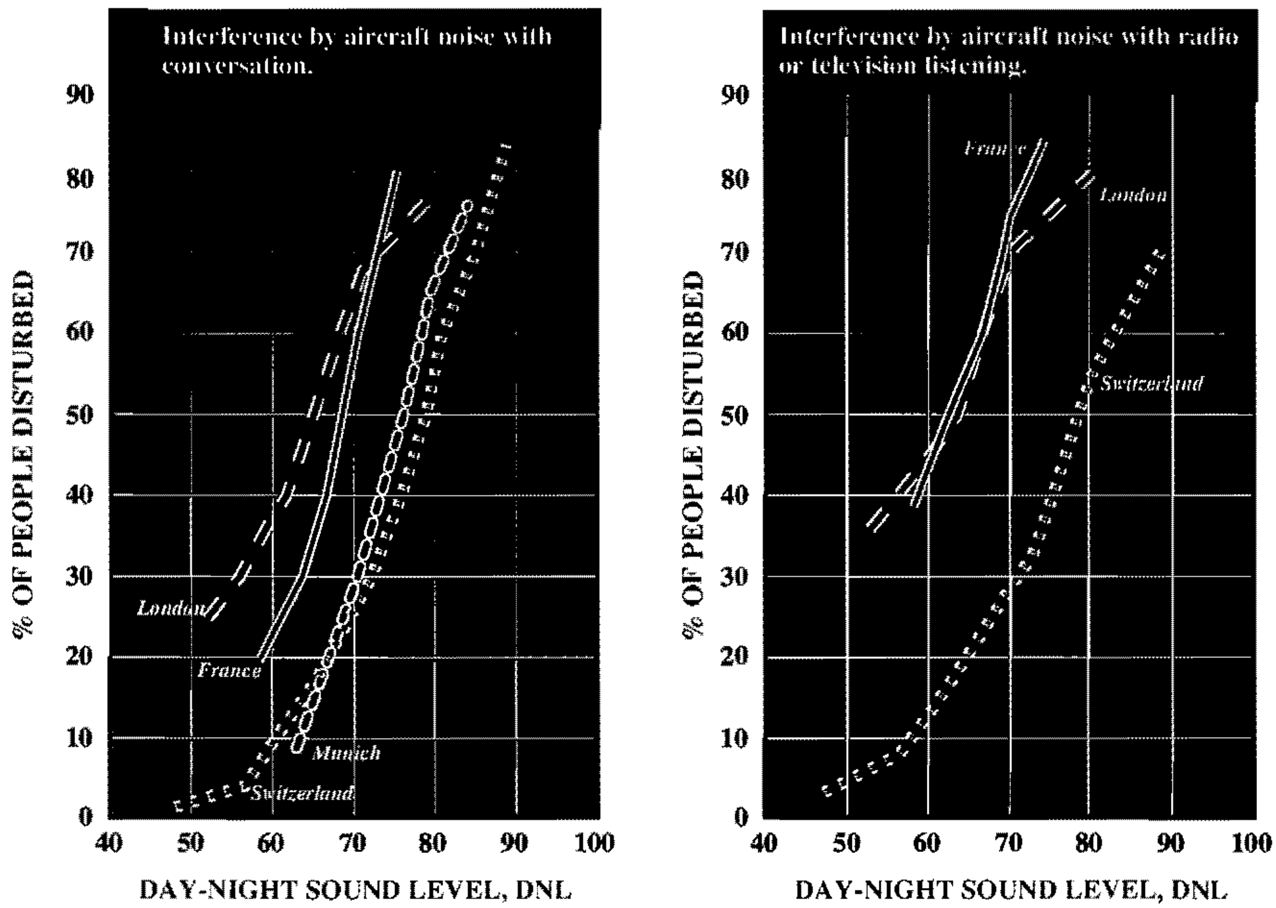
Annoyance has been found to increase along an S-shaped or logistic curve as cumulative noise exposure increases, as shown in **Exhibit F**. Developed by Finegold et al. (1992 and 1994), it is based on data derived from a number of studies of transportation noise (Fidell 1989). It shows the relationship between DNL levels and the percentage of people who are highly annoyed. Known as the "updated Schultz Curve" because it is based on the



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

Coffman Associates Airport Consultants

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

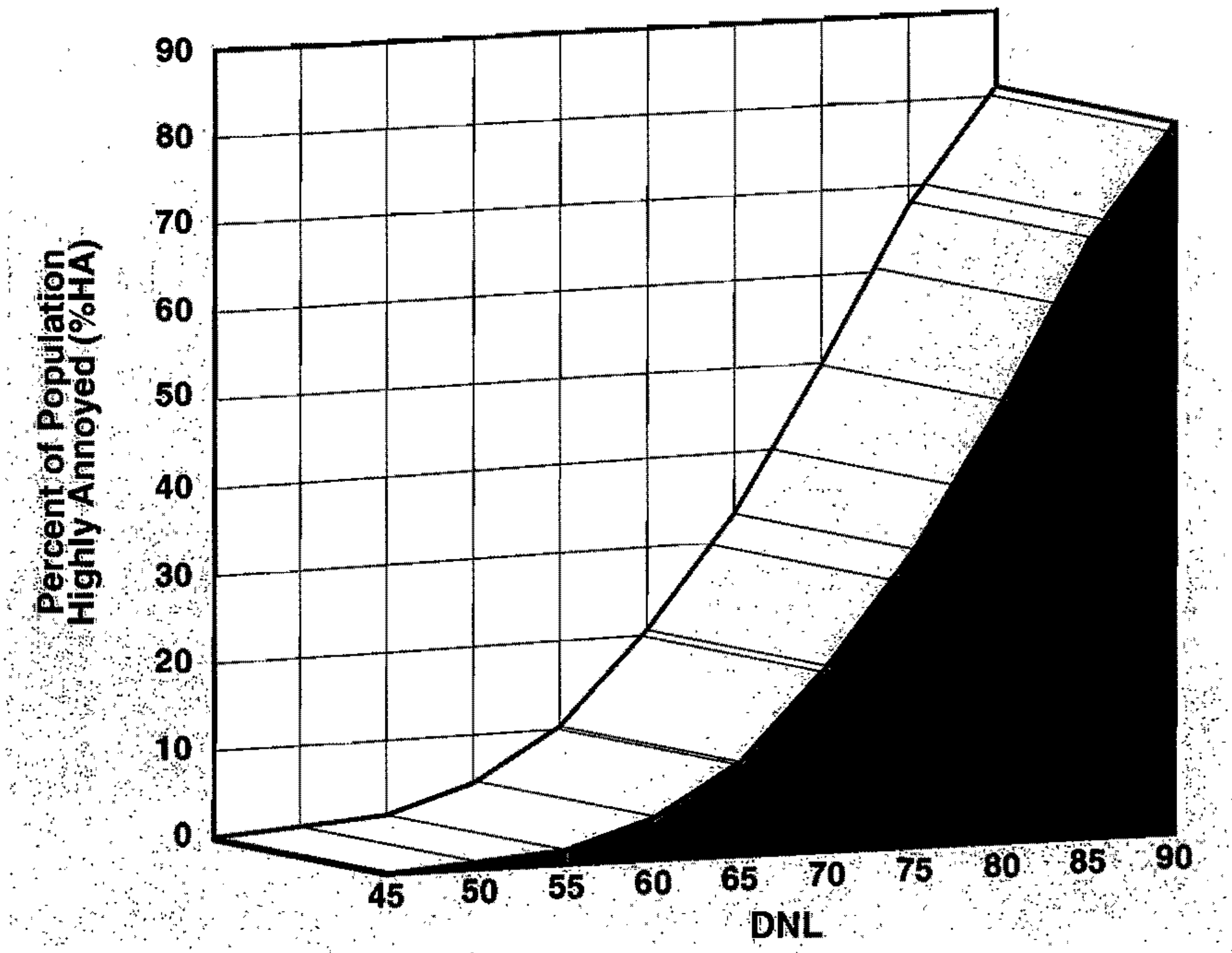


NOTE:

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

Source: Schultz, T. J. 1978.

Effects Exhibit E
INTERFERENCE BY AIRCRAFT NOISE WITH VARIOUS ACTIVITIES



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

Source: Finegold et al. 1992 and 1994.

PERCENT HIGHLY ANNOYED AT SELECTED NOISE LEVELS										
DNL	45	50	55	60	65	70	75	80	85	90
%HA	0.8%	1.6%	3.1%	6.1%	11.6%	20.9%	34.8%	51.7%	68.4%	81.3%

Coffman Associates
Airport Consultants

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

work of Schultz (1978), it represents the best available source of data for the noise dosage-response relationship (FICON 1992, Vol. 2, pp. 3-5; Finegold et al. 1994, pp. 26-27).

