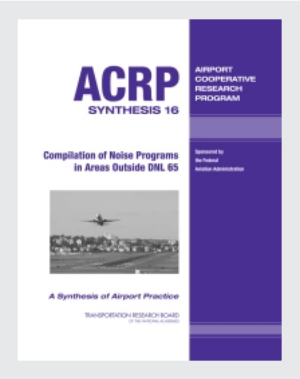

Compilation of Noise Programs in Areas Outside DNL 65

DETAILS

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP SYNTHESIS 16

Compilation of Noise Programs in Areas Outside DNL 65

A Synthesis of Airport Practice

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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), and the Air Transport Association (ATA) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

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The authors wish to acknowledge the thoughtful contributions of the ACRP Panel members to the design and review of this synthesis. The authors also wish to thank survey participants for their time and interest in this project, especially Sandy Lancaster (Dallas–Ft. Worth International Airport) for providing so much information about the DFW noise program and Ted Soliday (Naples Municipal Airport) for sharing the Naples story. Finally, Gail Staba (TRB staff) has been a valuable asset in coordinating team members and survey participants.

FOREWORD

Airport administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the airport industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire airport community, the Airport Cooperative Research Program authorized the Transportation Research Board to undertake a continuing project. This project, ACRP Project 11-03, "Synthesis of Information Related to Airport Practices," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute an ACRP report series, *Synthesis of Airport Practice*.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

PREFACE

By Gail Staba
Senior Program Officer
Transportation
Research Board

This synthesis study is intended to inform airport operators, stakeholders, and policy makers about alternative actions currently used by airports to address noise outside the DNL (Day–Night Average Noise Level) 65 contour. Federal policy identifying DNL 65 as the level of cumulative aircraft noise considered "significant" can be traced to the U.S.DOT's Aviation Noise Abatement Policy of 1976. No formal policy statements have been issued since 1976 that address noise outside DNL 65.

For this ACRP synthesis, an online survey of airport staff was conducted regarding noise outside DNL 65. The survey was designed primarily to identify the reasons for addressing noise outside DNL 65, and the wide range of noise abatement, mitigation, and communication techniques used to address noise outside DNL 65 that extend beyond sound insulation.

Mary Ellen Eagan and Robin Gardner, Harris Miller Miller & Hanson, Inc., Burlington Massachusetts, collected and synthesized the information and wrote the report. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

CONTENTS

COMPILATION OF NOISE PROGRAMS IN AREAS OUTSIDE DNL 65

SUMMARY

There are a number of existing and emerging reasons that airport operators need or desire to take action to address noise outside the Day–Night Average Noise Level (DNL) 65 contour, including the following:

- Airports are required by court order,
- Reasonable and cost-effective programs are available to address residential concerns outside DNL 65,
- Airports have adopted local land use compatibility guidelines that apply to lower impact levels,
- Airports have made commitments in support of airport capacity projects,
- Existing noise compatibility has matured and substantial complaints exist in areas outside the DNL 65 contour, and
- Federal and international policy is moving outside DNL 65.

Review of the actions leading to adoption of DNL 65 land use compatibility guideline demonstrates that it was intended to be adjusted as industry needs changed (in particular, as technology improvements resulted in quieter aircraft). In addition, adoption of the DNL 65 guideline in the 1970s and 1980s reflected a compromise between what was environmentally desirable and what was economically and technologically feasible at the time. Federal policy identifying DNL 65 as the level of cumulative aircraft noise considered "significant" can be traced to the U.S.DOT's Aviation Noise Abatement Policy of 1976. No formal policy statements have been issued since 1976 that address noise outside DNL 65.

For this ACRP synthesis, an online survey of airport staff was conducted regarding noise outside DNL 65. The survey was designed primarily to identify the reasons for addressing noise outside DNL 65, and the wide range of noise abatement, mitigation, and communication techniques used to address noise outside DNL 65 that extend beyond sound insulation. Potential survey recipients were identified by the consultant and Project Panel based on some knowledge of noise issues at subject airports. Other airports were invited to participate through an article in the newsletter *Airport Noise Report.* As a result, the pool of respondents does not necessarily reflect average opinion on the subject of noise outside DNL 65; it does, however, represent a diverse sample of airports in terms of size and geography. Of the 43 airports targeted, 35 responded for an 81% response rate, which exceeds the 80% target for ACRP synthesis studies. Given the relatively small sample size, conclusions should not be considered definitive for all airports, but illustrative of the range of challenges airports face and the variety of approaches to address them.

The survey included five general questions regarding noise issues outside DNL 65. The responses to these questions are instructive:

- *A majority of respondents* (*83%*) *indicated that noise issues outside DNL 65 were* "*important,*" "*very important,*" *or* "*critical*" *to their airport.* The remaining 17% were evenly split, stating that noise issues outside DNL 65 were "somewhat important," or "not at all important."

- *The most frequently listed method of minimizing noise outside DNL 65 was operator education and outreach* (*74% of respondents*), followed by noise abatement flight tracks (69%), preferential runway use programs (66%), noise abatement departure or arrival procedures (60%), and ground noise control (51%).
- *Eighty percent of respondents indicated that* "*community concerns*" *were the motivation for addressing noise outside DNL 65;* 57% also indicated that "preventive planning" was a motivation.
- *Almost three-quarters of respondents* (*74%*) *indicated that more than 75% of their airport's noise complaints come from people who live outside DNL 65.*
- *The most common outreach tools to communicate with people exposed to noise outside DNL 65 are websites* (*74%*), *community meetings/forums* (*74%*), *online tracking* (*40%*), *and newsletters* (*40%*).

The survey also found the following:

- *A majority of surveyed airports use noise abatement departure* (*63%*) *and arrival* (*51%*) *flight tracks and departure* (*54%*) *and arrival cockpit procedures* (*40%*) *to minimize noise over residential and other noise-sensitive neighborhoods.* However, among surveyed airports there is no consistency in methodology among airports for evaluating noise abatement outside DNL 65, and there is little guidance or support from the FAA on appropriate metrics or criteria for evaluating noise abatement procedures.
- *Most airports reported some procedures to minimize ground noise* (*69%*); *25% of those airports reported that the procedures were developed primarily to address noise outside DNL 65, and an additional 38% reported that procedures were developed to address noise issues both inside and outside DNL 65.*
- *More than half of the surveyed airports* (*57%*) *reported having land use compatibility measures that apply outside DNL 65.* The tools used by airports for land use compatibility planning include zoning, building permits that require sound insulation of residential and noise-sensitive nonresidential land uses, and disclosure to residents.
- *The majority of respondents* (*58%*) *do not provide sound insulation to homeowners living outside DNL 65.* However, 20% provide sound insulation for homes in contiguous neighborhoods ("block rounding"), and an additional 15% provide sound insulation for homes within the DNL 60 dB contour.
- *Nearly three-quarters of respondents* (*74%*) *reported that they use both websites and face-to-face meetings to communicate with people exposed to noise outside DNL 65.*
- *The responding airports communicate with pilots about noise outside DNL 65 in a number of ways:* the most common are pilot briefings (40%) and Jeppesen inserts (40%), posters and handouts (37%), and FAA standards (17%); other methods include airfield signage, Airport Facility Directory Special Notices, videos distributed through flight schools, and phone calls.

The two case studies presented in this synthesis were selected to reflect a diversity of airport size, geography, and strategies to address noise issues outside DNL 65. The case studies demonstrate that there is a need for airports to have flexibility in addressing noise outside DNL 65—whether because communities have demanded it (Naples Municipal Airport) or because the airport has conducted proactive planning (Dallas/Ft. Worth International Airport). Both airports offer strategies that could be adopted by other airports as best practices for similar situations; the common elements include invested staff, consistent and transparent communication, and close collaboration with local land use planning organizations.

This synthesis identified the need for additional research in the following areas:

- "Toolkit" of strategies to address noise outside DNL 65 with recommended best practices that could help airports identify those strategies best suited for a variety of noise issues outside DNL 65.

- Communication—Better methods are needed for working with local communities.
- Evaluation of noise abatement strategies outside DNL 65, including noise metrics, criteria, and benefit-cost analyses.
- Land use measures—This study identified a need to identify the barriers to implementing land use measures.
- Complaints—The relationship between noise complaints and noise level is still not well understood. Areas for research in this area include: (1) an evaluation of how complaints are made, recorded, and dealt with; (2) how airport operators use and evaluate complaint levels to drive noise programs; and (3) how airport operators evaluate the effectiveness of noise programs through changes in complaints.
- Case studies: Those described in this synthesis are instructive; however, the scope of this project did not allow for an in-depth analysis or discussion of some of the best practice strategies that could be derived from these airports.

CHAPTER ONE

INTRODUCTION

This report presents the results of ACRP Project S02-03, Compilation of Noise Programs in Areas Outside DNL 65. This introductory chapter describes the purpose of the report, presents the methodology used to develop the report, and outlines the organization of the report.

PURPOSE OF REPORT

There has been widespread industry discussion on programs to address land use compatibility outside the annual average 65 Day–Night Average Sound Level (DNL) contour. This ACRP synthesis project grew out of such industry discussion, and the need to understand the issue of noise outside DNL 65. The focus of this synthesis is a compilation of noise programs in areas outside DNL 65. Its goal is to compile in one location current federal law and policy and how it is applied regionally, and to provide the state of the practice of noise program measures targeted outside DNL 65 at airports. The discussion of noise program measures outside DNL 65 is not limited to mitigation measures such as sound insulation, but includes the entire range of strategies to address aircraft noise issues, including noise abatement procedures, ground noise policies, land use compatibility planning, and community and operator outreach.

REPORT STRUCTURE

The rest of this document presents the following:

Chapter two—Regulations, Policies, and Court Cases Governing Issues of Noise Outside DNL 65—A compilation of existing policies and regulations, plus relevant court decisions (published and as-available).

Chapter three—Survey of Airports Regarding Noise Outside DNL 65—A summary of the survey conducted for this synthesis, including survey methodology, and an overview of results.

Chapter four—Operational Procedures—Information on the development and implementation of noise abatement procedures designed specifically to address noise issues outside of DNL 65.

Chapter five—Land Use and Sound Insulation Policies—A summary of information on land use policies that prevent or remediate incompatibilities outside of DNL 65.

Chapter six—Communication and Outreach—A summary of information on the communication and outreach techniques airports use to address noise outside DNL 65.

Chapter seven—Case Studies—Two case studies of airports that have addressed noise outside DNL 65.

Chapter eight—Conclusions—A summary of the information collected for this synthesis and a discussion of future research needs.

The four appendixes include a copy of the synthesis survey (Appendix A), the survey results (Appendix B), and two case studies (Dallas/Ft. Worth International Airport, Appendix C, and Naples Municipal Airport, Appendix D). References, including reports, websites, and data sources used in preparing the synthesis report, and a glossary of terms, abbreviations, and acronyms are also included.

CHAPTER TWO

REGULATIONS, POLICIES, AND COURT CASES GOVERNING ISSUES OF NOISE OUTSIDE DNL 65

There are a number of existing and emerging reasons that airport operators may need or desire to take action to address noise outside the DNL 65 contour, including the following:

- Because of complaints from areas outside DNL 65, airports have identified reasonable and cost-effective programs to reduce noise impacts at lower noise levels; this is especially true for operational noise abatement flight procedures, such as Continuous Descent Arrivals (CDA) [The Continuous Descent Arrival, also referred to as the Continuous Descent Approach, has proven to be highly advantageous over conventional "dive-and-drive" arrival and approach procedures. The environmental and economic benefits of CDA were demonstrated in flight tests at Louisville International Airport in 2002 and 2004; there are significant reductions in noise (on the order of 6 to 8 dB for each event) owing to reductions in thrust and a higher average altitude (Clarke 2006)], and Noise Abatement Departure Profiles (NADPs) [FAA Advisory Circular (AC) 91-53A, *Noise Abatement Departure Profiles* (1993), identifies two departure profiles—the close-in departure profile and the distant departure profile—to be used by air carrier operators. The AC outlines acceptable criteria for speed, thrust settings, and airplane configurations used in connection with each NADP. These NADPs can then be combined with preferential runway use selections and flight path techniques to minimize, to the greatest extent possible, the noise impacts], as well as some advanced navigation procedures such as Required Navigation Procedures [Area Navigation (RNAV) enables aircraft to fly on any desired flight path within the coverage of ground- or space-based navigation aids, within the limits of the capability of the self-contained systems, or a combination of both capabilities. As such, RNAV aircraft have better access and flexibility for point-to-point operations. RNP is RNAV with the addition of an onboard performance monitoring and alerting capability (FAA 2008)].
- Airports have adopted local land use compatibility guidelines that apply to lower impact levels: Several jurisdictions have used DNL 60 dB in defining planning objectives or goals (Coffman Associates 2000).
- Airports have made commitments in support of airport capacity projects; for example, at Ft. Lauderdale, the FAA agreed in its Final Environmental Impact Statement (EIS) on a runway extension to allow Broward County to follow neighborhood boundaries to mitigate for noise impact. This block-rounding will double the number of homes eligible for insulation or purchase assurance from just more than 1,000 to more than 2,000 ("ATA Says Block-Rounding at Bob Hope, Ft. Lauderdale Int'l Has Gone Too Far" 2008).
- The existing noise compatibility program has matured and substantial complaints exist in areas outside the DNL 65 contour: A recent study conducted by the FAA's Center of Excellence for aviation noise and emissions research, PARTNER (Partnership for AiR Transportation Noise and Emission Reduction), concluded that significant complaints come from areas beyond DNL 65 (Li 2007). The staff at airports that respond to aircraft noise complaints finds that an increasing portion of their time is spent addressing concerns from residents outside the DNL 65.
- Federal policy is moving outside DNL 65: The Joint Planning and Development Office has determined that noise must be aggressively addressed to meet the capacity requirements of the Next Generation Air Transportation System (NextGen). Recently, the FAA has identified targets for noise reduction, including a near-term target to maintain its current 4% annual reduction in the number of people exposed to DNL 65 or greater, and commensurate or greater reduction of the number of people exposed to DNL 55–65; as well as a long-term target, first bringing DNL 65 primarily within airport boundary, and later DNL 55 primarily within airport boundary (FAA 2008).
- Airports are required by court order: Two recent cases [Naples v. FAA (2005) and State of Minnesota et al. v. MAC (2007)] have determined that airports must address noise impacts beyond the current DNL 65 land use compatibility guidelines.

Review of the actions leading to adoption of DNL 65 land use compatibility guideline indicates that it was intended to be adjusted as industry needs changed (in particular, as technology improvements resulted in quieter aircraft). Federal noise policy has always recognized that land use compatibility decisions should be made at the local level. In addition, adoption of the DNL 65 guideline in the 1970s reflected a compromise between what was environmentally desirable and what was economically and technologically feasible at the time.

This chapter addresses the existing and proposed applicable laws, policies, and regulations, plus relevant court decisions

(published and as-available). The chapter includes federal, state, and local requirements, as appropriate. Table 1 summarizes the relevant regulations and policies that have evolved to the current application of DNL 65 as a threshold of normally compatible residential land use.

REGULATIONS ADDRESSING NOISE OUTSIDE DNL 65

Three entities share responsibility for the regulation of airports and aircraft: (1) the FAA, (2) the airport proprietor, and (3) the state and local government(s) with land use jurisdiction over the airport property. Often, the airport proprietor also is the local government with land use authority; however, there are several examples of states, intergovernmental agencies, and major metropolitan cities operating airports on property under the jurisdiction of one or more governmental bodies.

Congress and the FAA have developed a program primarily focused on allocating money to airports and local governments to address noise. In 1979, Congress adopted the Aviation Safety and Noise Act, which, in addition to its financial components, required the FAA to "establish a single system of measuring noise . . . establish a single system for determining the exposure of individuals to noise resulting from airport operations . . . and identify land uses normally compatible with various exposures of individuals to noise" (49 U.S.C. § 47502).