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

SUMMARY

The effects of noise on people include hearing loss, other ill health effects, and annoyance. While harm to physical health is generally not a problem in neighborhoods near airports, annoyance is a common problem. Annoyance is caused by sleep disruption, interruption of conversations, interference with radio and television listening, and disturbance of quiet relaxation.

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

References

Caltrans 1993. *Airport Land Use Planning Handbook.* Prepared for California Department of Transportation, Division of Aeronautics by Hodges & Shutt. Sacramento: California Department of Transportation, December 1993.

CHABA 1977. *Guidelines for Preparing Environmental Impact Statements on Noise, Report of Working Group 69 on Evaluation of Environmental Impact of Noise.* Committee on Hearing, Bioacoustics, and Biomechanics, Assembly of Behavioral and Social Sciences, National Research Council, National Academy of Sciences, Washington, DC.

Coffman Associates, Inc. 1993. *General Mitchell International Airport, Milwaukee, Wisconsin, F.A.R. Part 150 Noise Compatibility Study, Noise Compatibility Program.* Coffman Associates.

Directorate of Operational Research and Analysis (DORA) 1980. *Aircraft Noise and Sleep Disturbance: Final Report.* DORA Rep. 8008, Civil Aviation Authority, London, 1980. Cited in Kryter 1984, p. 434.

Federal Aviation Administration (FAA) 1977. *Impact of Noise on People.* U.S. Department of Transportation, FAA, May 1977.

Federal Interagency Committee on Urban Noise (FICUN) 1980. *Guidelines for Considering Noise in Land Use Planning and Control.*

Federal Interagency Committee on Noise (FICON) 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues.*

Fidell, S. et al. 1989. *Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise.* HSD-TR-89-009. Wright-Patterson AFB, Ohio: U.S. Air Force, Noise and Sonic Boom Impact Technology. Cited in FICON 1992.

Fields, J.M. 1986. *Cumulative Airport Noise Exposure Metrics: An Assessment of Evidence for Time-of-Day Weightings,* Report No. DOT/FAA/EE-86/10, FAA, Washington, DC.

Finegold, L.S. et al. 1992. "Applied Acoustical Report: Criteria for Assessment of Noise Impacts on People." Submitted to *Journal of Acoustical Society of America.* June 1992. Cited in FICON 1992.

Finegold, L.S. et al. 1994. "Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People." *Noise Control Engineering Journal*, Vol. 42, No. 1, Jan.-Feb. 1994.

Gjestland, T. 1989. "Aircraft Noise Annoyance." *1989 International Conference On Noise Control Engineering*, Vol. 2, pp. 903-908.

Great Britain Committee on the Problem of Noise, 1963. *Noise, Final Report*. Presented to Parliament by Lord Minister for Science by Command of Her Majesty. H.M. Stationery Office, London, July 1963. Cited in Newman and Beattie 1985, p. 23.

Griefahn, B. 1989. "Critical Loads For Noise Exposure At Night." *1990 International Conference On Noise Control Engineering*, Vol. 2, pp. 1163-1166.

Griefahn, B. 1992. "Hypertension — A Particular Risk For Noise Exposure." *1992 International Conference On Noise Control Engineering*, Vol 2, pp. 1123-1126.

Hershey, R.L., et al. 1975. *Analysis of the Effect of Concorde Aircraft Noise on Historic Structures*. Report No. FAA-RD-75-118, July 1975. Cited in Newman and Beattie 1985, p. 70.

Kryter, K.D. 1970. *The Effects of Noise on Man*. Academic Press, New York. Cited in Newman and Beattie 1985, p. 22.

Kryter, K.D. 1984. *Physiological, Psychological, and Social Effects of Noise*, NASA Reference Publication 1115.

Newman, Steven J. and Kristy R. Beattie, 1985. *Aviation Noise Effects*. Prepared for U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Washington, D.C., Report No. FAA-EE-85-2, March 1985.

Ollerhead, J.B. et al., 1992. *Report of a Field Study of Aircraft Noise and Sleep Disturbance*. A study commissioned by the Department of Transport from the Department of Safety, Environment and Engineering, Civil Aviation Authority (United Kingdom).

Pearsons, K.S. et al., 1990. *Analyses of the Predictability of Noise-induced Sleep Disturbance*, U.S. Air Force Report HSD-TR-89-029. Cited in Ollerhead, et al. 1992, p. 2.

Richards, E.J. and J.B. Ollerhead, 1973. "Noise Burden Factor — A New Way of Rating Noise," *Sound and Vibration*, Vol. 7, No. 12, December.

Schuller W.M. and van der Ploeg F.D., 1993. "Recent Developments With Respect to Aircraft Noise And Sleep Disturbance." *1993 International Conference On Noise Control Engineering*, Vol. 1, pp. 155-160.

Schultz, T.J. 1978. "Synthesis of Social Surveys on Noise Annoyance. *Journal of the Acoustical Society of America*, Vol. 64, No. 2, pp. 377-405. Cited in FICON 1992.

Taylor, S.M. and P.A. Wilkins, 1987. "Health Effects." In *Transportation Noise Reference Book*, Ed. P.M. Nelson. Butterworths.

U.S. Environmental Protection Agency (EPA), 1974. *Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety*. EPA, Office of Noise Abatement and Control, Washington, DC, March 1974.

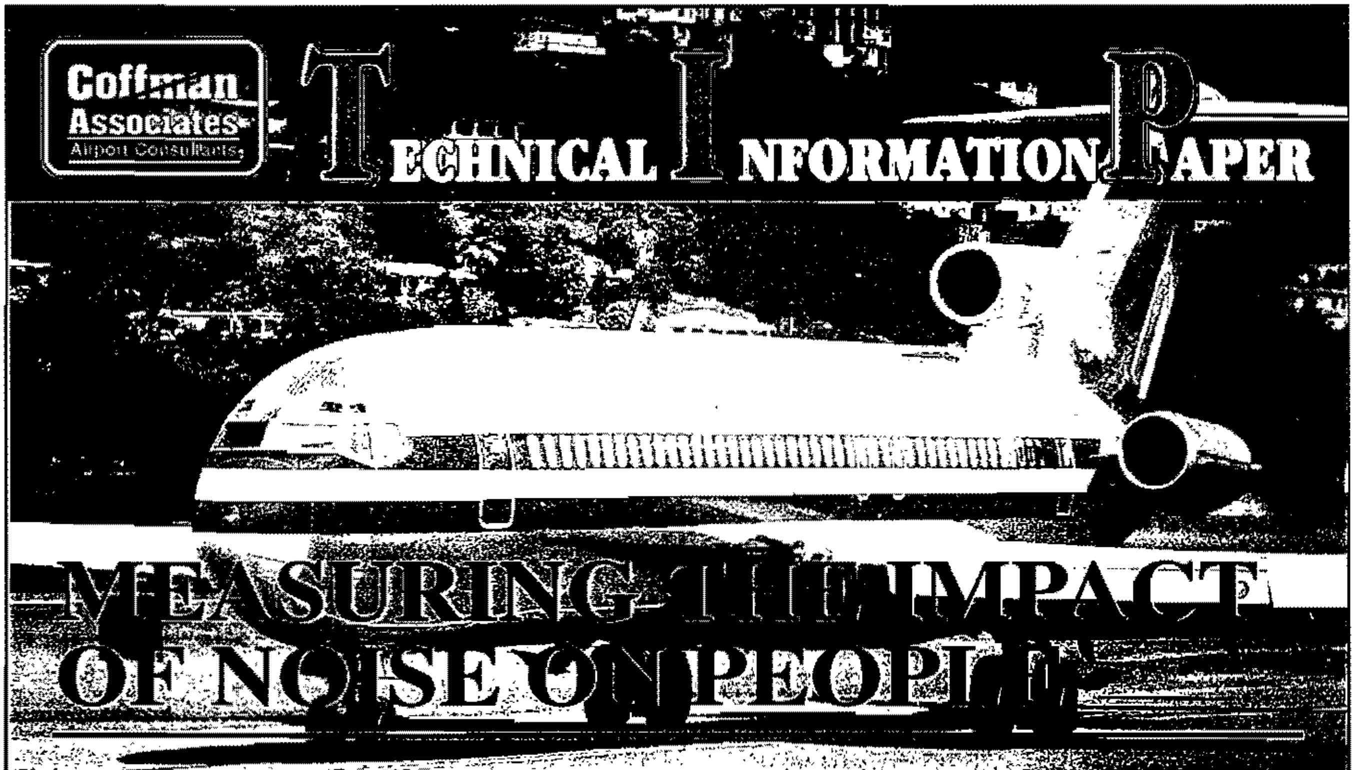
Wiggins, J.H. 1975. *The Influence of Concorde Noise on Structural Vibrations*. Report No. FAA-75-1241-1, July 1975. Cited in Newman and Beattie 1985, p. 70.

Yoshida T. and Nakamura S., 1990. "Community and Health of Inhabitants." *1990 International Conference On Noise Control Engineering*, Vol. 2, pp. 1125-1128.

Coffman Associates
Airport Consultants

TECHNICAL INFORMATION PAPER

MEASURING THE IMPACT OF NOISE ON PEOPLE



Coffman Associates Airport Consultants

TECHNICAL INFORMATION PAPER

MEASURING THE IMPACT OF NOISE ON PEOPLE

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

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

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

AVERAGE COMMUNITY RESPONSE TO NOISE

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

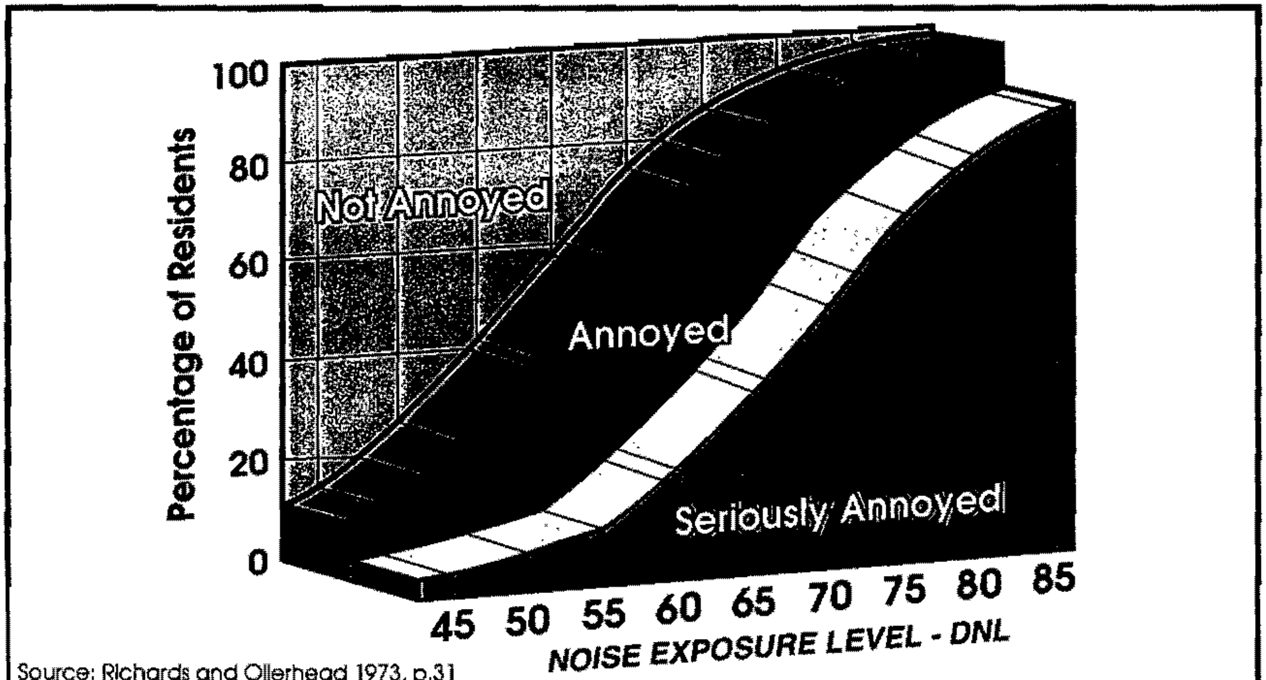
Coffman Associates Airport Consultants

Physical factors influencing an individual's reaction to noise include the background noise in the community, the time of day, the season of the year, the predictability of the noise, and the individual's control over the noise source.

Although individual responses to noise can vary greatly, the average response among a group of people is much less variable. This enables us to generalize about the average impacts of aircraft noise on a community despite the wide variations in individual response.

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

Annoyance has been found to increase along an S-shaped or logistic curve as cumulative noise exposure increases, as shown in **Exhibit A**. This graph shows the percentage of residents either somewhat or seriously annoyed by noise of varying DNL levels. It was developed from research in the early 1970s (Richards and Ollerhead 1973). It is interesting that the graph indicates that at even extremely low noise levels, below 45 DNL, a very small percentage of people remain annoyed by aircraft noise. Conversely, the graph shows that while the percentage of people annoyed by noise exceeds 95 percent at 75 DNL, it only approaches, and does not reach, 100 percent even at the extremely high noise level of 85 DNL.



LWP Exhibit A
ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL AREAS

Coffman Associates Airport Consultants

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

The updated Schultz Curve shows that annoyance is measurable beginning at 45 DNL, where 0.8 percent of people are highly annoyed. It increases gradually to 6.1 percent at 60 DNL. Starting at 65 DNL, the percentage of people expected to be highly annoyed increases steeply from 11.6 percent up to 68.4 percent at 85 DNL. Note that this relationship includes only those reported to be "highly annoyed". Based on the findings shown in **Exhibit A**, the percentages would be considerably higher if they also included those who were "moderately annoyed".

THE DEVELOPMENT OF WEIGHTING FUNCTIONS

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

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

UPDATED LEVEL-WEIGHTED POPULATION FUNCTIONS

As discussed above, the original Schultz curve has been updated to take into account additional studies of community response to noise. The updated curve is shown in **Exhibit B**. Coffman Associates has updated the weighting functions developed by CHABA (1977, p. B-7) to correspond with the updated Schultz curve. **Table 1** shows the percentage of people likely to be highly annoyed by aircraft noise for 5 DNL increments ranging from 45 to 80 DNL. It also shows weighting functions for use in calculating level-weighted population. These were developed by setting the function for the 75 to 80 DNL range at unity (1.000). The other functions were computed in proportion to the values for "percent highly annoyed".

TABLE 1
Percent Highly Annoyed and Weighting Function by DNL Range

DNL Range	Average Percent Highly Annoyed	Weighting Function
45-50	1.19%	0.028
50-55	2.36%	0.055
55-60	4.63%	0.107
60-65	8.87%	0.205
65-70	16.26%	0.376
70-75	27.83%	0.644
75-80	43.25%	1.000

Based on the response curve shown in Exhibit A, the weighting functions can be considered as roughly equivalent to the proportion of people likely to be either highly annoyed or somewhat annoyed by noise.