The FAA addressed these requirements in Federal Aviation Regulation (FAR) Part 150 as follows:

- As the unit of measurement, the FAA selected the *A-weighted sound level,* referred to as dB(A) or often simply as dB, which measures sound in the manner most

TABLE 1
DNL 65 TIMELINE

Date	Event	Result
1972	Congress passed Noise Control Act	Required EPA Administrator to conduct a study of the " . . . implications of identifying and achieving levels of cumulative noise exposure around airports . . . " and to "publish . . . information on the levels of environmental noise the attainment and maintenance of which in defined areas under various conditions are requisite to protect the public health and welfare with an adequate margin of safety."
1973	EPA published *Impact Characterization of Noise Including Implications of Identifying and Achieving Levels of Cumulative Noise Exposure,* PB224408, July 1973	Identified DNL as the measure of cumulative noise, and DNL 60 dB as the threshold of compatibility; below this level, there should be limited annoyance and minimal complaints about aircraft noise.
1974	EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety,* March 1974	Recommended that Day–Night Level not exceed 55 dB
1974	Maryland passed Environmental Noise Act of 1974	Set DNL 65 dB as its official noise limit for residential land use effective 1 July 1975, and DNL 60 dB when the "U.S. Fleet Noise Level is reduced 5 dB below 1 July 1975 level."
1976	FAA adopted Aviation Noise Policy	Clarified roles of federal government, airport operator, and local government and identified a goal of "confining severe aircraft noise exposure levels around U.S. airports to the areas included within the airport boundary or over which the airport has a legal interest, and of reducing substantially the number and extent of areas receiving noise exposure levels that interfere with human activity."
1979	Congress passed Airport Safety and Noise Act (ASNA)	Required the FAA to "establish a single system of measuring noise . . . establish a single system for determining the exposure of individuals to noise resulting from airport operations . . . and identify land uses normally compatible with various exposures of individuals to noise."
1984	FAA adopted FAR Part 150	Identified noise levels below DNL 65 dB as guideline for normally compatible with residential uses in Appendix A.
1990	Congress passed Airport Noise and Capacity Act	Directed the FAA to create two new regulations that: (1) required a phase out, by January 1, 2000 (with limited exceptions) of Part 36 Stage 2 civil subsonic turbojet aircraft with maximum gross takeoff weights over 75,000 pounds, and (2) established stringent requirements for airport proprietors to follow prior to adopting new restrictions on operations of Stage 2 or 3 aircraft.
2004	Congress passed Vision 100	Prohibited FAA from issuing Part 150 approval of AIP funding for land use compatibility actions outside the DNL 65 noise contour from 2004 through 2007. Also added Section 160, which allows local jurisdictions to undertake noise compatibility planning.

AIP = Airport Improvement Program.

consistent with human hearing [by reducing the contribution of lower and very high frequencies to the total level) [14 C.F.R. Pt 150, App A § A150.3(a)].

- For purposes of evaluating noise exposure, the FAA selected the *Day–Night Average Sound Level* (DNL), the 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 a.m., and between 10 p.m. and midnight, local time. The symbol for DNL is Ldn [14 C.F.R. Pt 150, App A § A150.3(b)].
- With respect to *land use compatibility,* the FAA published a table in its regulations (14 C.F.R. Part 150, Appendix A), which prescribes whether a variety of different land use categories are compatible with aircraft operations for a particular range of noise levels (14 C.F.R. Pt 150, App A § Table 1). That table identifies DNL 65 dB as the threshold of compatibility for most residential land uses, and where measures to achieve outdoor to indoor Noise Level Reduction of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals.

Each of these requirements has been the subject of confusion and contention. For example, there have been complaints that dB(A) fails to account for low frequency noise (experienced as vibration or rumble) often associated with jet operations. The primary complaint with DNL is that it does not reflect the sound of individual aircraft operations, which may be dramatically louder than the steady rate of sound captured by DNL. In addition, although some contend that the DNL 65 dB level represents a scientifically and statistically accurate predictor of community annoyance, others assert that it is a poor predictor of how a particular community or an individual responds to aircraft noise.

In addition to establishing these noise measurement tools, FAR Part 150 established a program for airports to develop (1) a "noise exposure map" or NEM that models existing and future noise exposure and identifies the areas of incompatible land use, and (2) a "noise compatibility program" or NCP that identifies, examines, and recommends to the FAA alternative means to mitigate and abate noise [49 U.S.C §§ 47503 (noise exposure maps) and 47504 (noise compatibility programs); 14 C.F.R. Pt. 150].

The NCP often is a principal component of an airport's overall noise program since the NCP (1) is intended to be comprehensive, both in its evaluation of noise issues and potential solutions, (2) presents an opportunity for community involvement and input, and (3) provides an indication of which noise control measures are eligible for federal funding.

Part 150 identifies certain measures that should be considered in preparing the noise compatibility program; these are summarized in Table 2.

POLICIES ADDRESSING NOISE OUTSIDE DNL 65

Aircraft noise and land use compatibility has long been recognized as an important consideration in planning of communities and the airports that serve these communities (President's Airport Commission May 1952). The quantitative approach to determining land uses compatible with aircraft noise began with the Noise Control Act of 1972. It required the U.S. EPA Administrator to conduct a study of the " . . . implications of identifying and achieving levels of cumulative noise exposure around airports . . . " (U.S. EPA 1973). This requirement resulted in the identification of DNL as the measure of cumulative noise, and DNL 60 dB as the threshold of compatibility;

TABLE 2
NOISE COMPATIBILITY PROGRAM MEASURES

Operational Measures	Land Use Measures	Program Management Measures
• Implementing a preferential runway system to direct air traffic over less-populated areas • Using flight procedures, including noise abatement approach and departure procedures • Identifying flight tracks to reduce noise and/or direct air traffic over less-populated areas • Adopting mandatory restrictions based on aircraft noise characteristics, such as curfews • Identifying a particular area of the airport that can be used for aircraft engine runups and constructing a "ground runup enclosure" to reduce noise from runups	• Acquiring noise-impacted property • Acquiring "avigation easements" or other interests in property that permit aircraft to fly over the property in exchange for payments or other consideration • Requiring disclosure about the presence of the airport and potential noise impacts in real estate documents • Constructing berms or other noise barriers • Sound insulation of structures used for noise-sensitive land uses (e.g., residences, schools, nursing homes) • Requiring the use of sound insulating building materials in new construction • Imposing zoning or other controls on noise-sensitive land uses in impacted areas, including prohibiting such development or requiring special permits and approvals	• Posting signs on the airfield and at other locations at the airport to notify pilots about recommended flight procedures and other measures • Creating a noise office at the airport and/or assigning responsibility for noise issues to a staff member • Creating a dedicated telephone line or other means for neighbors to submit comments/complaints about the airport and individual aircraft operations • Making flight track information available to the public • Developing educational materials about the airport's noise program for pilots, other airport users, and community members

below this level, there should be limited annoyance and minimal complaints about aircraft noise. This report (U.S. EPA 1973) provides extensive discussion of why DNL was chosen and why DNL 60 dB was identified as the appropriate limit of exposure. The discussion focuses on effects on people and communities, including hearing, interference with speech, sleep and learning/thinking, annoyance, and complaints, and provides some information on nonauditory health effects.

The Noise Control Act of 1972 also required the EPA Administrator to publish " . . . information on the levels of environmental noise the attainment and maintenance of which in defined areas under various conditions are requisite to protect the public health and welfare with an adequate margin of safety." This requirement resulted in what is now commonly referred to as "The Levels Document," (U.S. EPA 1974). This report recommended that to provide this protection, the value of the Day–Night Level not exceed 55 dB.

Next, the state of Maryland passed the Maryland Environmental Noise Act of 1974. This legislation included the requirement that the Maryland Department of Transportation (DOT), State Aviation Administration select the noise analysis method and exposure limits. In its report *Selection of Airport Noise Analysis Method and Exposure Limits* (1975), Maryland set DNL 65 dB as its official noise limit for residential land use effective 1 July 1975, and DNL 60 dB when the "U.S. Fleet Noise Level is reduced 5dB below 1 July 1975 level." In discussing the selection of the compatibility DNL level, the report noted that neither Congress nor the EPA intended to set limits for states and local jurisdictions. "This is a decision that the Noise Control Act clearly leaves to the states and localities themselves." Maryland's policy is notable because it has often been described as one of the models for the later Part 150.

Federal policy for civil aviation noise is described in the FAA's 1976 Aviation Noise Policy, which included a goal of "confining severe aircraft noise exposure levels around U.S. airports to the areas included within the airport boundary or over which the airport has a legal interest, and of reducing substantially the number and extent of areas receiving noise exposure levels that interfere with human activity" (FAA 1976). The DOT policy recommended use of the Noise Exposure Forecast (NEF) metric and stated that "severe" aircraft noise occurred at levels of 40 NEF or more, and "significant" aircraft noise occurred at levels of 30 NEF or more. The policy further identified NEF 30 and 40 as equivalent to DNL 65 and 75, respectively. The policy also stated that "the objective of the airport noise plan should be to develop noise reduction techniques that to the extent possible would confine the area exposed to this level of noise to the airport boundary or land actually being used or which can reasonably be expected to be used in a way compatible with these noise levels."

In 1984, the FAA adopted the final rule that set out the process for noise compatibility planning around airports—14 CFR Part 150. In this regulation, the FAA provided a table giving various land uses compatible with Day–Night Average Sound Levels. This table shows that residential uses are considered compatible with levels below DNL 65 dB. Most Part 150 studies result in identification of noise abatement measures (e.g., changes in flight operations, and runway use) and/or noise mitigation measures (commonly sound insulation). Through fiscal year 2006, the FAA has provided more than $7.5B for implementation of these measures (FAA 2008). The FAA also uses DNL and specific computation procedures for its calculation to comply with the National Environmental Policy Act (NEPA) (FAA Orders 1050, 1E and 5050.4B) and for guiding the funding of projects associated with the Airport Improvement Program (AIP) (FAA Order 5100.38C).

A few states and many local jurisdictions have recommended DNL values identical to those of FAA for land use compatibility with aircraft noise, though some also identify dimensions of a "noise sensitivity zone" (Minnesota, Oregon). Several jurisdictions have used DNL 60 in defining planning objectives or goals (Coffman Associates 2000). Limits are provided as guidance (Wisconsin, Oregon), and may include zoning ordinances and planning templates (Oregon). Other states, notably California and Maryland, have set specific procedures that must be followed in examining airport or aircraft noise. The Department of Defense also provides similar DNL-based levels for determining *Air Installations Compatible Use Zones* (1977), which incorporate noise and accident potential in setting the size and shape of the zones. Further, the department will provide funding and guidance to a community that wishes to develop a plan for setting in place land use compatibility measures around military air installations, but generally provides no funding to implement those measures (*Joint Land Use Study* . . . 2002).

The FAA has rarely funded land use programs outside DNL 65 in order to focus on airports with significant (as defined by DNL 65) or severe (as defined by DNL 75) noise exposure. As the existing noise mitigation programs mature at airports, and with increasing numbers of operations by quiet aircraft, the proportion of citizens outside the DNL 65 complaining about aircraft noise has increased. Today, noise offices at many airports have an increasing workload to respond to these complaints. Furthermore, in some locations, approval of airport capacity improvements has been contingent on the ability to address noise/land use conflicts outside DNL 65.

A requirement of Vision 100 (Public Law 108-176) prevented the FAA from issuing AIP funding under Part 150 for land use compatibility actions outside the DNL 65 noise contour from 2004 through 2007. Although the provision has sunset, there continues to be opposition to funding of such action ("ATA Says Block-Rounding at Bob Hope, Ft. Lauderdale Int'l Has Gone Too Far" 2008). In some instances, this provision also resulted in FAA's refusal to adopt noise abatement flight procedures if such procedures were directed at

reducing noise outside the DNL 65. In contrast, funding has been allocated to the FAA's Center of Excellence to develop procedures such as the CDA procedure, which primarily reduces noise in the DNL 45–60 contours for most airports.

The FAA has been looking beyond DNL 65 in an attempt to determine what will be necessary for airports to accommodate the anticipated growth in air travel demand and to produce the next generation air traffic system. The FAA has indicated that a change to address noise outside DNL 65 will be essential to meet both the capacity goals of the Next Generation Air Transportation System and furthering the development of additional noise stringencies in the international arena. FAA recently articulated its NextGen targets as follows (FAA 2008):

- Maintain current target of 4% annual reduction in number of people exposed to DNL 65 or more near-term (compared with 2000 to 2002), and achieve commensurate or greater reduction of the number of people exposed to DNL 55–65.
- Achieve greater reductions mid- and long-term, first bringing DNL 65 primarily within airport boundary, and later DNL 55 primarily within airport boundary.

CAPACITY ENHANCEMENT COMMITMENTS ADDRESSING NOISE OUTSIDE DNL 65

In recent years, airports have made commitments in support of airport capacity projects that include mitigation of noise beyond DNL 65. Several examples follow.

- The FAA's 1998 Record of Decision on the Environmental Impact Statement for the Minneapolis–St. Paul International Airport (MSP), Dual Track Airport Planning Process: New Runway 17/35 and Airport Layout Plan Approval included a noise mitigation plan that called for sound insulation to DNL 60. The noise mitigation plan was developed by a Noise Mitigation Committee consisting of mayors of cities surrounding MSP, Northwest Airlines, Metropolitan Council, and the Metropolitan Airports Commission (MAC) (FAA 1998).
- The Los Angeles World Airports (LAWA) worked in partnership with the Los Angeles International Airport (LAX) Coalition for Economic, Environmental, and Educational Justice (LAX Coalition) to develop a program to ensure that communities affected by the LAX Master Plan Program also receive benefits as a result of the implementation of the Program. The Community Benefits Agreement details the various proposals of mitigation and benefit, including increased funding for the aircraft noise mitigation program, end-of-block sound insulation, suspension of avigation easements for noise, and a FAR Part 161 Study for limitations on nighttime departures (Los Angeles World Airports 2008).
- At Ft. Lauderdale, the FAA agreed in its Final Environmental Impact Statement (EIS) on a runway extension to allow Broward County to follow neighborhood boundaries to mitigate for noise impact. This block-rounding will double the number of homes eligible for insulation or purchase assurance from just over 1,000 to more than 2,000 ("ATA Says Block-Rounding at Bob Hope, Ft. Lauderdale Int'l Has Gone Too Far" 2008).

COURT CASES ADDRESSING NOISE OUTSIDE DNL 65

A number of airport environmental cases have challenged noise analyses conducted for studies performed under the NEPA. In most of these cases, the petitioners have argued that the noise analysis was insufficient; however, in all cases, the courts have deferred to FAA's methodology. These cases include:

- Suburban O'Hare Commission v. Dole: In this case, the Suburban O'Hare Commission asked the court to rule on the adequacy of the EIS prepared for O'Hare International Airport and, in particular, the methodology used to develop noise contours. The parties agreed on the use of DNL 65 as an impact criterion.
- Citizens Against Burlington v. Busey: In this case, the petitioners alleged insufficient analysis of noise impacts, and that the noise analysis should include noise outside DNL 65 dB (specifically, sleep disturbance). The court found the FAA's DNL 65 analysis sufficient.
- Communities INC v. Busey: In this case, the petitioners argued that the EIS noise analysis should have addressed noise outside DNL, especially as related to historic properties. The court deferred to the FAA's use of DNL 65 as the sole impact criterion.
- Seattle Community Council Federation v. FAA: In this case, petitioners asked the court to consider whether it was reasonable for the FAA to rely on DNL 65 as the threshold of noise impact for proposed airspace changes. The court deferred to FAA's discretion in the identification of DNL 65 as the threshold of impact.
- Morongo Band of Mission Indians v. FAA: In this case, the tribe challenged FAA's use of "urban" noise criteria (DNL 65) to evaluate noise levels on the reservation. Again, the court deferred to FAA's discretion for developing methodology.
- City of Bridgeton v. Slater: Challenge to noise methodology used. "The court also held that the FAA has discretion to adopt the noise methodology it deems appropriate without judicial second guessing."

In recent years, courts have determined that airports must address noise impacts beyond the current DNL 65 land use compatibility guidelines. Three examples of such decisions follow.

- In January 2007, the District Court for Hennepin County, Minnesota, granted summary judgment in favor of the city of Minneapolis and other plaintiffs in litigation

against the MAC (City of Minneapolis et al. v. Metropolitan Airports Commission 2007). The court found that MAC had failed to comply with its state law obligation to provide noise insulation in the DNL 60–65 dB contour around the MSP as promised in the EIS for the construction of the new Runway 17/35 and other documents.