EXAMPLE USE OF LEVEL-WEIGHTED POPULATION

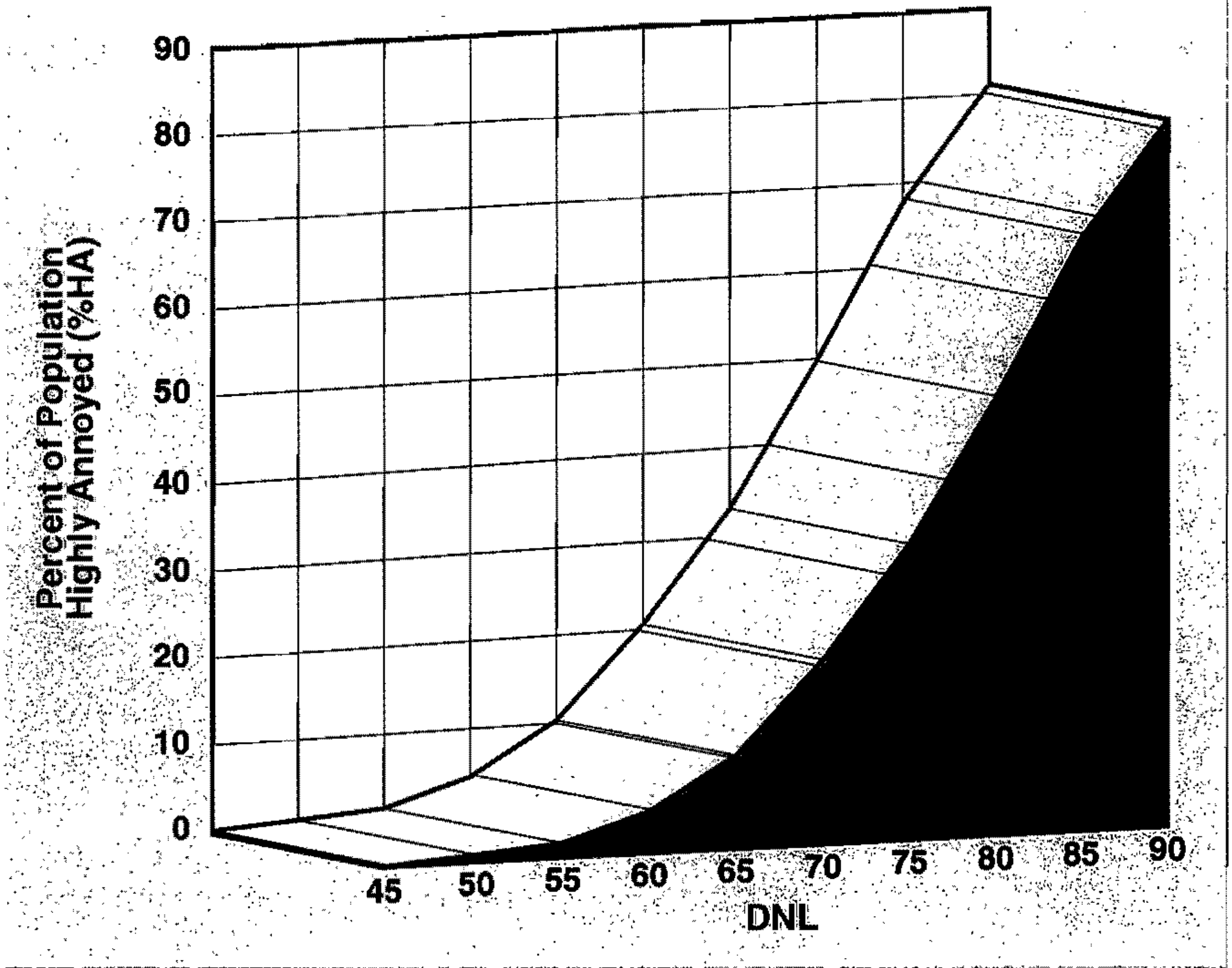
In airport noise compatibility planning, the level-weighted population (LWP) methodology is particularly useful in comparing the results of different noise analysis scenarios. Since the percentage of people who are highly annoyed increases with increasing noise levels, the LWP values may differ between operating scenarios even though the total population within the noise impact boundary is equal. An example below illustrates the LWP methodology. Scenarios A and B show the effects of two airport operating scenarios. While the population subject to noise above 65 DNL is the same for both, Scenario B has a lower LWP because fewer people are impacted by the higher noise levels.

TABLE 2
Level-Weighted Population Methodolgy - Example

	Scenario A			Scenario B		
DNL Range	LWP Factor	Population	LWP	LWP Factor	Population	LWP
65-70	.376	x 2,000	= 753	.376	x 3,000	= 1,128
70-75	.644	x 1,400	= 902	.644	x 700	= 451
75+	1.000	x 600	= 600	1.000	x 300	= 300
Total		4,000	2,254		4,000	1,879

SUMMARY

The response to noise among a group of people varies systematically with changes in noise levels. As noise increases, the proportion of people disturbed by noise increases. This relationship has been estimated and is presented in the "updated Schultz curve" shown in Exhibit B. The data in the updated Schultz curve can be used to develop weighting functions for computing the numbers of people likely to be annoyed with noise. This is especially useful in comparing the net impact of different noise scenarios.



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

Source: Finegold et al. 1992 and 1994.

PERCENT HIGHLY ANNOYED AT SELECTED NOISE LEVELS

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

Coffman Associates
Airport Consultants

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

References

CHABA 1977. *Guidelines for Preparing Environmental Impact Statements on Noise, Report of Working Group 69 on Evaluation of Environmental Impact of Noise.* Committee on Hearing, Bioacoustics, and Biomechanics, Assembly of Behavioral and Social Sciences, National Research Council, National Academy of Sciences, Washington, DC.

Directorate of Operational Research and Analysis (DORA) 1980. *Aircraft Noise and Sleep Disturbance: Final Report.* DORA Rep. 8008, Civil Aviation Authority, London, 1980. Cited in Kryter 1984, p. 434.

Federal Interagency Committee on Noise (FICON) 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues.*

Fidell, S. et al. 1989. *Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise.* HSD-TR-89-009. Wright-Patterson AFB, Ohio: U.S. Air Force, Noise and Sonic Boom Impact Technology. Cited in FICON 1992.

Finegold, L.S. et al. 1992. "Applied Acoustical Report: Criteria for Assessment of Noise Impacts on People." Submitted to *Journal of Acoustical Society of America.* June 1992. Cited in FICON 1992.

Finegold, L.S. et al. 1994. "Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People." *Noise Control Engineering Journal,* Vol. 42, No. 1, January - February 1994.

Great Britain Committee on the Problem of Noise, 1963. *Noise, Final Report.* Presented to Parliament by Lord Minister for Science by Command of Her Majesty. H.M. Stationery Office, London, July 1963. Cited in Newman and Beattie 1985, p. 23.

Kryter, K.D. 1970. *The Effects of Noise on Man.* Academic Press, New York. Cited in Newman and Beattie 1985, p. 22.

Kryter, K.D. 1984. *Physiological, Psychological, and Social Effects of Noise,* NASA Reference Publication 1115.

Newman, Steven J. and Kristy R. Beattie, 1985. *Aviation Noise Effects.* Prepared for U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Washington, D.C., Report No. FAA-EE-85-2, March 1985.

Richards, E.J. and J.B. Ollerhead, 1973. "Noise Burden Factor — A New Way of Rating Noise," *Sound and Vibration,* Vol. 7, No. 12, December.

Schultz, T.J. 1978. "Synthesis of Social Surveys on Noise Annoyance. *Journal of the Acoustical Society of America*, Vol. 64, No. 2, pp. 377-405. Cited in FICON 1992.

U.S. Environmental Protection Agency (EPA), 1974. *Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety*. EPA, Office of Noise Abatement and Control, Washington, DC, March 1974.

Coffman Associates Airport Consultants

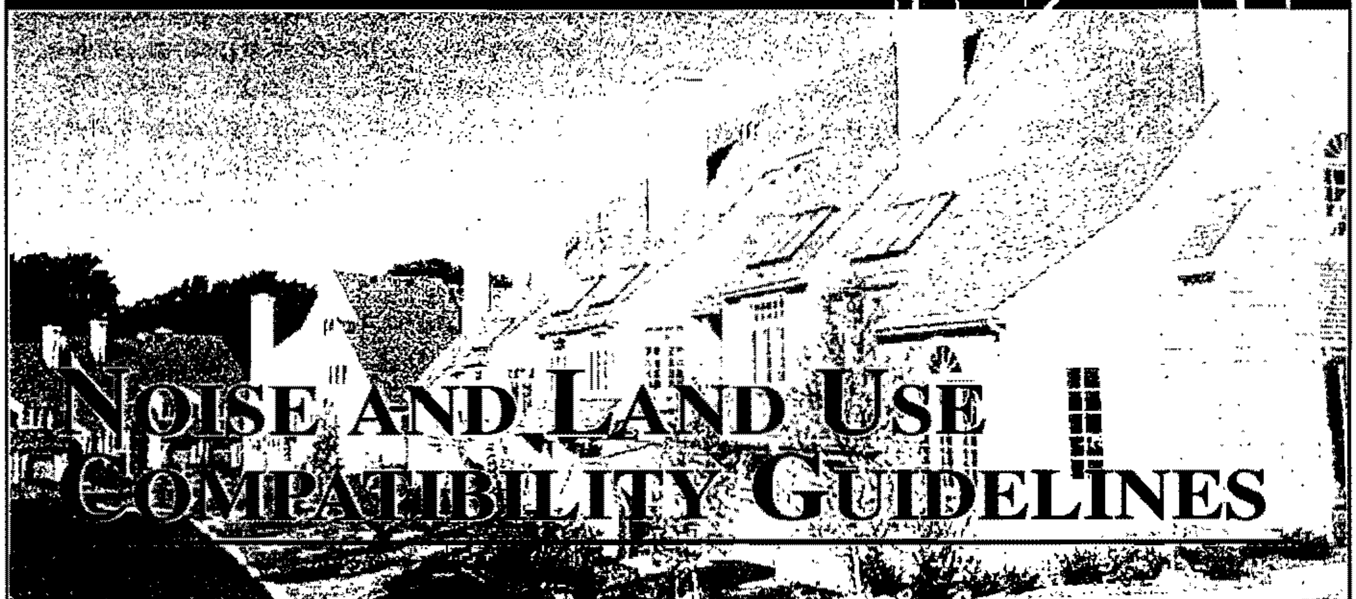
Coffman Associates
Airport Consultants

TECHNICAL INFORMATION PAPER

NOISE AND LAND USE COMPATIBILITY GUIDELINES

Coffman Associates
Airport Consultants

TECHNICAL INFORMATION PAPER



NOISE AND LAND USE COMPATIBILITY GUIDELINES

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

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

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

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

Coffman Associates
Airport Consultants

EFFECT OF BACKGROUND NOISE ON REPORTED ANNOYANCE

Noise analysts have speculated that the overall ambient noise level in an environment determines to what degree people will be annoyed by aircraft noise of a given level. That is, in a louder environment it takes a louder level of aircraft noise to generate complaints than it does in a quieter environment.