- In June 2005, the U.S. Court of Appeals in Washington, D.C., ruled that a Stage 2 restriction at the Naples Municipal Airport was reasonable and the FAA erred in terminating the city of Naples Airport Authority's eligibility for AIP grants (City of Naples Airport Auth. v. FAA). Importantly for purposes of this discussion, the court found that the Stage 2 restriction was reasonable. In particular, the court found that it was permissible for the Airport Authority to consider the benefits of the restriction to individuals exposed to noise above DNL 60 dB. The court concluded, "The Airport Authority and the City of Naples introduced ample evidence—much of which went unrebutted—demonstrating that the Stage 2 ban was justified." The court further clarified that the FAA's land use compatibility guidelines do not bind local governments and that the Airport Authority properly relied on the threshold established by the local governments with land use jurisdiction.
- In Berkeley the Keep Jets Over the Bay Committee v. Board of Port Commissioners of the City of Oakland, the court found that the noise analysis in the city of Oakland's Environmental Impact Report (EIR) was insufficient because it did not "address adequately the potential disturbance to area residents resulting from increased nighttime air cargo operations, specifically, by omitting significant information about the airport's potential interference with sleep, including physiological response and annoyance from increased nighttime overflights. The flaw in the EIR's noise analysis was its failure to provide, in addition to a community noise equivalent level (CNEL) (a community noise measure) analysis, the most fundamental information about the project's noise impacts, which specifically included the number of additional nighttime flights that would occur under the project, the frequency of those flights, and their effect on sleep."

CHAPTER THREE

SURVEY OF AIRPORTS REGARDING NOISE OUTSIDE DNL 65

SURVEY METHODOLOGY

An online program was used to survey airports regarding noise outside DNL 65. The survey was developed in collaboration with the Project Panel, and was designed primarily to identify the reasons airports have addressed noise outside DNL 65, and the range of noise abatement, mitigation, and communication techniques used to address noise outside DNL 65. The survey is reproduced in Appendix A.

The survey was directed at targeted airports, which were identified through a review of FAA Part 150 records of approval and with the Project Panel's advice. The targets included a range of airport sizes and geographic locations. Potential survey recipients were identified by the consultant and Project Panel, based on some knowledge of noise issues at subject airports. In addition, the survey was announced in trade publications ("Airport Input Sought for ACRP Study of Noise Programs Going Outside DNL 65" 2007). Messages were distributed directly from the online survey program and reminders were also personally provided to target airports. These messages provided a short background on the ACRP program and reiterated the purpose and importance of this study. As a result, the pool of respondents does not necessarily reflect average opinion on the subject of noise outside DNL 65; it does, however, represent a diverse sample of airports in terms of size and geography.

Of the 43 airports targeted, 35 responded for an 81% response rate. Multiple choice questions regarding outreach tools, noise metrics, and noise abatement procedures allowed airports to check all options that applied; therefore, responses to some questions could total more than 100%. Appendix B contains the statistical summary of the survey results, as well as responses to open-ended questions including all written comments provided by respondents.

OVERALL SURVEY RESULTS

There were 35 total respondents to the synthesis survey. Of the 35 respondents, 7 were from California, 8 from Florida and the remaining 20 from throughout the country. Figure 1 depicts the locations of respondents.

Eighteen of the 35 airports surveyed (53%) had more than 250,000 annual operations, 29% had 100,000 to 250,000 annual operations, and 6% had less than 50,000 annual operations. Furthermore, 44% of the respondents work for an airport commission or authority, 27% work for a local government, and 24% work for an airport management agency. A majority of the survey respondents have more than 15 years experience.

The survey included five general questions regarding noise issues outside DNL 65. The responses to these questions are instructive:

- A majority of respondents (83%) indicated that noise issues outside DNL 65 were "important," "very important," or "critical" to their airport. The remaining 17% stated that noise issues outside DNL 65 were "somewhat important," or "not at all important."
- The most frequently listed method of minimizing noise outside DNL 65 was aircraft operator education and outreach (74% of respondents), followed by noise abatement flight tracks (69%), preferential runway use programs (66%), noise abatement departure or arrival procedures (60%), and ground noise control (51%).
- Eighty percent of respondents indicated that "community concerns" were the motivation for addressing noise outside DNL 65; 57% also indicated that "preventive planning" was a motivation.
- Almost three-quarters of respondents (74%) indicated that more than 75% of their airport's noise complaints come from people who live outside DNL 65.
- The most common outreach tools to communicate with people exposed to noise outside DNL 65 are websites (74%), community meetings/forums (74%), online tracking (40%), and newsletters (40%).

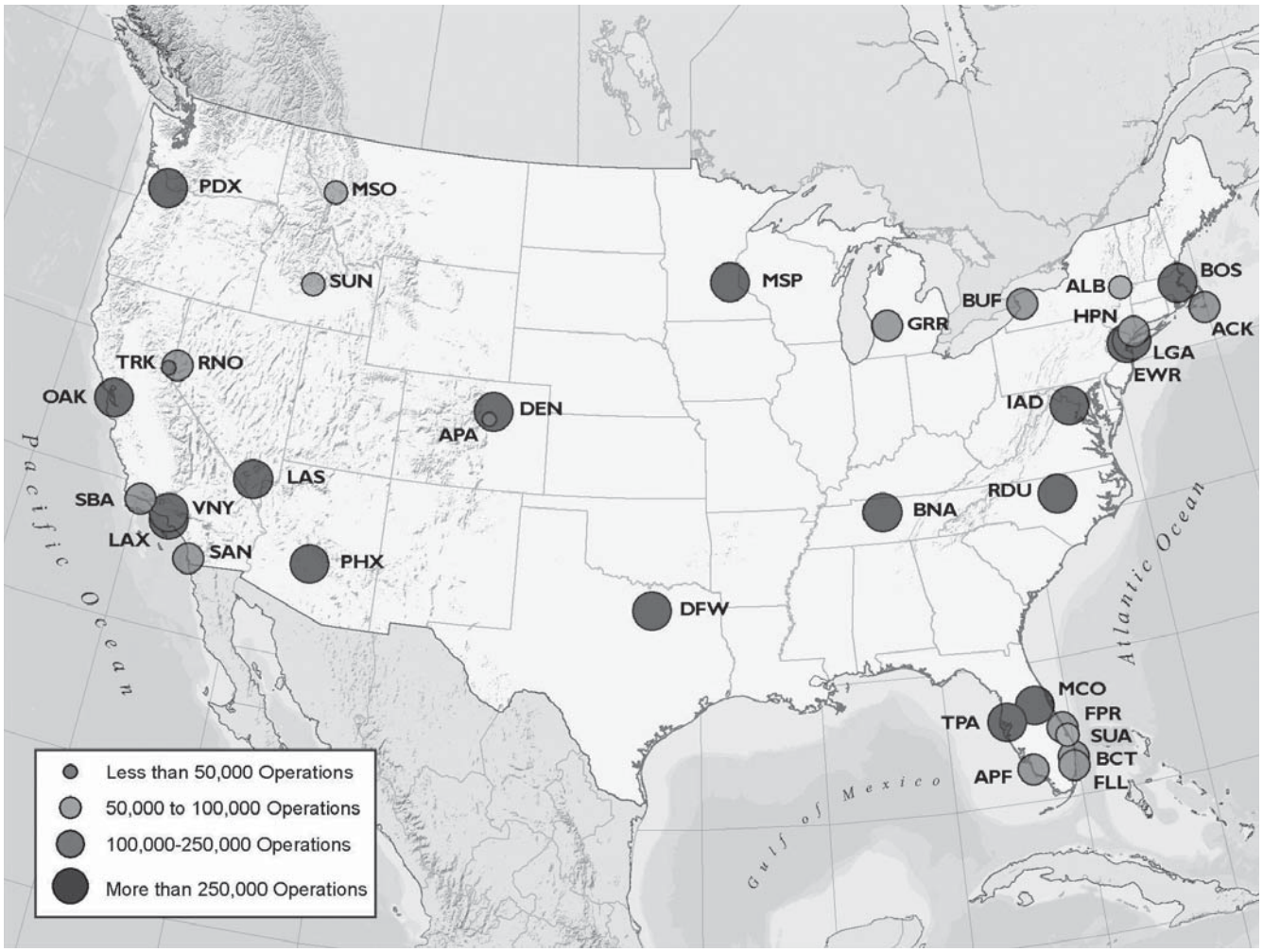

FIGURE 1 Location of survey respondents.

CHAPTER FOUR

OPERATIONAL PROCEDURES

This chapter presents results of the ACRP survey summarizing responses to questions on methods to minimize and abate aircraft noise, including noise abatement flight tracks, noise abatement operational procedures, and ground noise control.

NOISE ABATEMENT FLIGHT TRACKS AND FLIGHT PROCEDURES

Twenty-two of the surveyed airports (63%) have noise abatement flight tracks. Half (50%) reported that noise abatement flight tracks were developed to address noise both inside and outside DNL 65, and nearly 41% reported that the noise abatement tracks were developed *primarily to address noise outside DNL 65.* Further, all airports reported noise abatement flight procedures reduced noise and complaints outside DNL 65; 72% said noise abatement tracks were "very to moderately effective" in reducing noise and 62% said it was "very to moderately effective" in reducing community complaints.

Figure 2 presents responses to the question, "Type of noise abatement track" (note there can be multiple responses). The majority of these airports (63%) use jet departure noise abatement flight tracks, whereas 51% use jet arrival flight tracks. More than 30% of the airports use propeller and helicopter arrival and departure flight tracks.

Thirty-four percent of respondents (12) reported that they have received formal FAA approval for their noise abatement flight tracks; 11% reported they have received NEPA approval. Airports report that air traffic controllers implement the flight procedures as follows: 40% use vectoring, 29% specify VOR radials with turns and distant measuring equipment altitude requirements, 20% use RNAV, 14% use a global positioning system, and 20% cited other procedures but without air traffic control (ATC) assistance.

Airports reported a similar use of operational noise abatement procedures (i.e., cockpit procedures) designed to minimize noise during different types of operations. As shown in Figure 3, more than half of respondents (54%) have some type of noise abatement departure procedure (NADP) or International Civil Aviation Organization (ICAO) procedure; many also have jet arrival procedures such as CDA (40%), propeller departure procedures (43%), and propeller arrival procedures (37%); more than one-third (34%) reported helicopter departure and arrival procedures.

Airports typically communicate their noise abatement flight tracks and procedures to pilots in one of three ways: 37% use posters/hand-outs, 34% use Jeppesen inserts, and 29% use pilot briefings. FAA Standards are used by 17%, and 23% use other means to communicate flight procedures including air traffic controller instructions, tower instructions, airport websites, and the airport facility directory.

Survey respondents reported that a range of noise metrics are used to evaluate noise abatement flight tracks and procedures including DNL, CNEL, Maximum A-weighted Sound Level (L_{max}), Time Above, number of audible aircraft noise events, Sound Exposure Level (SEL) and Continuous Equivalent Sound Level (L_{eq}). Respondents also reported a wide range of noise levels used to evaluate flight tracks among the various noise metrics. Some airports reported that no assessment was conducted. Responses to this question suggest that there is a need for better guidance in developing noise abatement flight tracks.

The survey results suggest that airports do not have sufficient information on the implementation costs of noise abatement procedures, especially the costs to operators and the air traffic system. Eight airports reported that airline fuel costs are increased by implementing noise abatement flight procedures. The airports also commented that total aircraft operators cost for implementation was between nothing and $750K annually. Specific responses included, "A bit extra time and fuel" and "Minimal." FAA cost was reported as "Nothing" or "Unknown."

The challenges to implementing flight tracks are shown in Figure 4. The single greatest challenge that airports reported was communication with pilots (34%); other challenges to implementation included communication with ATC (29%), communication with the community (29%), increased flight time (26%), and increased fuel costs to airlines (20%).

Airports reported a variety of navigation procedures to implement noise abatement flight tracks: the most common is radar vectoring (40%), followed by VOR–distant measuring equipment (29%), RNAV (20%), and Global Positioning System (14%); three airports reported that the procedures were voluntary and had no ATC involvement.

Finally, respondents reported that both noise abatement flight tracks (Figure 5) and procedures (Figure 6) are generally

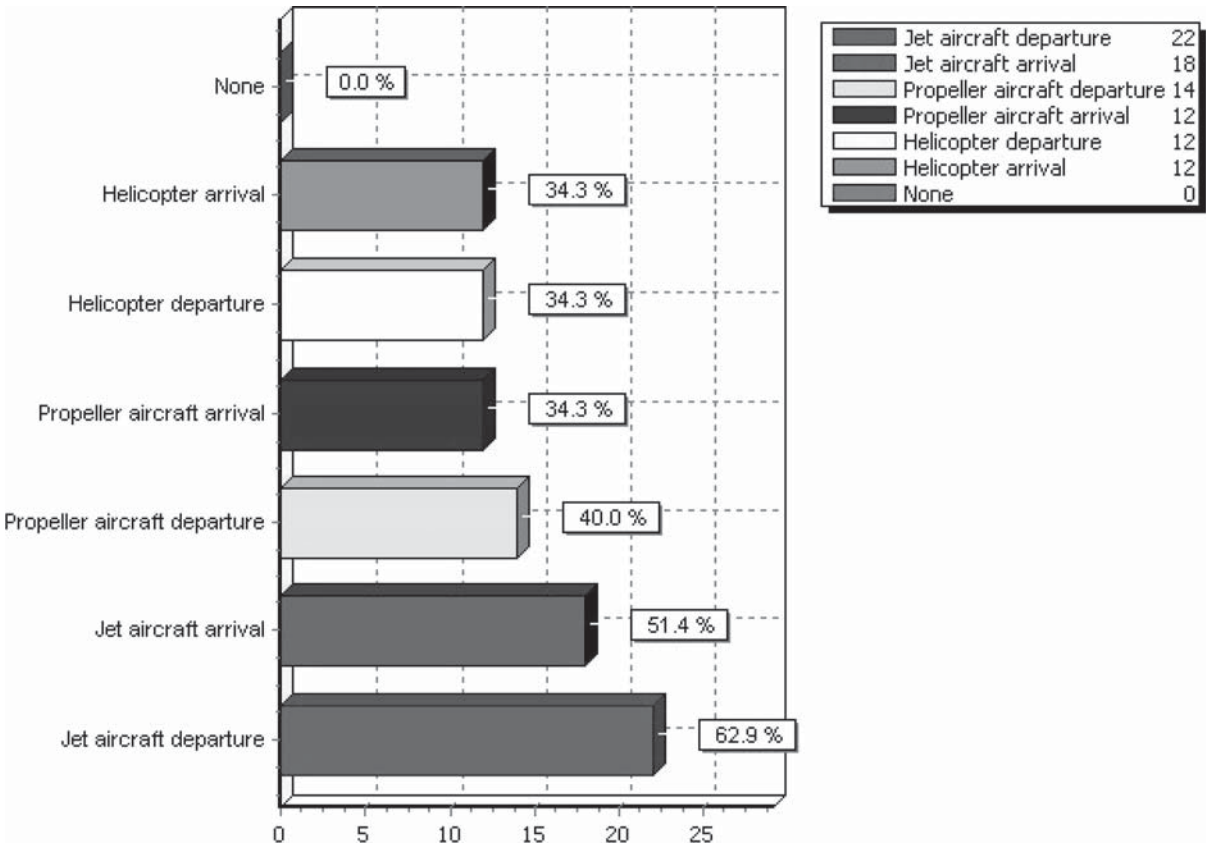

FIGURE 2 Types of noise abatement flight tracks at surveyed airports.