Kryter (1984, p. 582) reviewed some of the research on this question. He noted that the effects of laboratory tests and attitude surveys on this question are somewhat inconclusive. A laboratory test he reviewed found that recordings of aircraft noise were judged to be less intrusive as the background road traffic noise was increased. On the other hand, an attitude survey in the Toronto Airport area found that the effects of background noise were not significant.

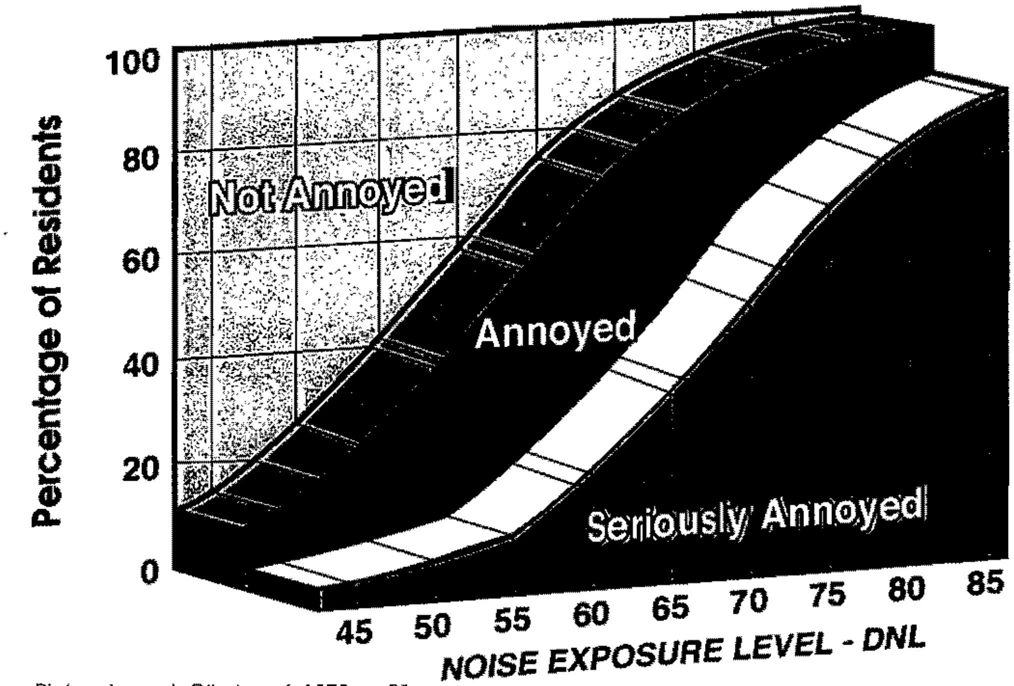
The studies reviewed by Kryter were intended to see if background noise provided some degree of masking of aircraft noise. They did not, however, take into consideration the subjects' rating of the overall quality of the noise environment.

The U.S. Environmental Protection Agency (EPA) has provided guidelines to address the question of background noise and its relationship to aircraft noise. EPA has determined that complaints can be expected when the intruding DNL exceeds the background DNL by more than 5 decibels (U.S. EPA 1974). The California Department of Transportation (Caltrans 1983, p. 52) notes that some Airport Land Use Commissions in California consider the effects of background noise in determining the aircraft noise contour of significance. Specifically, adjustments have been made in areas with quiet background noise levels of 50 to 55 CNEL. In those cases, aircraft CNEL contours are prepared down to 55 or 60 CNEL, and land use compatibility criteria are adjusted to apply to those areas.

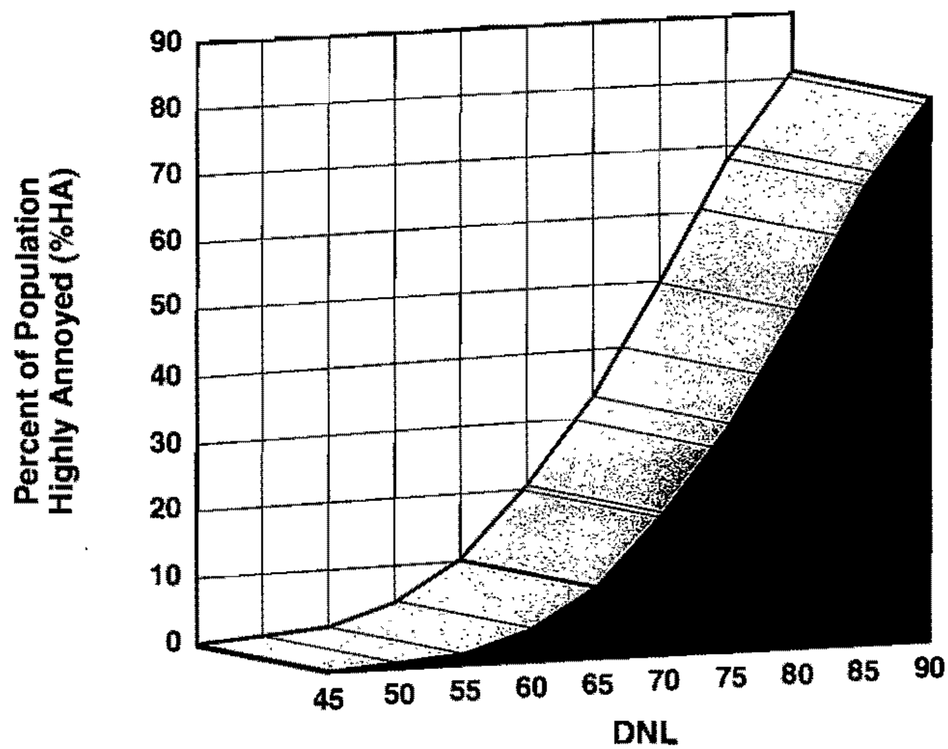
The Federal Interagency Committee on Noise (FICON 1992, p. 2-6) examined the question of background noise and its relationship to perceptions of aircraft noise. It reviewed the research in this field, concluding that there was a basis for believing that, in addition to the magnitude of aircraft noise, the difference between background noise and aircraft noise was in some way related to human perceptions of noise disturbance. It noted, however, that there was insufficient scientific data to provide authoritative guidance on the consideration of these effects. It advocated further research in this area.

LAND USE COMPATIBILITY GUIDELINES

The degree of annoyance which people suffer from aircraft noise varies depending on their activities at any given time. People rarely are as disturbed by aircraft noise when they are shopping, working, or driving as when they are at home. Transient hotel and motel residents seldom express as much concern with aircraft noise as do permanent residents of an area. The concept of "land use compatibility" has arisen from this systematic variation in human tolerance to



Source: Richards and Ollerhead 1973, p.31



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

Source: Finegold et al. 1992 and 199[illegible].

UPDATED SCHULTZ CURVE

Coffman Associates
Airport Consultants

Land Use Exhibit A

ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL AREAS

aircraft noise. Since the 1960s, many different sets of land use compatibility guidelines have been proposed and used. This section reviews some of the more well known guidelines.

FEDERAL LAND USE COMPATIBILITY GUIDELINES

FAA-DOD Guidelines

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

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

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

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

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

HUD Guidelines

In 1971, the U.S. Department of Housing and Urban Development (HUD)published noise assessment guidelines for evaluating the acceptability of sites for housing assistance. The guidelines, shown in **Table 2**, establish four classes of noise impact. The first two categories refer to areas outside the 65 DNL contour; the first at a distance exceeding the distance between the 65 and 75 DNL contours; and the second at a lesser distance. Houing is considered clearly acceptable in the first category and "normally acceptable" in the second. Housing is considered "normally unacceptable" in the 65 to 75 DNL range and clearly unacceptable inside the 75 DNL contour.