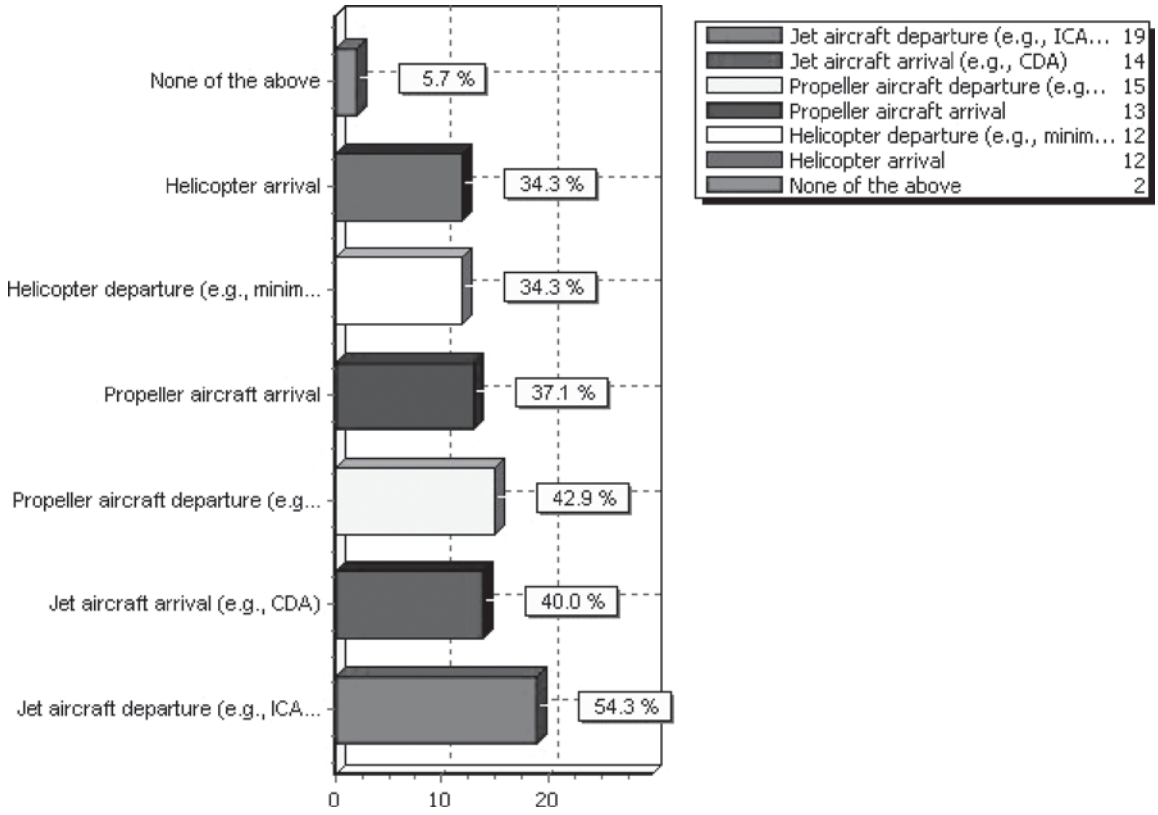

FIGURE 3 Types of noise abatement procedures at surveyed airports.

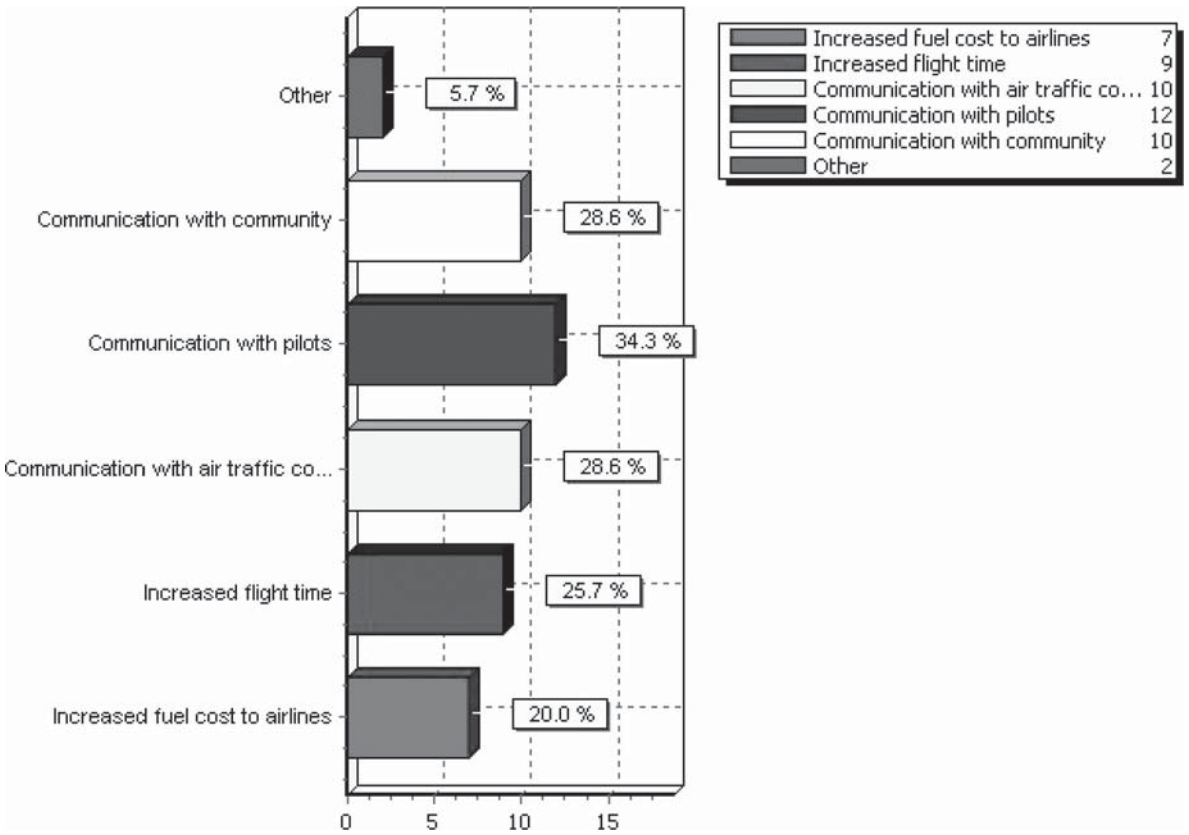

FIGURE 4 Challenges to implementing noise abatement flight tracks at surveyed airports.

"moderately effective" or "very effective" at reducing noise over noise-sensitive communities outside DNL 65, but somewhat less effective at reducing complaints outside DNL 65. Also, a higher percentage of respondents reported that flight tracks are "very effective" at reducing noise (36%) than report flight procedures as being "very effective" (19%).

AIRCRAFT GROUND NOISE CONTROL

Twenty-four of 35 airports (69%) reported some procedures to minimize noise from aircraft operations on the ground, such as taxi and pre-takeoff runups; of these, 38% said the procedures were primarily to address noise within DNL 65, 25% that the procedures were developed primarily to address noise outside DNL 65, and 38% that their procedures were developed to address noise issues both inside and outside DNL 65. The most common types of procedures are identified in Figure 7; they include physical construction of blast fences (31%), ground runup enclosures (GRE) (11%), and noise barriers/berms (20%); as well as runup procedures (29%), pre-takeoff runup policies (23%), reverse thrust policies (14%); and simply moving the aircraft away from noise-sensitive communities (23%).

Ground noise control procedures are implemented using formal rules and regulations (26%), informal means such as tower or air traffic controller coordination (14%), or both formal and informal means (31%). These procedures are communicated to pilots by posters (43%), briefings (31%), and

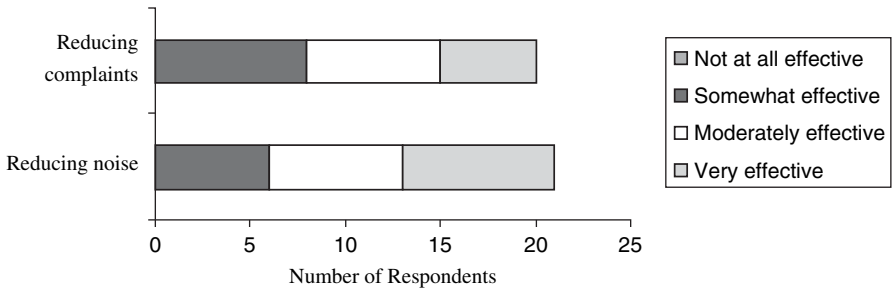

FIGURE 5 Effectiveness of noise abatement flight tracks at surveyed airports.

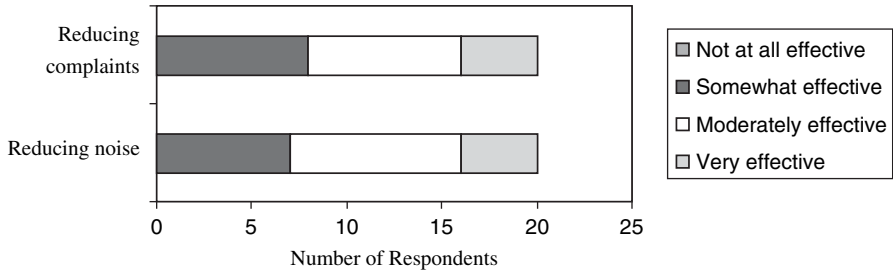

FIGURE 6 Effectiveness of noise abatement procedures at surveyed airports.

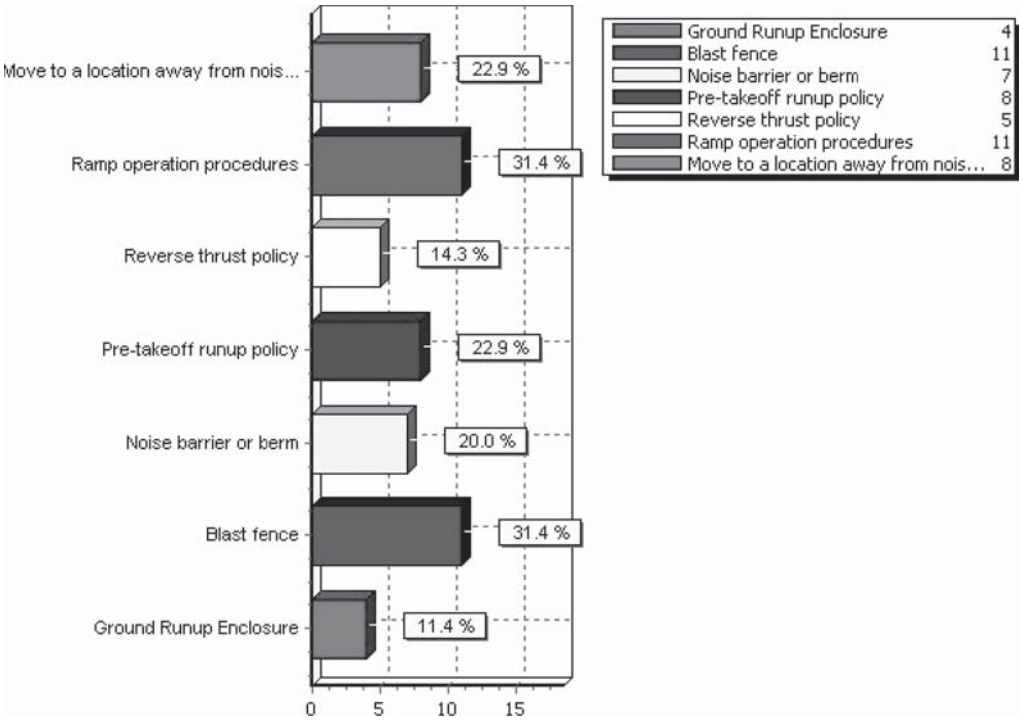

FIGURE 7 Types of ground noise procedures at surveyed airports.

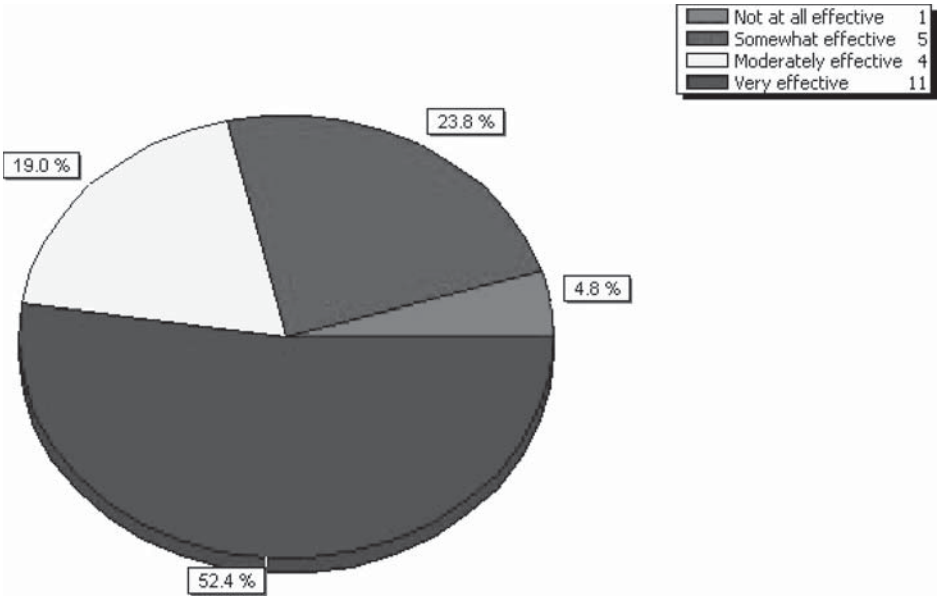

FIGURE 8 Effectiveness of ground noise procedures at surveyed airports.

other means such as airport operations or maintenance briefings (40%). Respondents reported that the greatest implementation challenges are communication with pilots (34%), communication with ground control (11%), and communication with the community (11%). Other implementation challenges reported included taxi time, fuel costs and emissions, and operations staff enforcing curfew rules.

Airports were very aware of implementation costs for capital expenditures such as GREs, but had little information on costs of other operational programs, and little information on costs to operators. The maximum reported airport cost was $8 million for a GRE, with the FAA contributing 80%. Respondents reported that ground noise control procedures are "very effective" at reducing noise complaints (52%) (see Figure 8).

CHAPTER FIVE

LAND USE AND SOUND INSULATION POLICIES

This chapter summarizes land use policies that prevent or remediate incompatibilities outside of DNL 65, including review of development proposals, zoning, easements, disclosure, sound insulation, building performance standards, and property acquisition.

PREVENTIVE LAND USE PLANNING

More than half of the surveyed airports (57%) reported having land use compatibility measures that apply outside DNL 65. The tools used by airports for land use compatibility planning include zoning, building permits that require sound insulation of residential and noise-sensitive nonresidential land uses, and disclosure to residents. Two airports reported that zoning prohibits residential development from DNL 60 to 65, and two airports permit residential development with sound insulation provided at either DNL 55 or 60. Other land use strategies include noise overlay districts, state compatibility plans, airport influence areas, and disclosure to 1 mile outside DNL 60. Navigation easements are used by 75% of the responding airports. Real estate disclosures are used by 65% of the responding airports.

Land use compatibility policies are communicated to homeowners and realtors through newsletters or handouts (27%), presentation to real estate boards (32%), and individual homeowner briefings (12%); 17% used other means of communication, such as working with government planning departments, public meetings, and responding to complaints. The airports' cost to implement land use incompatible policies outside DNL 65 are minimal: five respondents reported that their costs are "minimal" or that they rely on in-house construction, legal, and staff time; one respondent identified total implementation costs of $250,000. Although homeowners and realtors have no identified cost, airports noted other costs included city and county planning agencies and administrative.

Respondents indicated that the greatest challenges to implementation are coordinating with local land use officials (32%), coordinating with realtors (21%) and coordinating with homeowners (18%). Respondents also noted "Not all realtors or homeowners are cooperative even though they can be sued for non-compliance," "Recommendations [are] not always heeded," and "Sometimes the local officials do not contact the airport on critical land development."

Respondents reported a range of effectiveness: 21% said their efforts were "very effective" in preventing incompatible land uses outside DNL 65, 64% said their efforts were "somewhat or moderately effective," and 16% said their efforts were "not effective at all" (Figure 9).

SOUND INSULATION

The majority of respondents (58%) do not provide sound insulation to homeowners living outside DNL 65; 20% provide sound insulation for homes in contiguous neighborhoods ("block rounding"), and an additional 15% provide sound insulation for homes within the DNL 60 dB contour. Funding for sound insulation programs outside DNL 65 comes from the airport (50%), FAA funding through Passenger Facility Charges or AIP grants (36%), operators (7%), and homeowners (7%). Costs per home were reported between $10,000 and $15,000. Airports use a combination of funding sources for a maximum cost of $3.1 million for the entire program and a minimum cost of $10,000 per home. The FAA contributed 80% funding for contiguous neighborhood sound insulation programs.

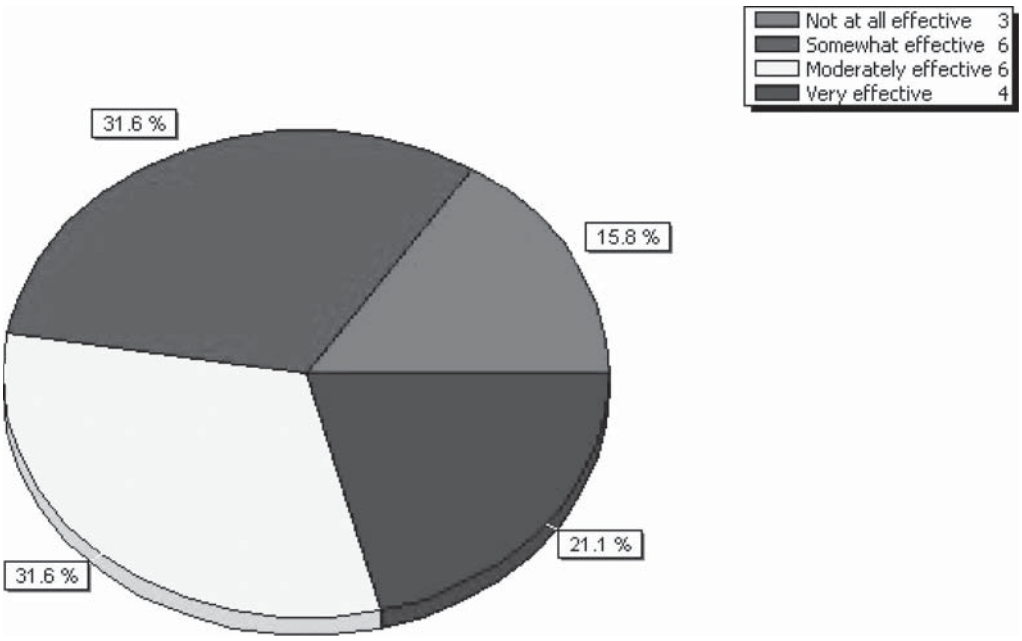

FIGURE 9 Effectiveness of land use policies at surveyed airports.

CHAPTER SIX

COMMUNICATION AND OUTREACH

This chapter summarizes the communication and outreach techniques airports use to address noise outside DNL 65.

COMMUNITY OUTREACH

Nearly three-quarters of respondents (74%) reported that they use both websites and face-to-face meetings to communicate with people exposed to noise outside DNL 65 (Figure 10). Airports also use online flight tracking (40%), newsletters (40%), and a variety of other tools such as quarterly and annual noise reports, noise staff driven outreach tools (brochures, e-mail noise alerts, local newspaper advertisements, etc.).

OUTREACH TO AIRCRAFT OPERATORS

The responding airports communicate with pilots in a number of ways: the most common being pilot briefings (40%), flight manual inserts (40%), posters and handouts (37%), and FAA standards (17%); other methods include airfield signage, Airport Facility Directory Special notices, videos distributed through flight schools, and phone calls (Figure 11).

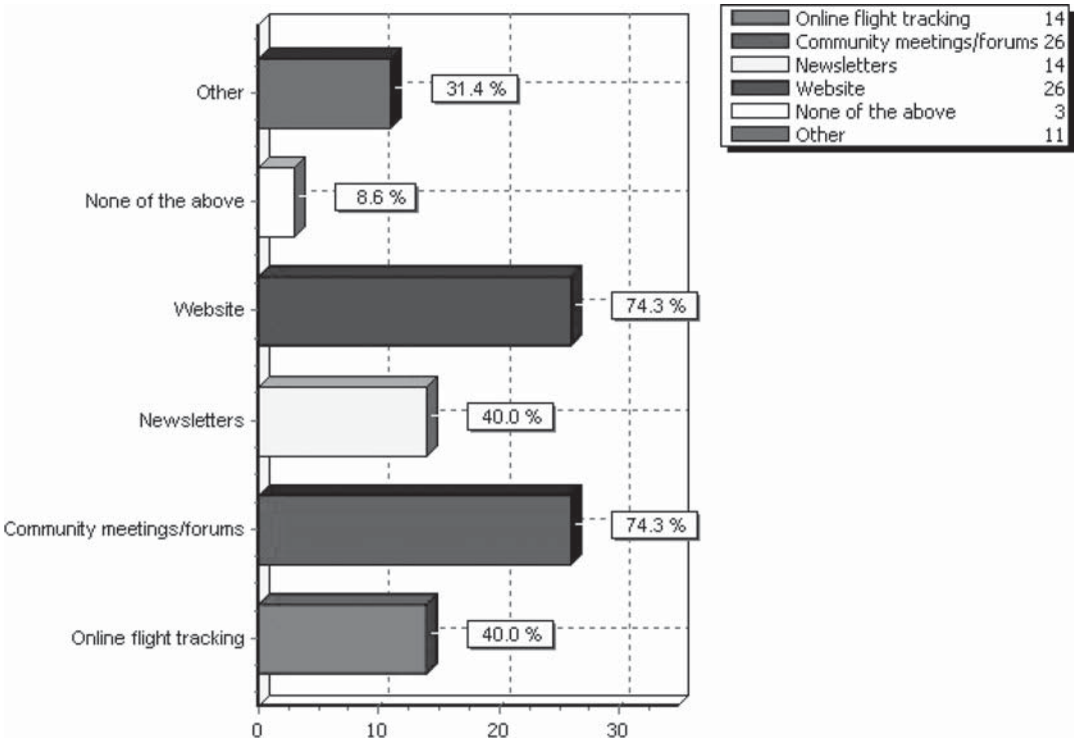

FIGURE 10 Community outreach tools at surveyed airports.

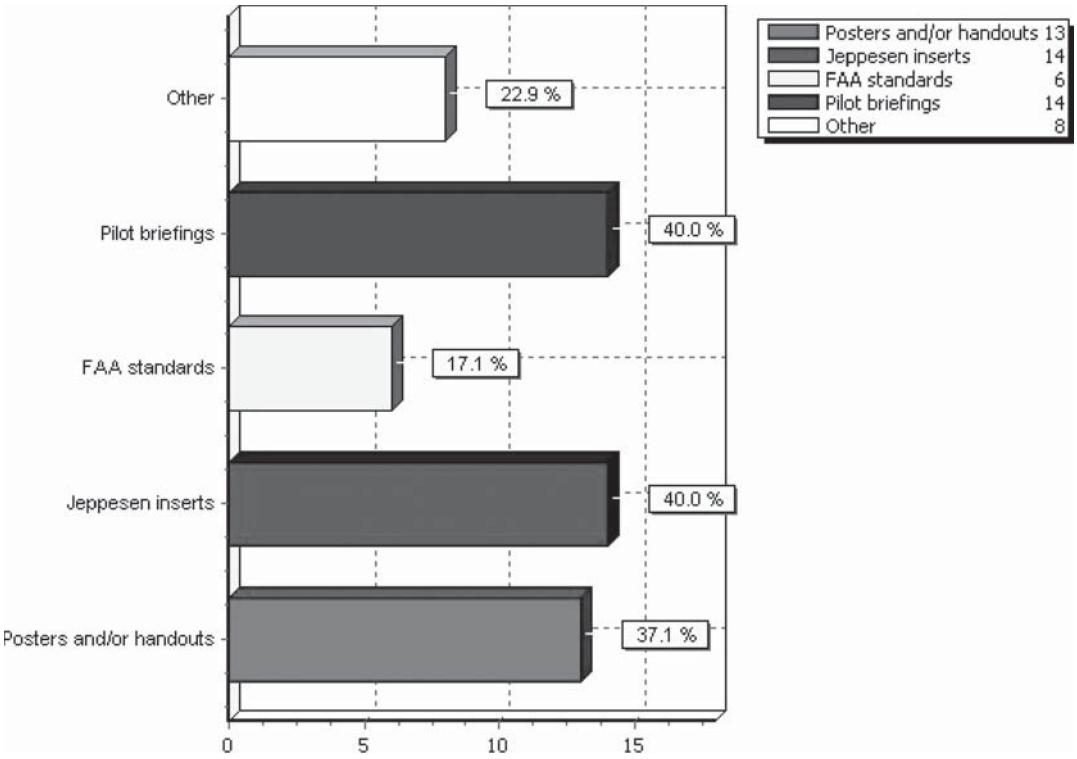

FIGURE 11 Outreach tools to airport operators at surveyed airports.

CHAPTER SEVEN

CASE STUDIES

The two case studies presented in this section demonstrate that there is a need for airports to have continued flexibility in addressing noise outside DNL 65—whether because communities have demanded it (Naples Municipal Airport) or because the airport has conducted proactive planning (Dallas/Ft. Worth International Airport).

NAPLES MUNICIPAL AIRPORT

The Naples Municipal Airport (APF) is the only airport in the United States with an approved Part 161 study; it has no residents living within the DNL 65 contour. A key factor in the success of the Part 161 study was Naples Airport Authority's diligence working with local land use planning jurisdictions to implement land use policies that were aimed at residential land uses to DNL 60 dB.

Part 150/161 Background

In 1987, the Naples Airport Authority (NAA) conducted its first FAR Part 150 study. As a result, in 1989, an Airport High Noise Special Overlay District was established that required rezoning for any new development or major redevelopment of land within the 65 dB DNL contour. In 1997, the NAA submitted a revised Part 150, which adopted DNL 60 dB as its threshold of compatibility for land use planning to preclude the development of incompatible uses in the vicinity of the Airport (Figure 12). The FAA approved 14 of 15 measures; perhaps most importantly, the FAA approved a ban on nonemergency night operations in Stage 1 jet aircraft. In 1998, the NAA submitted a second Part 150 update, which included a single measure: a 24-hour ban on nonemergency Stage 1 jet operations. In 1999, the FAA approved this measure. The implementation of this measure essentially eliminated any population within the DNL 65 dB contour.

Despite diligent—and successful—NAA efforts to implement the approved measures, including the Stage 1 ban, the NAA continued to receive community pressure regarding noise exposure. In August 1999, the NAA initiated a Part 161 study to identify potential operational restrictions that would be appropriate for addressing these community concerns. The Part 161 study determined that Stage 2 jets were the principal source of the noise impact that caused community concern. The number of people estimated to live within the 60 dB DNL contour if there were no restrictions in 2000 was approximately 1,400; a 24-hour ban on Stage 2 operations would reduce this to approximately 130. The Part 161 study was published in June 2000 and recommended the total ban on Stage 2 aircraft operations as the most reasonable and cost-effective measure to minimize incompatible land use. On January 1, 2001, the Stage 2 restriction went into effect.

Implementation of DNL 60 Land Use Compatibility Criteria by City of Naples and Collier County

The city of Naples Comprehensive Plan contained specific information regarding rezoning of areas affected or potentially affected by the airport for the first time in 1984. In 1989, the city updated the Comprehensive Plan to establish an Airport High Noise Special Overlay District (City Special District), depicted in the 1989 Comprehensive Plan as the area of land exposed to noise in excess of DNL 65 according to the five-year forecast case (1991) in the 1987 APF FAR Part 150 Study. Any applicant proposing to develop or significantly redevelop land in the City Special District was—and is today—required to first obtain a rezoning of the property to Planned Development. To obtain the rezoning, the proposed development or redevelopment must conform to existing zoning standards and must, after specific review for this purpose, be deemed compatible with the airport in terms of safety and noise.

In 1997, the city revised the map of the City Special District in the Comprehensive Plan to reflect the five-year forecast case (2001) 60 contour. In February 2001, the city and the NAA executed an interlocal agreement to update the District and Comprehensive Plan to reflect the 2005 forecast case DNL 60 contour.

In 1986, Collier County developed zoning maps indicating aircraft noise boundaries. In 1987, the Collier County planning department began referencing standards for sound control. In 1991, Collier County approved Ordinance 91-102 that redesigned aircraft noise zones using the five-year forecast case (1991) 65 dB DNL contour (County Special District), added land use restrictions, and implemented notification and sound level requirements for buildings and structures. These requirements are contained in the county's Land Development Code.

In June 1999, the NAA requested that the county adopt the five-year forecast case (2003) 60 dB DNL contour from the

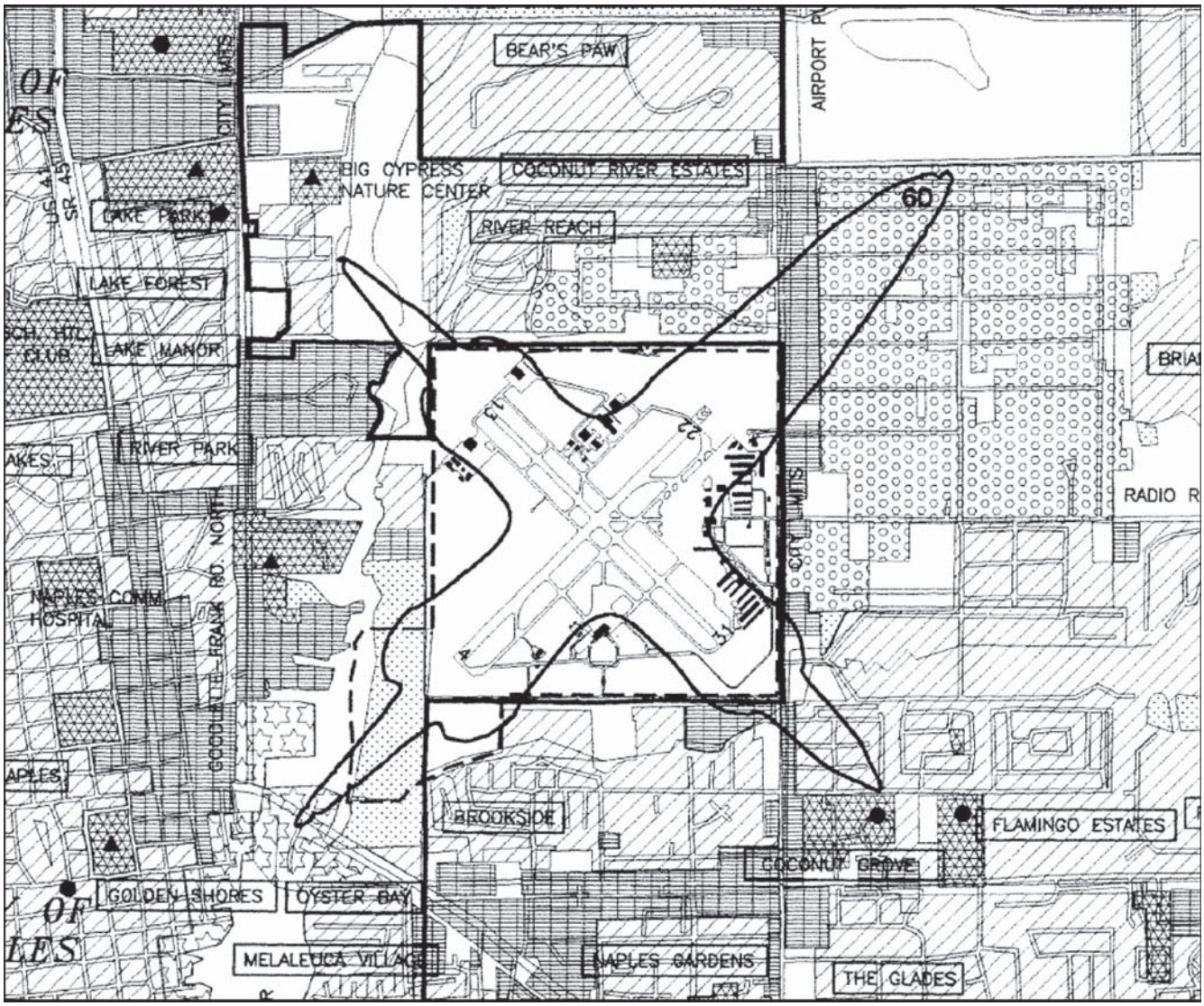

FIGURE 12 Forecast 2001 APF 60 dB DNL with NCP implemented.

1998 NEM. Collier County adopted the resolution in June 2000. That same month, the NAA requested the County use the five-year forecast case (2005) 60 dB DNL contour from the 2000 NEM Update for future land use planning. The county updated its zoning map in December 2000 to reflect those contours.

City and County Development Application Processes

In 2001, NAA staff met with city and county staff to review the processes that they follow on a day-to-day basis to identify development applications for properties located in the City Special District and the County Special District. As discussed previously, both of these overlay districts are based on 60 dB DNL contours. For the city, any applicant proposing development in the City Special District must submit a General Development Site Plan that provides the city council and staff the opportunity to consider the compatibility of the proposed development with the airport. The County Special District is incorporated directly in the zoning code, which provides applicants and county staff the ability to readily identify whether proposed development is located in the County Special District. As part of the county staff's review of the development application, staff considers whether the applicant has included necessary information to ensure compliance with the noise compatibility standards identified in the Land Development Code (i.e., land use restrictions, notifications, and sound insulation).

DALLAS/FT. WORTH INTERNATIONAL AIRPORT

Dallas/Ft.Worth International Airport (DFW) has used "policy contours" to guide development of residential and other noise-sensitive land uses around the airport. The contours are based on projections of ultimate aircraft noise made in the 1970s. These policy contours are larger than "acoustic" contours that

would reflect actual operations in recent years, yet provide a buffer to protect the airport. However, DFW is coming under increasing pressure from landowners to revise its policy contours and allow development closer to the airport.