TABLE 2
Site Exposure to Aircraft Noise
1971 HUD Guidelines

Distance from site to the center of the area covered by the principal runways	Acceptability category
Outside the Ldn = 65 (NEF = 30, CNR = 100) contour at a distance greater than or equal to the distance between the contours Ldn = 65 and Ldn = 75	Clearly acceptable
Outside the Ldn = 65 contour, at a distance less than the distance between the Ldn = 65 and Ldn = 75	Normally acceptable
Between the Ldn = 65 and Ldn = 75 contours	Normally unacceptable
Within the Ldn = 75 contour	Clearly unacceptable

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

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

EPA Guidelines

The U.S. Environmental Protection Agency published a document in 1974 suggesting maximum noise exposure levels to protect public health with an adequate margin of safety. These are shown in **Table 3**. They note that the risk of hearing loss may become a concern with exposure to noise above 74 DNL. Interference with outdoor activities may become a problem with noise levels above 55 DNL. Interference with indoor residential activities may become a problem with interior noise levels above 45 DNL. If we assume that standard construction attenuates noise by about 20 decibels, with doors and windows closed, a standard estimate, this corresponds to an exterior noise level of 65 DNL.

FAA Land Use Guidance System

In 1977, FAA issued an advisory circular on airport land use compatibility planning (FAA 1977b). It describes land use guidance (LUG) zones corresponding to aircraft noise of varying levels as measured by four different noise metrics (**Exhibit B**). It also includes suggested land use noise sensitivity guidelines (**Exhibit C**).

In **Exhibit B**, LUG Chart I, four land use guidance zones are described, corresponding to DNL levels of 55 or less (A), 55 to 65 (B), 65 to 75 (C), and 75 and over (D). LUG Zone A is described as minimal exposure, normally requiring no special noise control considerations. LUG Zone B is described as moderate exposure where

Coffman Associates Airport Consultants

LAND USE GUIDANCE ZONES (LUG)	NOISE EXPOSURE CLASS	INPUTS: AIRCRAFT NOISE ESTIMATING METHODOLOGIES				HUD NOISE ASSESSMENT GUIDELINES (1977)	SUGGESTED NOISE CONTROLS
		Ldn DAY-NIGHT AVERAGE SOUND LEVEL	NEF NOISE EXPOSURE FORECAST	CNR COMPOSITE NOISE RATING	CNEL COMMUNITY NOISE EQUIVALENT LEVEL		
A	MINIMAL EXPOSURE	0 TO 55	0 TO 20	0 TO 90	0 TO 55	"CLEARLY ACCEPTABLE"	NORMALLY REQUIRES NO SPECIAL CONSIDERATIONS
B	MODERATE EXPOSURE	55 TO 65	20 TO 30	90 TO 100	55 TO 65	"NORMALLY ACCEPTABLE"	LAND USE CONTROLS SHOULD BE CONSIDERED
C	SIGNIFICANT EXPOSURE	65 TO 75	30 TO 40	100 TO 115	65 TO 75	"NORMALLY UNACCEPTABLE"	NOISE EASEMENTS, LAND USE, AND OTHER COMPATIBILITY CONTROLS RECOMMENDED
D	SEVERE EXPOSURE	75 & HIGHER	40 & HIGHER	115 & HIGHER	75 & HIGHER	"CLEARLY UNACCEPTABLE"	CONTAINMENT WITHIN AIRPORT BOUNDARY OR USE OF POSITIVE COMPATIBILITY CONTROLS RECOMMENDED

Source: FAA 1977b, p. 12.

Coffman Associates
Airport Consultants

Land Use Exhibit B
LAND USE GUIDANCE CHART I:
AIRPORT NOISE INTERPOLATION

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

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

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

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

Source: FAA 1977b, p. 14.

Coffman Associates Airport Consultants

Land Use Exhibit C

LAND USE GUIDANCE CHART II:
LAND USE NOISE SENSITIVITY INTERPOLATION

land use controls should be considered. LUG Zone C is subject to significant exposure, and various land use controls are recommended. LUG Zone D, severe exposure, containment of the area within airport property, or other positive control measures, are suggested.

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

Effect	Level	Area
Hearing Loss	75 Ldn +	All areas
Outdoor activity interference and annoyance	55 Ldn +	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis of use.
	59 Ldn +	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	45 Ldn +	Indoor residential areas
	49 Ldn +	Other indoor areas with human activities such as schools, etc.

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

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

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

Federal Interagency Committee on Urban Noise

In 1979, the Federal Interagency Committee on Urban Noise (FICUN), including representatives of the Environmental Protection Agency, the Department of Transportation, the Housing and Urban Development Department, the Department of Defense, and the Veterans Administration, was established to coordinate various federal programs relating to the promotion of noise-compatible development. In 1980, the Committee published a report which contained detailed land use compatibility guidelines for varying DNL noise levels (FICUN 1980). These are presented in **Table 4**. The work of the Interagency Committee was very important as it brought together for the first time all federal agencies with a direct involvement in noise compatibility issues and forged a general consensus on land use compatibility for noise analysis on federal projects.

The Interagency guidelines describe the 65 DNL contour as the threshold of significant impact for residential land uses and a variety of noise-sensitive institutions (such as hospitals, nursing homes, schools, cultural activities, auditoriums, and outdoor music shells). Within the 55 to 65 DNL contour range, the guidelines note that cost and feasibility factors were considered in defining residential development and several of the institutions as compatible. In other words, the guidelines are based not solely on the effects of noise. They also consider the cost and feasibility of noise control.

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

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

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

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn						
		A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
44	Marine craft transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	Y
45	Highway and street right-of-way	Y	Y	Y	Y[2]	Y[3]	Y[4]	Y
46	Automobile parking	Y	Y	Y	Y[2]	Y[3]	Y[4]	Y
47	Communications	Y	Y	Y	25[2]	30[3]	N[4]	N
48	Utilities	Y	Y	Y	Y[2]	Y[3]	Y[4]	Y
49	Other transportation, communication, and utilities	Y	Y	Y	25[2]	30[3]	N[4]	N
50	**Trade**				[2]	[3]	[4]	
51	Wholesale trade	Y	Y	Y	Y[2]	Y[3]	Y	N
52	Retail trade - building materials hardware and farm equipment	Y	Y	Y	Y	Y	N	N
53	Retail trade - general merchandise	Y	Y	Y	25	30	N	N
54	Retail trade - food	Y	Y	Y	25	30	N	N
55	Retail trade - automotive, marine craft, aircraft and accessories	Y	Y	Y	25	30	N	N
56	Retail trade - apparel and accessories	Y	Y	Y	25	30	N	N
57	Retail trade - furniture, home furnishings, and equipment	Y	Y	Y	25	30	N	N
58	Retail trade - eating and drinking establishments	Y	Y	Y	Y	Y	N	N
59	Other retail trade	Y	Y	Y	25	30	N	N
60	Services							
61	Finance, insurance, and real estate services	Y	Y	Y	25[2]	30[3]	N[4,11]	N[6,11]
62	Personal services	Y	Y	Y	25	30	N	N
62.4	Cemeteries	Y	Y	Y	Y[2]	Y[3]	Y[4]	Y
63	Business services	Y	Y	Y	25	30	Y	N
64	Repair services	Y	Y	Y	Y	Y	Y	N
65	Professional services	Y	Y	Y	25	30	N	N
65.1	Hospitals, nursing homes	Y	Y*	25*	30*	N	N	N
65.2	Other medical facilities	Y	Y	Y	25	30	N	N
66	Contract construction services	Y	Y	Y	25	30	N	N
67	Government services	Y	Y*	Y*	25*	30*	N	N
68	Educational services	Y	Y*	25*	30*	N	N	N
69	Miscellaneous	Y	Y	Y	Y	Y	Y	N
70	**Cultural, entertainment, and recreation**							
71	Cultural activities (including churches)	Y	Y*	25*	30*	N	N	N
71.2	Nature exhibits	Y	Y*	Y*	N	N	N	N
72	Public assembly	Y	Y	Y	N	N	N	N
72.1	Auditoriums, concert halls	Y	Y	25	30	N	N	N
72.11	Outdoor music shells, spectator sports	Y	Y*	Y	Y	N	N	N
73	Amusements	Y	Y	Y	N	N	N	N
74	Recreation activities (including golf courses, riding stables, water recreation)	Y	Y*	Y*	25*	30*	N	N
75	Resorts and group camps	Y	Y*	Y*	Y*	N	N	N
76	Parks	Y	Y*	Y*	Y*	N	N	N
79	Other cultural, entertainment	Y	Y*	Y*	Y*	N	N	N

Coffman Associates Airport Consultants

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

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

NOTES

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

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

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

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

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

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

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

6 No buildings.

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

8 Residential buildings require a NLR of 25.

9 Residential buildings require a NLR of 30.

10 Residential buildings not permitted.

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

Coffman Associates Airport Consultants

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

KEY	
SLUCM	Standard Land Use Coding Manual, (U.S. Urban Renewal Administration and Bureau of Public Roads, 1965).
Y(Yes)	Land Use and related structures compatible without restrictions.
N(No)	Land Use and related structures are not compatible and should be prohibited.
NLR (Noise Level Reduction)	Noise Level Reduction (outdoor-to-indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
Y*(Yes with restrictions)	Land Use and related structures generally compatible; see notes 2 through 4.
25, 30, or 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 must be incorporated into design and construction of structure.
25*, 30*, or 35*	Land Use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.
Y*	The designation of these uses as "compatible" in this zone reflects individual federal agencies considerations of general cost and feasibility factors as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider....