Noise Contour History

DNL contours have been developed for DFW on the following occasions:

- In 1971, the North Central Texas Council of Governments developed a forecast set of DNL contours for future 1985 activity. These contours have been used over the years as policy contours and serve as an important factor in minimizing and preventing incompatible land use from developing around DFW.
- In the early 1990s, DFW prepared DNL contours for an EIS for the construction of two new runways and redevelopment of terminals. Neighboring cities challenged DFW Airport on zoning authority; court tests ensued on the EIS. In 1992, the FAA issued a Record of Decision; this decision also required DFW to "implement an extensive noise mitigation program . . . to mitigate for the increased noise levels to residences and other noise-sensitive uses."
- The most recent DNL contours for DFW were prepared in 2002 for the Environmental Assessment of new RNAV flight procedures. Those contours show that the 65 DNL noise contour for 2002 is almost entirely within the airport property boundary.

Figure 13 presents a comparison of DNL 65 contours at DFW over time, including the North Central Texas Council of Governments contours prepared in 1971 (for 1985 future operations—the policy contour); 1992 contours prepared for the Final EIS, and 2002 contours prepared for the RNAV Environmental Assessment.

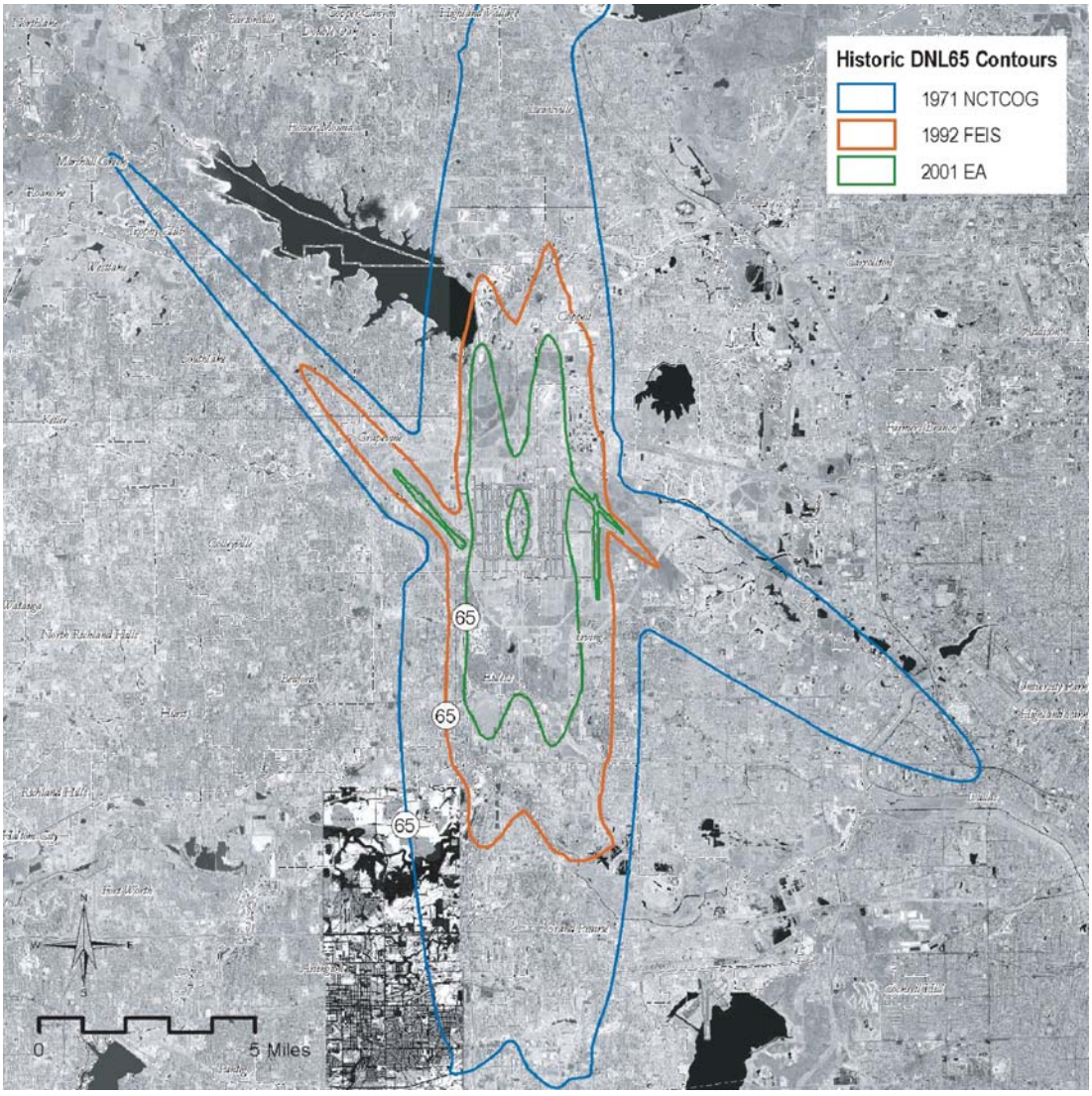

FIGURE 13 Comparison of historic DNL contours at DFW.

Dallas/Fort Worth Noise Program

Most of DFW's noise program is focused on areas outside DNL 65, including:

- Operational procedures to minimize noise in neighborhoods surrounding the airport: the FAA has implemented precision navigation procedures for departures using RNAV; this is estimated to improve efficiency and reduce noise in some areas—all outside DNL 65.
- Policy contours that limit noise-sensitive development in noncompatible areas. The DNL 65 noise contour as depicted on the policy contour is well outside the DNL 65 noise contour based on an acoustic contour of today; hence, DFW protects a substantial amount of land in its environs that is outside of the current 65 DNL.
- A state-of-the-art monitoring system to track noise levels over time.

One of the biggest challenges currently facing the airport is the continued application of policy contours for land use planning that does not reflect acoustic reality. DFW has committed to update noise contours by 2009. An important question remains over whether local jurisdictions will adopt updated noise contours for land use planning purposes, which will no doubt result in noise-sensitive development closer to DFW.

CHAPTER EIGHT

CONCLUSIONS

This ACRP synthesis provides background on the regulatory, policy, and legal development of Day–Night Average Noise Level (DNL) 65 in the United States, as well as results of an online survey of 35 airports that have demonstrated interest in the issue of noise outside DNL 65. The responses to the survey on noise issues outside DNL 65 included the following:

- A majority of respondents (83%) indicated that noise issues outside DNL 65 were "important," "very important," or "critical" to their airport. The remaining 17% reported that noise issues outside DNL 65 were "somewhat important" or "not at all important."
- The most frequently cited method of minimizing noise outside DNL 65 was operator education and outreach (74% of respondents), followed by noise abatement flight tracks (69%), preferential runway use programs (66%), noise abatement departure or arrival procedures (60%), and ground noise control (51%).
- "Community concerns" were indicated by 80% of respondents as the motivation for addressing noise outside DNL 65; 57% also indicated that "preventive planning" was a motivation.
- Seventy-four percent of respondents indicated that more than three-quarters of their airport's noise complaints came from people who live outside DNL 65.

Survey responses also revealed the following:

- A majority of airports use noise abatement departure (63%) and arrival (51%) flight tracks and departure (54%) and arrival (40%) cockpit procedures to minimize noise over residential and other noise-sensitive neighborhoods outside DNL 65. However, among surveyed airports there is no consistency in methodology for evaluating the effectiveness of noise abatement outside DNL 65, and there is little guidance from the FAA on appropriate metrics or criteria for evaluating noise abatement procedures. Responses to the survey indicated that in certain areas airport staff is not privy to the cost incurred by airlines and the FAA of implementing various actions, as the responses noted that information is not available. Finally, respondents report that noise abatement flight tracks are somewhat more effective than noise abatement procedures at reducing noise complaints.
- Most airports reported some procedures to minimize noise from ground operations such as taxi and pre-takeoff runups (69%); 25% of those airports reported that the procedures were developed primarily to address noise outside DNL 65, and an additional 38% reported that the procedures were developed to address noise issues both inside and outside DNL 65. The most common types of ground noise control include physical construction of blast fences (31%), ground runup enclosures (11%), and noise barriers/berms (20%); as well as runup procedures (29%), pre-takeoff runup policies (23%), reverse thrust policies (14%), and simply moving the aircraft away from noise-sensitive communities (23%).
- More than half of the surveyed airports (57%) reported having land use compatibility measures that apply outside DNL 65. The tools used by airports for land use compatibility planning include zoning, building permits that require sound insulation of residential and noise-sensitive nonresidential land uses, and disclosure to residents. Respondents reported a wide range of effectiveness: 21% said their efforts were "very effective" in preventing incompatible land uses outside DNL 65, 64% said their efforts were "somewhat or moderately effective," and 16% said their efforts were "not effective at all."
- The majority of respondents (58%) do not provide sound insulation to homeowners living outside DNL 65. However, 20% provide sound insulation for homes in contiguous neighborhoods ("block rounding"), and an additional 15% provide sound insulation for homes within the DNL 60 dB contour.
- Nearly three-quarters of respondents (74%) reported that they use both websites and face-to-face meetings to communicate with people exposed to noise outside DNL 65. Airports also use online flight tracking (40%), newsletters (40%), and a variety of other tools such as quarterly and annual noise reports, and noise staff driven outreach tools.
- The responding airports communicate with pilots about noise outside DNL 65 in a number of ways: the most common are pilot briefings (40%) and Jeppesen inserts (40%), posters and handouts (37%), and FAA standards (17%); other methods include airfield signage, Airport Facility Directory Special Notices, videos distributed through flight schools, and phone calls.

Two case studies demonstrate that there is a strong need for airports to have continued flexibility in addressing noise outside DNL 65—whether because communities have demanded it (Naples Municipal Airport) or because the airport has

conducted proactive planning (Dallas/Ft. Worth International Airport).

This synthesis identified the need for additional research in the following areas:

- "Toolkit" of strategies to address noise outside DNL 65—This synthesis identified a range of strategies employed by airports to address noise outside DNL 65. A comprehensive toolkit with recommended best practices could help airports identify those strategies best suited for a variety of noise issues outside DNL 65.
- Communication—Better methods are needed for working with local communities; some of this work is already underway through ACRP Project 02-05, Guidebook on Community Responses to Aircraft Noise.
- Evaluation of noise abatement strategies outside DNL 65 including noise metrics, criteria, and benefit-cost analyses.
- Land use measures—This study identified a need to identify the barriers to implementing land use measures; some of this work is ongoing through ACRP Project 03-03, Enhancing Airport Land Use Compatibility.
- Complaints—The relationship between noise complaints and noise level is still not well understood. Areas for research in this area include: (1) an evaluation of how complaints are made, recorded, and dealt with; (2) how airport operators use and evaluate complaint levels to drive noise programs; and (3) how airport operators evaluate the effectiveness of noise programs through changes in complaints.
- Case studies—The case studies described in this synthesis are instructive; however, the scope of this project did not allow for an in-depth analysis or discussion of some of the best practice strategies that could be derived from these airports.

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GLOSSARY OF TERMS, ABBREVIATIONS, AND ACRONYMS

AIP	Airport Improvement Program
ANP	Advanced Navigation Procedures
ATC	Air Traffic Control
CDA	Continuous Descent Arrival
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibel
dBA	A-weighted decibel
DNL	Day–Night Average Sound Level
FAR	Federal Aviation Regulation
GRE	Ground runup enclosure
ICAO	International Civil Aviation Organization
L_{eq}	Continuous Equivalent Sound Level
L_{max}	Maximum A-weighted Sound Level
MSP	Minneapolis–St. Paul International Airport
NADP	Noise Abatement Departure Procedure
NAS	National Airspace System
NEM	Noise exposure map
NEPA	National Environmental Policy Act
NEXTGEN	Next Generation Air Transportation System
Part 150	14 CFR Part 150, Airport Noise Compatibility Planning
PARTNER	Partnership for Air Transportation Noise and Emissions Reduction
RNAV	Area Navigation
SEL	Sound Exposure Level
Time above	Time Above Threshold
USC	United States Code
Vision 100	Public Law 108-176, “Vision 100—Century of Aviation Reauthorization Act”

APPENDIX A

Survey Instrument

Survey for Airport Noise Officers on Noise Issues Outside DNL 65

The Transportation Research Board's Airport Cooperative Research Program has commissioned a study on airport noise programs in areas outside Day–Night Average Sound Level (DNL) 65 (S02-03). The goal of this synthesis project is to compile in one location current Federal law and policy and how it is applied regionally, and to provide the state of the practice of noise programs targeted outside DNL 65 at airports. As someone with experience in this area, we would like to have your input on this subject.

Please be assured that your responses will be kept in strictest confidence, to be aggregated with all other responses.

1) State in which you are located:

- Alabama
- Alaska
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- District of Columbia
- Florida
- Georgia
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey

- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Other (please specify):

If you selected other, please specify: _____

2) Please indicate your number of years of experience in the aviation industry:

- 0–5 yrs
- 5–10 yrs
- 10–15 yrs
- 15–20 yrs
- 20–30 yrs
- 30+ yrs

3) How many operations does your airport have annually?

- Less than 50,000
- 50,000–100,000
- 100,000–250,000
- More than 250,000

4) Please indicate the current nature of your employment:

- Local Government
- State Government
- Federal Government
- Airport Commission/Authority
- Airport Management
- Consultant
- Other (please specify):

If you selected other, please specify:

_____

5) How important are noise concerns outside DNL 65 to your airport?

- Not at all important
- Somewhat important
- Important

- Very important
- Critical

Additional comments:

_____

6) What method(s) does your airport use to minimize noise outside DNL 65 (check all that apply)?
   - Noise abatement flight tracks
   - Noise abatement departure or arrival procedures (e.g., NADPs or CDA)
   - Preferential runway use program
   - Ground noise control
   - Operator education and outreach
   - None of the above
   - Other (please specify):

If you selected other, please specify:

_____

7) What method(s) does your airport use to reduce/minimize land use incompatibilities outside DNL 65 (check all that apply)?
   - Collaboration with local land use officials and/or real estate developers
   - Zoning
   - Easements
   - Disclosure
   - Sound insulation
   - Building code enforcement
   - None of the above
   - Buyouts
   - Other (please specify):

If you selected other, please specify:

_____

8) What was your motivation for addressing noise outside DNL 65 (check all that apply)?
   - Political action
   - Litigation
   - Mitigation for airport expansion
   - Preventive planning
   - Community concerns
   - Other (please specify):

If you selected other, please specify:

_____

9) What percentage of your noise complaints come from people who live outside DNL 65?
   - None
   - Less than 25%
   - 25%–50%
   - 50%–75%
   - More than 75%
   - Don’t know

10) What kind out outreach tools do you use to communicate with people exposed to noise outside DNL 65 (check all that apply)?

- Online flight tracking
- Community meetings/forums
- Newsletters
- Website
- None of the above
- Other (please specify):

If you selected other, please specify:

_____

11) Has FAA denied your airport's plans to mitigate or abate noise outside DNL 65?

- Yes, because "Noise below DNL 65 is not significant"
- Yes, because "FAA does not fund actions outside DNL 65" (or it is such a low priority that it will never be funded)
- Yes, because "The sponsor has not shown that there is a problem outside DNL 65"
- Yes, because "The local community has not enacted the local land use policies (including provision to protect areas outside DNL 65)"
- Yes, because "At locations outside DNL 65, community noise is equal or greater to the aircraft noise"
- Yes, because "FAA has a national policy of not addressing noise from aircraft weighting less than 12,500 Online flight tracking"
- Yes, because "The lack of evidence/precedent indicating sound insulation of 'floating' homes would be effective"
- No
- Other (please specify):

If you selected other, please specify:

_____

Additional comments:

_____

12) Do you use noise abatement flight tracks for noise abatement?

- Yes
- No (Survey will skip to question 24)

13) Type of noise abatement track (check all that apply).

- Jet aircraft departure
- Jet aircraft arrival
- Propeller aircraft departure
- Propeller aircraft arrival
- Helicopter departure
- Helicopter arrival
- None

14) Were your noise abatement tracks developed primarily to address noise outside DNL 65, primarily to address noise within DNL 65, or both?

- Primarily to address noise outside DNL 65
- Primarily to address noise within DNL 65
- Both

15) What noise metric(s) did you use to evaluate noise abatement flight tracks (enter levels for all that apply)?

Day–Night Average Sound Level, DNL Level: _____

Equivalent Level, L_{eq} Level: _____
Sound Exposure Level, SEL Level: _____
Maximum A-weighted Level, L_{max} Level: _____
Time Above, TA Level: _____
Number of events above (NA): _____
Other: _____

16) What review/approval was needed to implement noise abatement flight tracks (check all that apply)?
- None
- FAA approval
- NEPA approval

17) How are your noise abatement flight tracks implemented by ATC (check all that apply)?
- Vectoring
- DME with published turn and altitude instructions
- RNAV
- GPS
- Other (please specify):

If you selected other, please specify:
_____

18) Please explain the implementation process with FAA, focusing on implementation obstacles/challenges:
_____
_____
_____

19) How are your noise abatement flight tracks communicated to pilots (check all that apply)?
- Posters and/or handouts
- Jeppesen inserts
- FAA standards
- Pilot briefings
- Other (please specify):

If you selected other, please specify:
_____

20) How effective are your noise abatement flight tracks at reducing noise over sensitive communities outside DNL 65?
- Not at all effective
- Somewhat effective
- Moderately effective
- Very effective

Additional comments:
_____

21) How effective are your noise abatement flight tracks at reducing complaints from noise-sensitive communities outside DNL 65?
- Not at all effective
- Somewhat effective
- Moderately effective

- Very effective

Additional comments:

_____

22) What is the estimated cost to implement this measure?
Cost to Airport: _____
Cost to Operators: _____
Cost to FAA: _____
Other costs (explain): _____

23) Are there any drawbacks or challenges to implementing your flight tracks (check all that apply)?
- Increased fuel cost to airlines
- Increased flight time
- Communication with air traffic control
- Communication with pilots
- Communication with community
- Other (please specify):

If you selected other, please specify:

_____

24) Do you use Departure or Arrival Flight Procedures for noise abatement?
- Yes
- No (Survey will skip to question 35)

25) Type of noise abatement procedure (check all that apply).
- Jet aircraft departure (e.g., ICAO NADP and/or NBAA procedure)
- Jet aircraft arrival (e.g., CDA)
- Propeller aircraft departure (e.g., pattern altitude)
- Propeller aircraft arrival
- Helicopter departure (e.g., minimum crossing height)
- Helicopter arrival
- None of the above

26) Were your noise abatement procedures developed primarily to address noise outside DNL 65, primarily to address noise within DNL 65, or both?
- Primarily to address noise outside DNL 65
- Primarily to address noise within DNL 65
- Both

27) What noise metric(s) did you use to evaluate noise abatement procedures (enter levels for all that apply)?
Day–Night Average Sound Level, DNL Level: _____
Equivalent Level, L_{eq} Level: _____
Sound Exposure Level, SEL Level: _____
Maximum A-weighted Level, L_{max} Level: _____
Time Above, TA Level: _____
Other: _____

28) How are your noise abatement flight procedures implemented (check all that apply)?
- Informal

- Formal
- Both

29) Please explain:

_____
_____
_____

30) How are your noise abatement procedures communicated to pilots (check all that apply)?

- Posters and/or handouts
- Jeppesen inserts
- FAA standards
- Pilot briefings
- Other (please specify):

If you selected other, please specify:

_____

31) How effective are your noise abatement procedures at reducing noise over sensitive communities outside DNL 65?

- Not at all effective
- Somewhat effective
- Moderately effective
- Very effective

Additional comments:

_____

32) How effective are your noise abatement procedures at reducing complaints from noise-sensitive communities outside DNL 65?

- Not at all effective
- Somewhat effective
- Moderately effective
- Very effective

Additional comments:

_____

33) What is the estimated cost to implement this measure?

Cost to Airport: _____
Cost to Operators: _____
Cost to FAA: _____
Other costs (explain): _____

34) Are there any drawbacks or challenges to implementing your procedures (check all that apply)?

- Increased fuel cost to airlines
- Increased flight time
- Communication with air traffic control
- Communication with pilots
- Communication with community
- Other (please specify):

If you selected other, please specify:

_____

35) Does your airport have procedures to minimize ground noise (i.e., from takeoff roll, reverse thrust, taxi, or engine runups)?
- Yes
- No (Survey will skip to question 45)

36) Type of ground noise procedure (check all that apply).
- Ground runup enclosure
- Blast fence
- Noise barrier or berm
- Pre-takeoff runup policy
- Reverse thrust policy
- Ramp operation procedures
- Move to a location away from noise-sensitive sites

37) Were your ground noise procedures developed primarily to address noise outside DNL 65, primarily to address noise within DNL 65, or both?
- Primarily to address noise outside DNL 65
- Primarily to address noise within DNL 65
- Both

38) What noise metric(s) did you use to evaluate ground noise procedures (enter levels for all that apply)?

Day–Night Average Sound Level, DNL Level: _____
Equivalent Level, L_{eq} Level: _____
Sound Exposure Level, SEL Level: _____
Maximum A-weighted Level, L_{max} Level: _____
Time Above, TA Level: _____
Other: _____

39) How are your ground noise procedures implemented (check all that apply)?
- Informal
- Formal
- Both

40) Please explain:

_____
_____
_____

41) How are your ground noise procedures communicated to pilots (check all that apply)?
- Posters and/or handouts
- Pilot briefings
- Other (please specify):

If you selected other, please specify:

_____

42) How effective are your ground noise procedures at reducing complaints from noise-sensitive communities outside DNL 65?
- Not at all effective
- Somewhat effective

- Moderately effective
- Very effective

Additional comments:
_____

43) What is the estimated cost to implement this measure?
Cost to Airport: _____
Cost to Operators: _____
Cost to FAA: _____
Other costs (explain): _____

44) Are there any drawbacks or challenges to implementing your ground noise procedures (check all that apply)?
- Increased fuel cost to airlines
- Communication with ground control
- Communication with pilots
- Communication with community
- Other (please specify):

If you selected other, please specify:
_____

45) Do you have land use measures that apply outside DNL 65?
- Yes
- No (Survey will skip to question 56)

46) What type of zoning do you or the land use governments surrounding the airport use outside DNL 65? (Enter levels for all that apply.)
Prohibit development of residential land uses—Identify Level: _____
Permit development of residential land uses with sound insulation—Identify Level: _____
_____
Other: _____
None _____

47) Do you or the governing body(ies) with land use authority require avigation easements?
- Yes (please specify level in comments section)
- No

Additional comments:
_____

48) Do you or the governing body(ies) with land use authority require real estate disclosure?
- Yes (please specify level in comments section)
- No

Additional comments:
_____

49) Do you offer sound insulation to any homeowners living outside DNL 65?
- Yes, for homes in contiguous neighborhoods (“humanize”)
- Yes, for homes within DNL 60 dB contour
- No
- Other (please specify):

If you selected other, please specify:

_____

50) What is your funding source for sound insulation outside DNL 65?
- Airport
- Operators
- FAA
- Homeowner
- Other (please specify):

If you selected other, please specify:

_____

51) What is the estimated cost to implement this measure?
Cost to Airport: _____
Cost to Operators: _____
Cost to FAA: _____
Cost to Homeowner _____
Other costs (explain): _____

52) How effective are your, or the land use governing body(ies), land use policies communicated to homeowners and realtors (check all that apply)?
- Newsletters and/or handouts
- Individual homeowner briefings
- Presentations to real estate boards
- Other (please specify):

If you selected other, please specify:

_____

53) How effective are your, or the land use governing body(ies), land use policies at preventing non-compatible development in communities outside DNL 65?
- Not at all effective
- Somewhat effective
- Moderately effective
- Very effective

Additional comments:

_____

54) What is the estimated cost to implement this land use measure?
Cost to Airport: _____
Cost to Homeowners _____
Cost to Realtors: _____
Other costs (explain): _____

55) Are there any drawbacks or challenges to implementing the land use policies around your airport (check all that apply)?
- Coordination with local land use officials
- Coordination with realtors
- Coordination with homeowners

Additional comments:

_____

Final Comments

56) Please provide information for a point of contact to whom any follow-up questions can be addressed if necessary:
As thanks for sharing your information, we would like to e-mail you a link to the completed report.
Please include any other e-mail addresses where we should send the completed report.
Name: _____
Telephone: _____
E-mail: _____

57) Do you have a case study on noise issues outside of DNL 65 that you would be willing to contribute? If you answer yes, the consultant will contact you via e-mail and arrange for a telephone interview regarding the case study. Prior to the interview, you will receive an outline of the types of information needed in the interview.
- Yes
- No

58) Do you have any other information that you believe would be helpful to this study? If so, please indicate below:
_____
_____
_____
_____

Thank you for your assistance in completing this survey. Your responses will help provide insights into how to better analyze the economic impact of airports. If you have any questions regarding the survey, please contact Mary Ellen Eagan, meagan@hmmh.com, 781.229.0707. You can mail any documentation that you might feel will be helpful to this study to the following address:

Mary Ellen Eagan
Harris Miller Miller & Hanson Inc.
77 South Bedford St.
Burlington, MA 01803

APPENDIX B

Survey Results and Analysis

SUMMARY

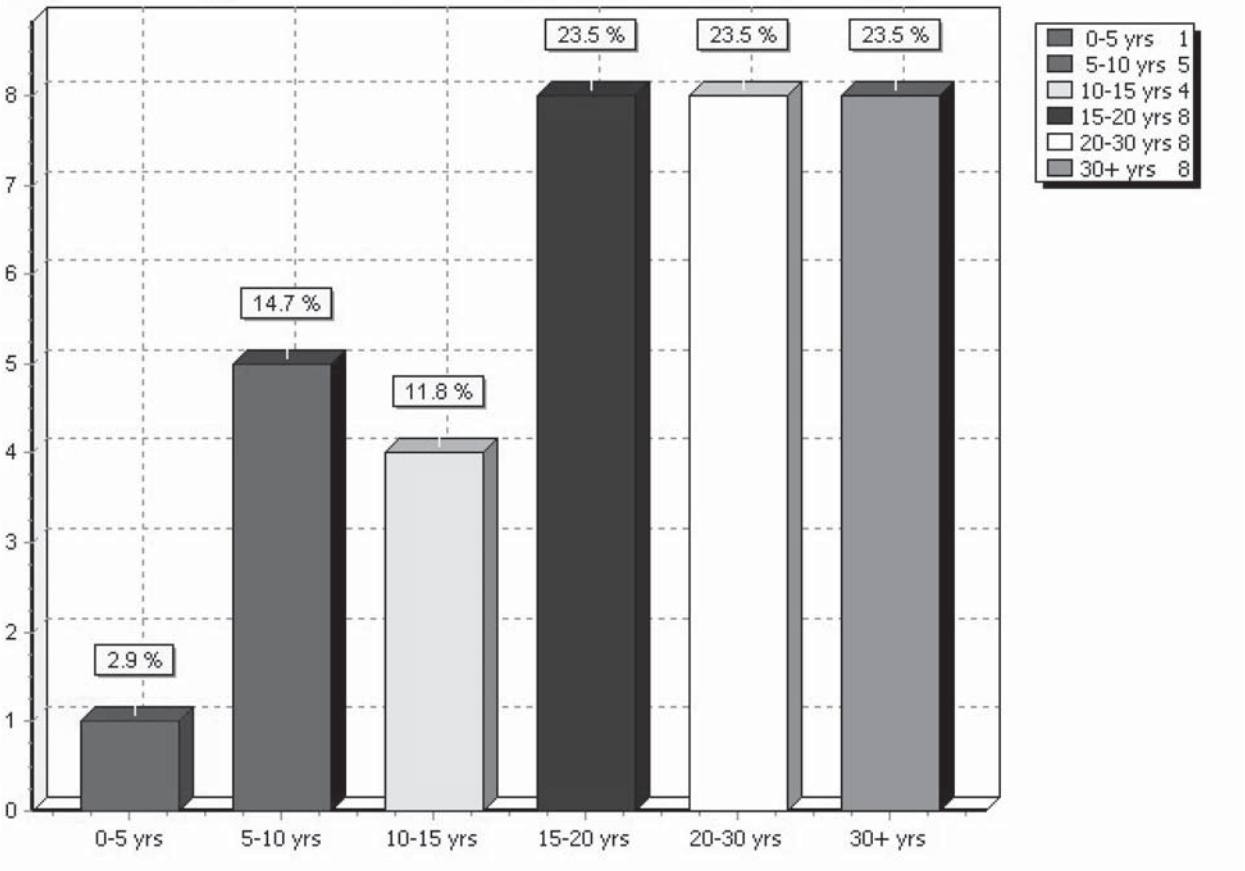
This report contains a detailed statistical analysis of the results to the survey titled *Survey for Airport Noise Officers on Noise Issues Outside DNL 65*. The results analysis includes answers from all respondents who took the survey in the 95 day period from Monday, April 28, 2008, to Thursday, July 31, 2008. Thirty-four completed responses were received to the survey during this time.

1. State in which you are located:

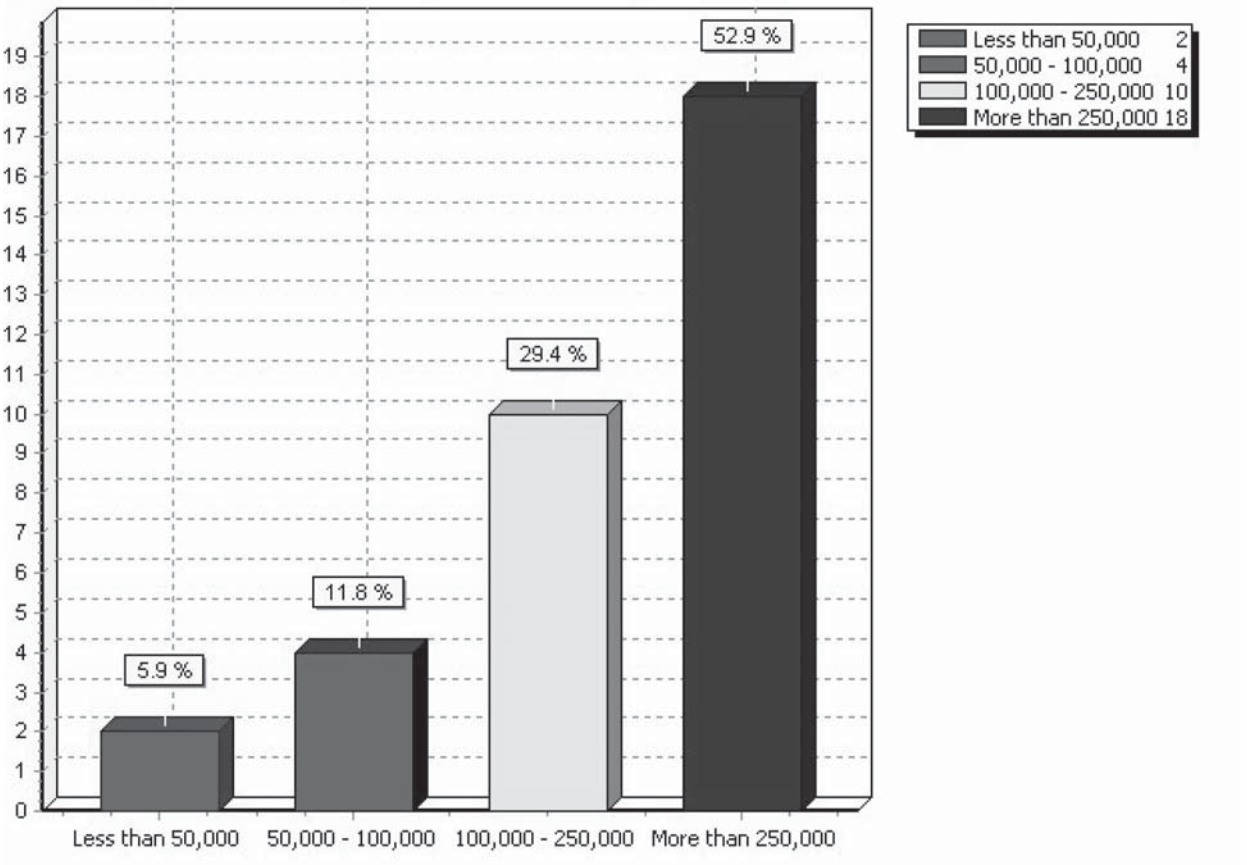
Response	Count	Percent
Alabama	0	0.0%
Alaska	0	0.0%
Arizona	1	2.9%
Arkansas	0	0.0%
California	7	20.6%
Colorado	1	2.9%
Connecticut	0	0.0%
Delaware	0	0.0%
District of Columbia	0	0.0%
Florida	6	17.6%
Georgia	0	0.0%
Hawaii	0	0.0%
Idaho	1	2.9%
Illinois	0	0.0%
Indiana	0	0.0%
Iowa	0	0.0%
Kansas	0	0.0%
Kentucky	0	0.0%
Louisiana	0	0.0%
Maine	0	0.0%
Maryland	0	0.0%
Massachusetts	2	5.9%
Michigan	1	2.9%
Minnesota	1	2.9%
Mississippi	0	0.0%
Missouri	0	0.0%
Montana	1	2.9%
Nebraska	0	0.0%
Nevada	2	5.9%
New Hampshire	0	0.0%
New Jersey	0	0.0%
New Mexico	0	0.0%
New York	3	8.8%
North Carolina	1	2.9%
North Dakota	0	0.0%
Ohio	0	0.0%
Oklahoma	0	0.0%
Oregon	1	2.9%
Pennsylvania	0	0.0%
Rhode Island	0	0.0%
South Carolina	0	0.0%
South Dakota	0	0.0%
Tennessee	1	2.9%
Texas	2	5.9%
Utah	0	0.0%
Vermont	0	0.0%
Virginia	2	5.9%
Washington	0	0.0%
West Virginia	0	0.0%
Wisconsin	0	0.0%
Wyoming	0	0.0%
Other	1	2.9%