Note: *Guidelines For Considering Noise In Land Use Planning and Control*, Federal Interagency Committee On Urban Noise, June 1980, p. 6

ANSI Guidelines

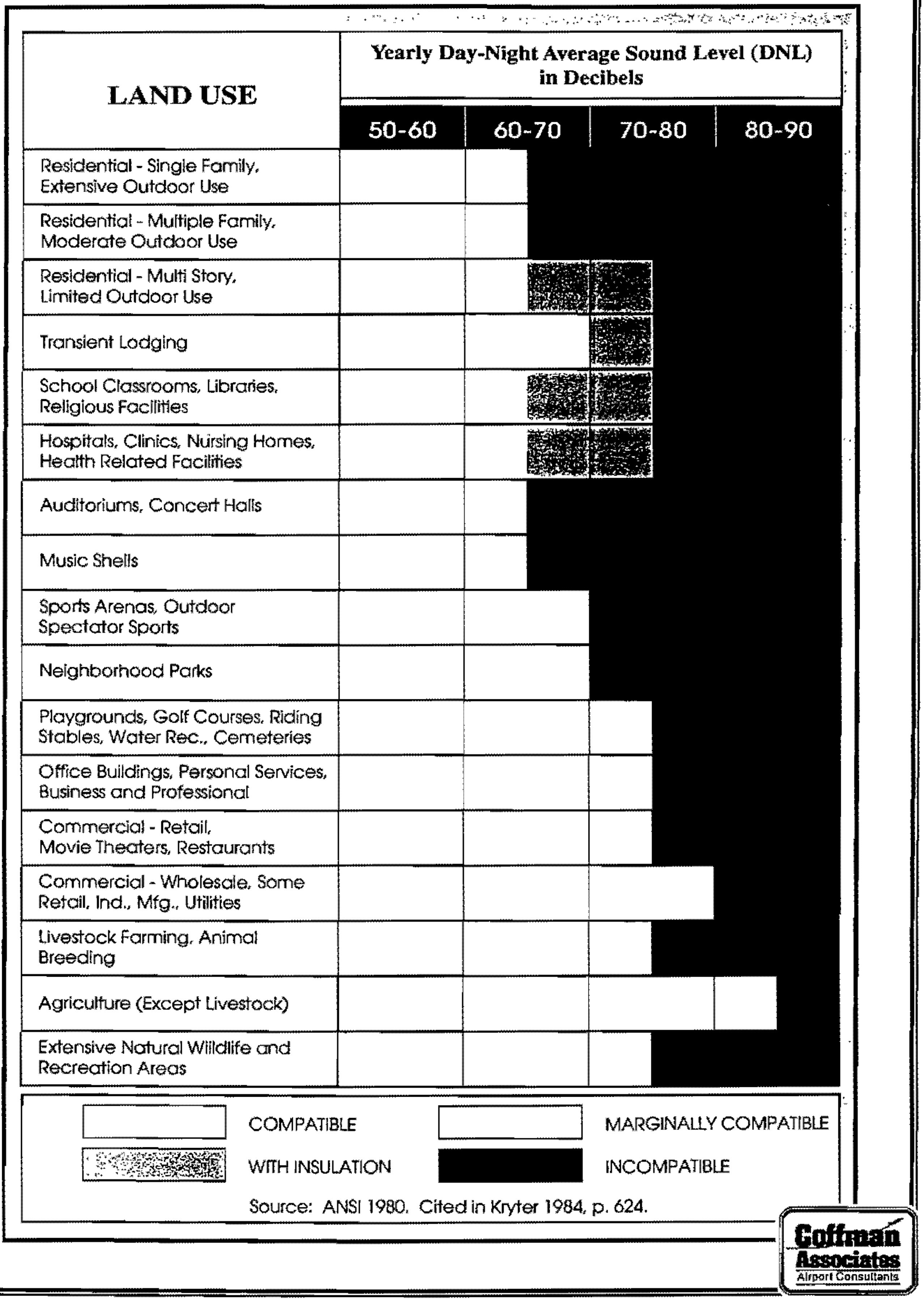
In 1980, the American National Standards Institute (ANSI) published recommendations for land use compatibility with respect to noise (ANSI 1980). Kryter (1984, p. 621) notes that no supporting data for the recommended standard is provided.

The ANSI guidelines are shown in **Exhibit D**. While generally similar to the Federal Interagency guidelines, there are some important differences. First, ANSI's land use classification system is less detailed. Second, the ANSI standard acknowledges the potential for noise effects below the 65 DNL level, describing several uses as "marginally compatible" with noise below 65 DNL. These include single-family residential (from 55 to 65 DNL), multi-family residential, schools, hospitals, and auditoriums (60 to 65 DNL), and music shells (50 to 65 DNL). Other outdoor activities, such as parks, playgrounds, cemeteries, and sports arenas, are described as marginally compatible with noise levels as low as 55 or 60 DNL.

F.A.R. Part 150 Guidelines

The FAA adopted a revised and simplified version of the Federal Interagency guidelines when it promulgated F.A.R.

94SP02-LU D-3/15/94



Land Use Exhibit D

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

Part 150 in the early 1980s. (The Interim Rule was adopted on January 19, 1981. The final rule was adopted on December 13, 1984, published in the Federal Register on December 18, and became effective on January 18, 1985.) Among the changes made by FAA include the use of a coarser land use classification system and the deletion of any reference to any potential for noise impacts below the 65 DNL level.

The determination of the compatibility of various land uses with various noise levels, however, is very similar to the Interagency determinations.

Exhibit E lists the F.A.R. Part 150 land use compatibility guidelines. These are only guidelines. Part 150 explicitly states that determinations of noise compatibility and regulation of land use are purely local responsibilities. Lacking any specific guidance provided by state law or regulation, local airport sponsors around the country typically use the Part 150 land use guidelines as is when developing noise compatibility studies under F.A.R. Part 150.

SELECTED STATE LAND USE COMPATIBILITY GUIDELINES

Oregon Land Use Compatibility Guidelines

In 1981, the Oregon Department of Transportation published Volume VI of the State Aviation System Plan, *Airport Compatibility Guidelines*. It includes noise and land use compatibility guidelines. It defines three areas of impact and proposes general land use guidelines in each. The "severe noise impact zone" corresponds with the 70 DNL contour. The "substantial noise impact zone" corresponds with the area between 65 and 70 DNL. The "moderate noise impact zone" corresponds with the 55 to 65 DNL range. **Table 5** lists these guidelines.

The Oregon guidelines are based on administrative regulations of the Department of Environmental Quality, adopted by the Oregon Environmental Quality Commission in 1979 (Oregon Administrative Rules, Chapter 340, Division 35, Section 45). Air carrier airports are required to do studies defining the airport impact boundary, corresponding to the 55 DNL contour. Where any noise-sensitive property occurs within the noise impact boundary, the airport must develop a noise abatement program.

An Oregon airport noise abatement program may include many different recommendations for promoting land use compatibility. These include changes in land use planning, zoning, and building codes within the 55 DNL contour. In addition, disclosure of potential noise impacts may be required and purchase of land for non-noise sensitive public use may be permitted within the 55 DNL contour.

Within the 65 DNL contour, purchase assurance, voluntary relocation, soundproofing, and purchase of land is permitted.

LAND USE E-9/13/94

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

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

See other side for notes and key to table.

Coffman Associates Airport Consultants

Land Use Exhibit E

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

KEY

Y (Yes) Land Use and related structures compatible without restrictions.

N (No) Land Use and related structures are not compatible and should be prohibited.

NLR Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, 35 Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

NOTES

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

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

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

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

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

6 Residential buildings require a NLR of 25.

7 Residential buildings require a NLR of 30.

8 Residential buildings not permitted.

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

Coffman Associates
Airport Consultants

Land Use Exhibit E (Continued)
F.A.R. PART 150 LAND USE
COMPATIBILITY GUIDELINES

TABLE 5
Oregon Land Use Compatibility Guidelines

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

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

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

California Guidelines

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

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

California noise insulation standards apply to new hotels, motels, apartment buildings, and other dwellings not including detached single-family homes. They require that "interior noise levels attributable to outdoor sources shall not exceed 45 decibels (based on the DNL or CNEL metric) in any habitable room." In addition, any of these residential structures proposed within a 60 CNEL noise contour require an acoustical analysis to show that the proposed design will meet the allowable interior noise level standard. (California Code of Regulations, Title 24, Part 2, Appendix Chapter 35.)

In the Airport Land Use Planning Handbook (Caltrans 1993, p. 3-3), land use compatibility guidelines are suggested for use in the preparation of comprehensive airport land use plans. The guidelines suggest that no residential uses should be permitted within the 65 CNEL noise contour. In quiet communities, it is recommended that the 60 CNEL should be used as the maximum permissible noise level for residential uses. At rural airports, it is noted that 55 CNEL may be suitable for use as a maximum permissible noise level for residential uses.

These guidelines are similar to those proposed in an earlier edition of the *Airport Land Use Planning Handbook* (Caltrans 1983, p. 50). The older guidelines had a more detailed list of land use compatibility criteria, although the recommended lowest thresholds for residential land use compatibility were essentially the same.

EMERGING TRENDS IN LAND USE COMPATIBILITY GUIDELINES

In recent years, citizen activists, anti-noise groups, and environmental organizations have become concerned that the current methods of assessing aircraft noise are not sufficient. Among the concerns is that 65 DNL does not adequately represent the true threshold of significant noise impact. It has been argued that the impact threshold should be lowered to 60 or even 55 DNL, especially in areas of quiet background noise and in areas impacted by large increases in noise (*ANR*, V. 4, N. 12, p. 91; V. 5, No. 3, p. 21; V. 5, N. 11, p. 82).

In the 1990s, there were several significant events which, taken together, indicate a distinct movement toward the consideration of airport noise impacts below the 65 DNL level.

IN CONGRESS

In the 1992 session of Congress, a bill was introduced to lower the threshold for non-compatible land uses from 65 to 55 DNL (*ANR*, V. 4, N. 11, p. 83). The bill, however, was not passed. In 1995, a bill (HR 1971) was introduced in the House of Representatives to require the Department of Transportation to develop a plan to reduce the number of people residing within the 60 DNL contours around airports by 75 percent by January 1, 2001 (*ANR*, V. 7, N. 13, p. 101). This bill has not passed either. Nevertheless, these developments indicate concerns about aircraft noise below 65 DNL are coalescing into specific proposals to address the situation.

RALEIGH-DURHAM ARBITRATION

Also in 1992, an important arbitration proceeding between Raleigh-Durham International Airport and airport neighbors was concluded. Residents residing between the 55 and 65 DNL contours were awarded compensation for noise damages. This was apparently the first time damages had been awarded beyond the 65 DNL contour at any domestic airport (ANR V. 4, No. 14, p. 107). While, strictly speaking, this case sets no legal precedent, it provides further evidence that a change in the definition of the threshold of significant noise impact may be gathering momentum.

After the arbitration was concluded, the Raleigh-Durham Airport Authority developed a model noise ordinance that would require new housing between the 55 and 60 DNL contours to be sound-insulated to achieve an outdoor-to-indoor noise level reduction of 30 dB. Between the 60 and 65 DNL contours, a 35 dB reduction would be required. The model ordinance was proposed for use by local governments exercising land use control. (See ANR, V. 6, N. 3, p. 17.)

FICON REPORT

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

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

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

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

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

RECENT DEVELOPMENTS AT THE FAA

Early in 1994, the FAA explicitly endorsed a proposal by the Fairfax County, Virginia Airports Advisory Committee to prohibit housing within the 60 DNL contour around Dulles International Airport. The County proposal also called for ensuring that new homes outside, but within one-half mile, of the 60 DNL be designed to ensure maximum interior sound levels of 45 decibels or less. (See *ANR*, V. 6, N. 7, p. 49.)

In 1993, the FAA established a Study Group on Compatible Land Use to look at the issue of airport land use compatibility. The Study Group included representatives of airports, the aviation industry, communities, and community groups. Its final report was released in January 1995. A major part of the Group's deliberations centered on the sufficiency of 65 DNL as a threshold for determining land use compatibility. Community representatives argued for a lower compatibility threshold. At one point, the idea of establishing 60 DNL as the threshold of compatibility for new residential development was under active discussion. The final report, however, did not endorse this position. One final recommendation supported the consideration by local governments of a flexible approach in setting airport noise thresholds for land use compatibility. It was recommended that the FAA "continue to support locally initiated compatible land use planning beyond the DNL 65 dB contour, when appropriate." (See *ANR*, V. 6, N. 5, p. 33; V. 6, N. 12, p. 93; V. 7, N. 2, p. 10.)

CONCLUSIONS

This technical information paper has presented information on land use compatibility guidelines with respect to noise. It is intended to serve as a reference for the development of policy guidelines for F.A.R. Part 150 Noise Compatibility Studies.

There is a strong and long-lasting consensus among various government agencies that 65 DNL represents an appropriate threshold for defining significant impacts on non-compatible land use. Nonetheless, both research and empirical evidence suggest that noise at levels below 65 DNL is often a concern. Increased concern about these lower levels of noise has been registered in public forums across the country. Official responses by public agencies indicate at least a partial acknowledgement of these concerns. Indeed, in Oregon and California, airport noise analysis and compatibility planning below the 65 DNL level is strongly advised or required.

In urbanized areas with relatively high background noise levels, 65 DNL continues to be a reasonable threshold for defining airport noise impacts. In suburban and rural locations, lower noise thresholds deserve consideration. Given emerging national trends and the experience at many airports, it can be important to assess aircraft noise below 65 DNL, especially in areas with significant amounts of undeveloped land where land use compatibility planning is still possible. Future planning in undeveloped areas around airports should recognize that the definition of critical noise thresholds is undergoing transition. In setting a prudent course for future land use near airports, planners and policy-makers should try to anticipate these changes.

REFERENCES

ANR (*Airport Noise Report*), selected issues, Ashburn, VA.

ANSI 1980. *Sound Level Descriptors for Determination of Compatible Land Use.* American National Standards Institute, ANSI S3.23 - 1980 (ASA 22-1980).

Caltrans 1983. *Airport Land Use Planning Handbook - A Reference and Guide for Local Agencies.* Prepared for California Department of Transportation, Division of Aeronautics by the Metropolitan Transportation Commission and the Association of Bay Area Governments, July 1983.

Caltrans 1993. *Airport Land Use Planning Handbook.* Prepared for California Department of Transportation, Division of Aeronautics by Hodges & Shutt, Santa Rosa, California, in association with Flight Safety Institute; Chris Hunter & Associates; and University of California, Berkeley, Institute of Transportation Studies, December 1993.

FAA 1977a. *Impact of Noise on People.* U.S. Department of Transportation, Federal Aviation Administration, May 1977.

FAA 1977b. *Airport Land Use Compatibility Planning,* AC 150/5050-6. U.S. Department of Transportation, Federal Aviation Administration, Washington, DC.

FICON 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues.* Federal Interagency Committee on Noise, Washington, DC.

FICUN 1980. *Guidelines for Considering Noise in Land Use Planning and Control.* Federal Interagency Committee on Urban Noise, Washington, DC.

Finegold, L.S. et al. 1992. "Applied Acoustical Report: Criteria for Assessment of Noise Impacts on People." Submitted to *Journal of Acoustical Society of America.* June 1992. Cited in FICON 1992.

Kryter, K.D. 1984. *Physiological, Psychological, and Social Effects of Noise,* NASA Reference Publication 1115.

ODOT 1981. *Airport Compatibility Guidelines, Oregon Aviation System Plan, Volume VI,* Oregon Department of Transportation, Aeronautics Division, Salem.

Richards, E.J. and J.B. Ollerhead, 1973. "Noise Burden Factor — A New Way of Rating Noise," *Sound and Vibration,* Vol. 7, No. 12, December.

Coffman Associates
Airport Consultants

Schultz, T.J. and McMahon, N.M. 1971. *HUD Noise Assessment Guidelines.* Report No. HUD TE/NA 171, August 1971. (Available from NTIS as PB 210 590.)

U.S. DOD 1964. *Land Use Planning with Respect to Aircraft Noise.* AFM 86-5, TM 5-365, NAVDOCKS P-98, U.S. Department of Defense, October 1, 1964. (Available from DTIC as AD 615 015.)

U.S. EPA 1974. *Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety.* U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., March 1974.

U.S. EPA 1991. *A Review of Recent Public Comments on the Application of Aircraft Noise Descriptors.* U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, DC. Cited in FICON 1992.

Coffman Associates

Airport Consultants

KANSAS CITY
(816) 524-3500

237 N.W. Blue Parkway
Suite 100
Lee's Summit, MO 64063

PHOENIX
(602) 993-6999

4835 E. Cactus Rd.,
Suite #235
Scottsdale, AZ 85254