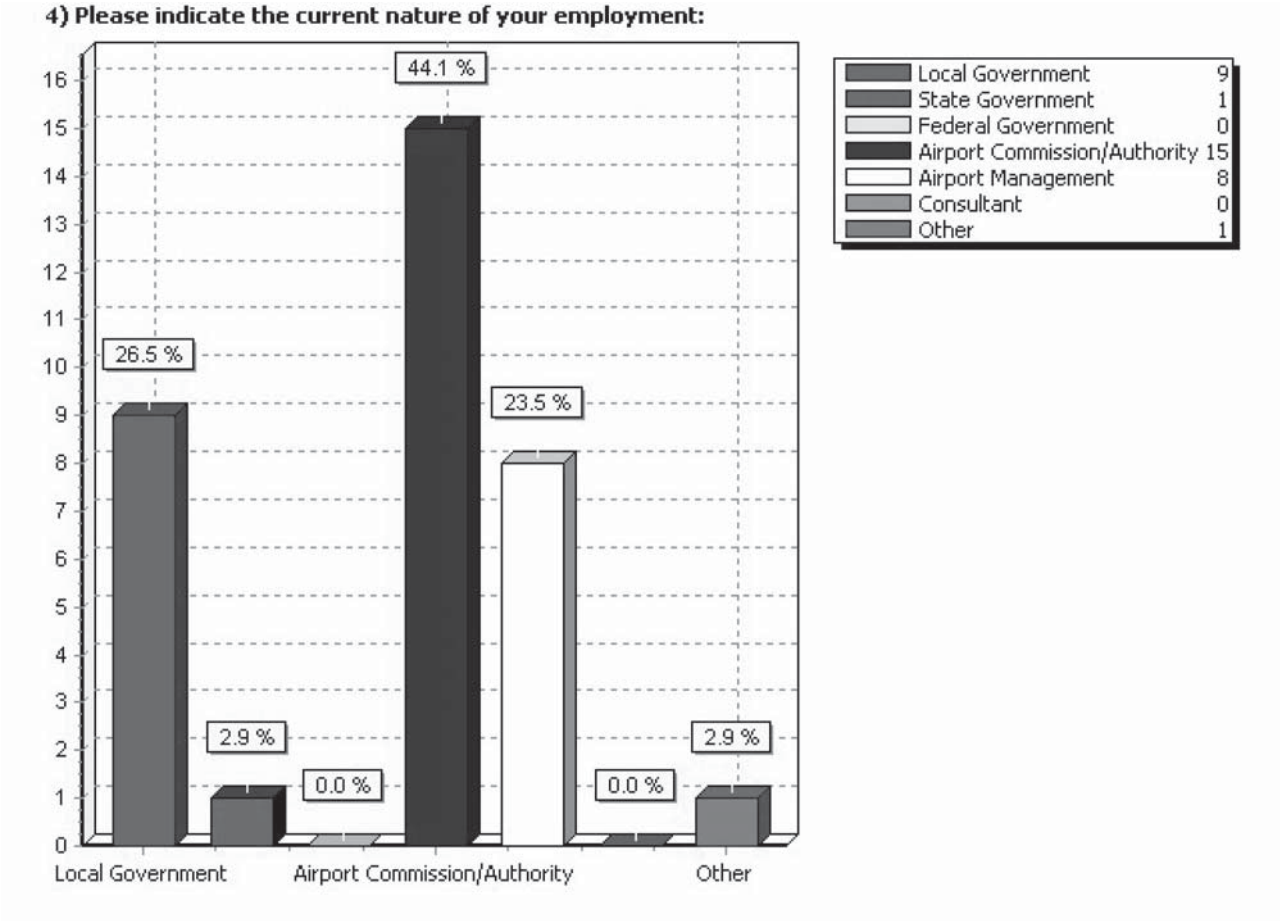
Other Responses: New York and New Jersey

2) Please indicate your number of years of experience in the aviation industry:



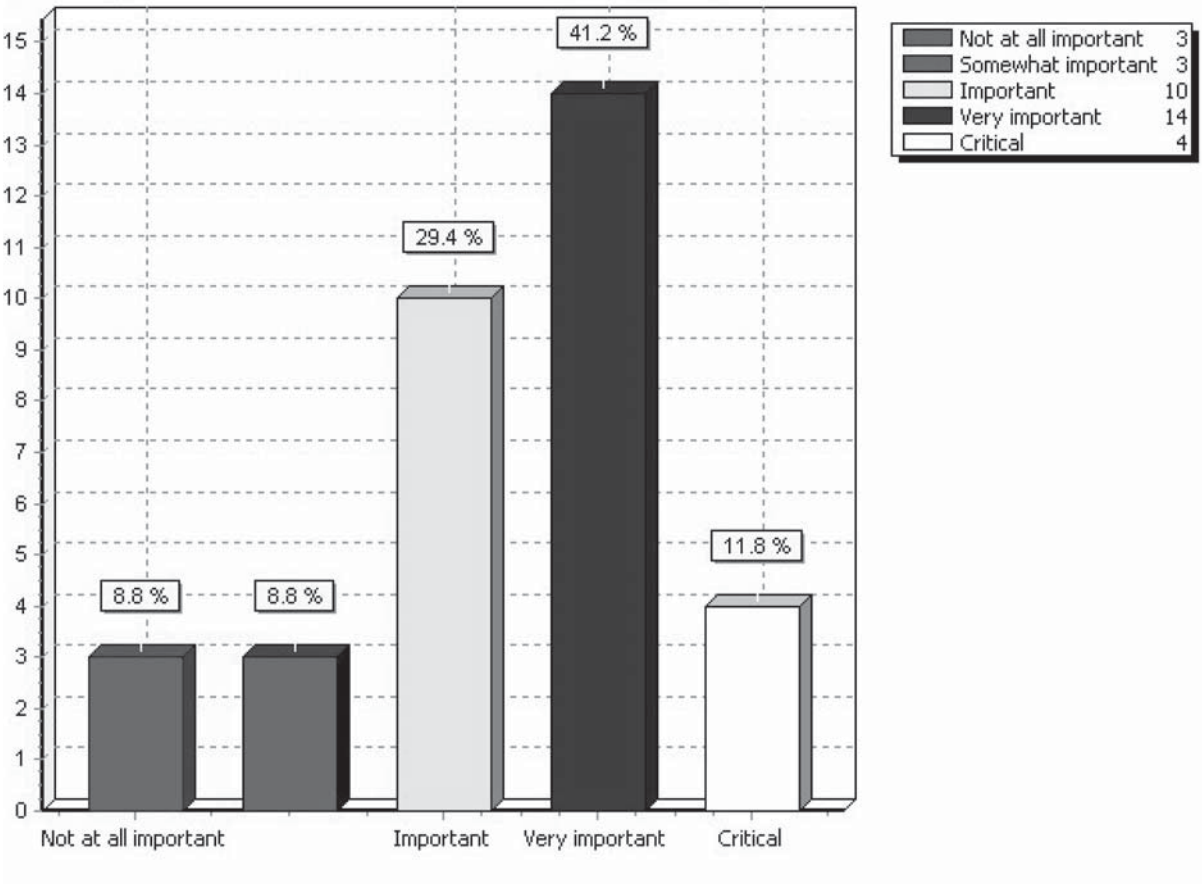
3) How many operations does your airport have annually?





Other Responses: Private Contractor, Public Benefit Corporation, Bi-State Authority.

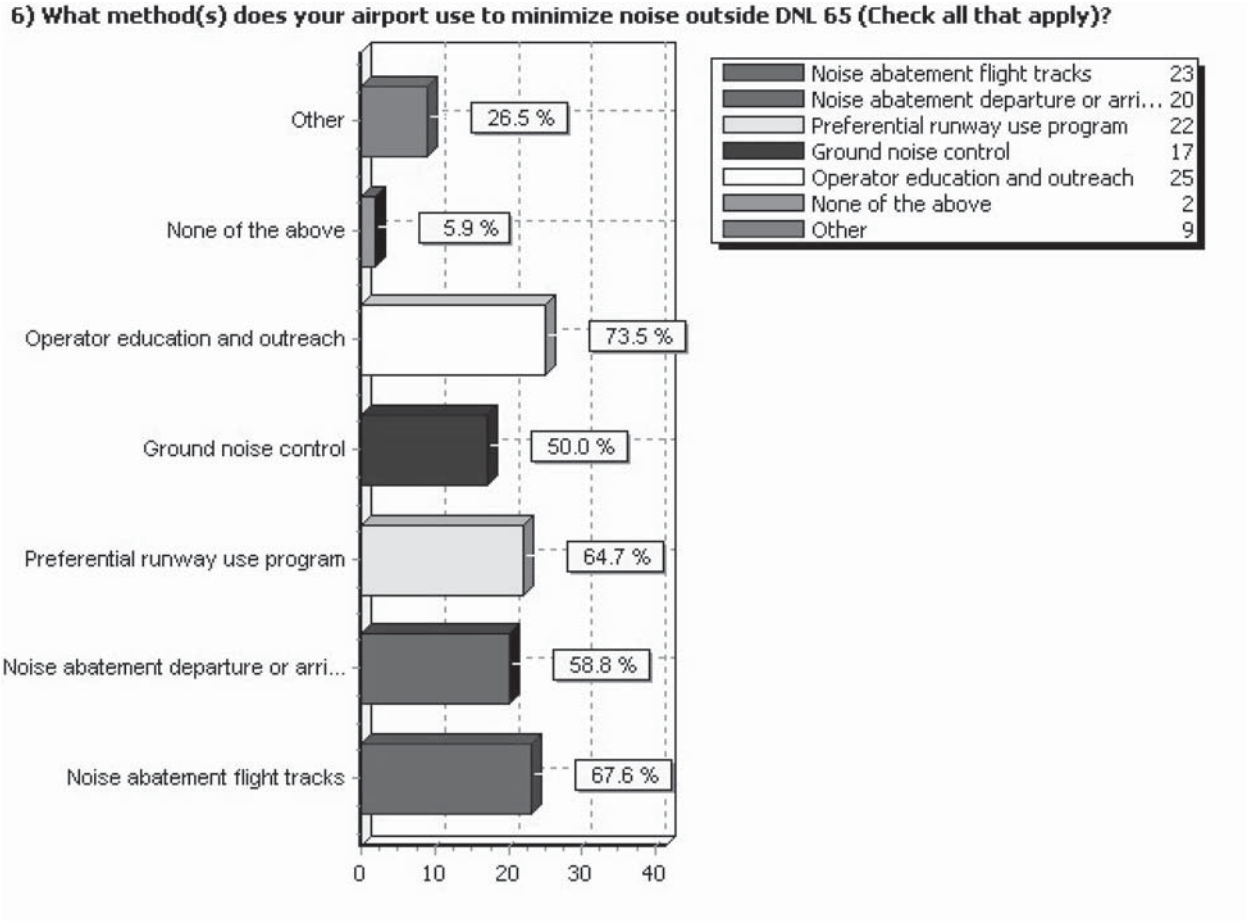
5) How important are noise concerns outside DNL 65 to your airport?



Comment Responses:

All noise concerns are treated with equal importance no matter where they are located.
With no population inside the 2005 65 DNL contour, all noise concerns are outside DNL 65.
Interagency Agreement with four airports.
We have experienced significant reduction in incompatible land uses around the airport since the mid-1980s.
Using 60 DNL for some land use planning since early 1990s.
Some communities are affected with noise outside the DNL 65 when departure patterns are altered during runway closures for construction.
We accept the FAA's DNL 65 standard. It is our experience that the levels of annoyance over aircraft noise at our airport are minimal based on the complaints received.

6) What method(s) does your airport use to minimize noise outside DNL 65 (Check all that apply)?

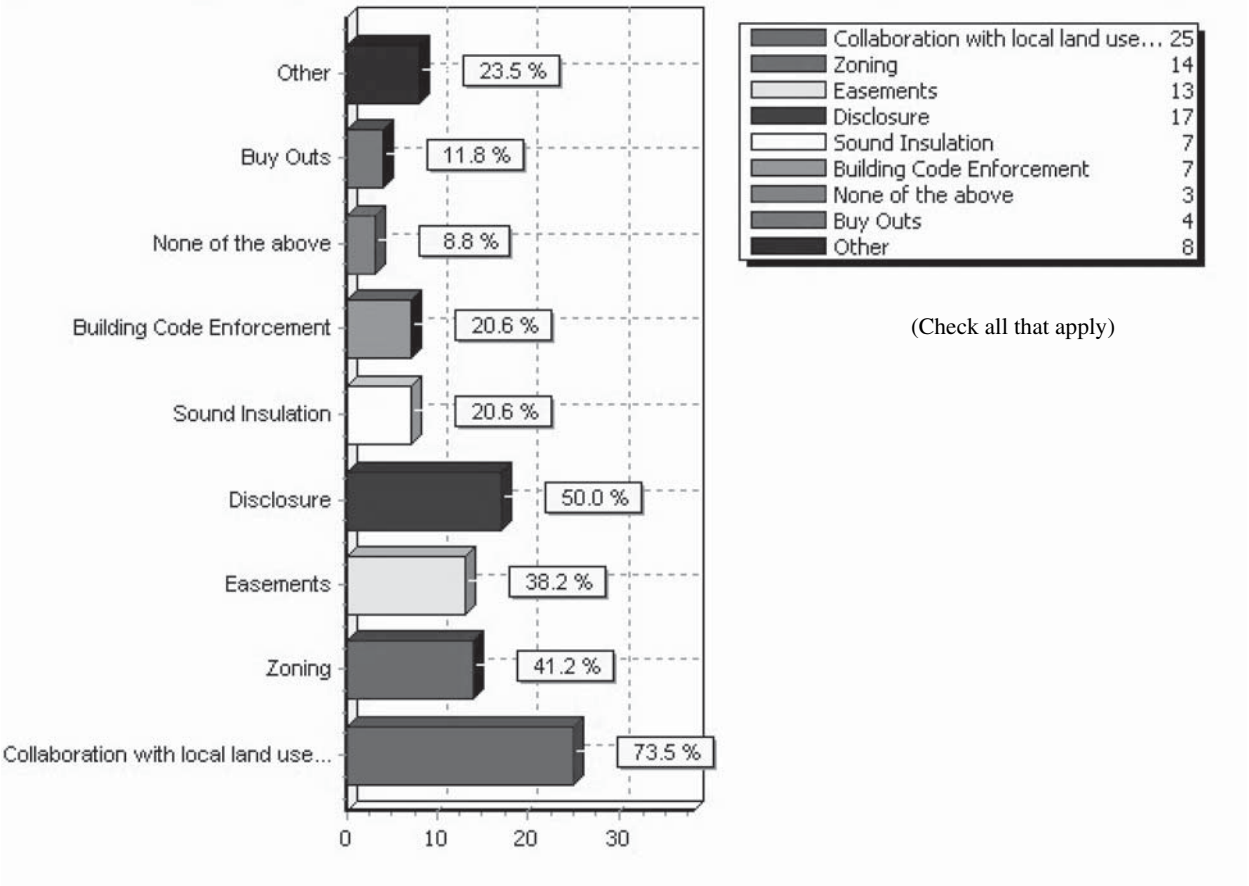


(Check all that apply)

Other Responses:

Dedicated Noise Complaint Hotline 24/7
Noise budget
Noise Monitoring
Pilot training, Weekly coordination with ATCT
RNAV departures, airport large land mass
Detailed noise reports
All programs at the airport are voluntary
Airport Influence Area
Use of “policy” contours
Procedures at this airport are voluntary
Noise Insulation Program

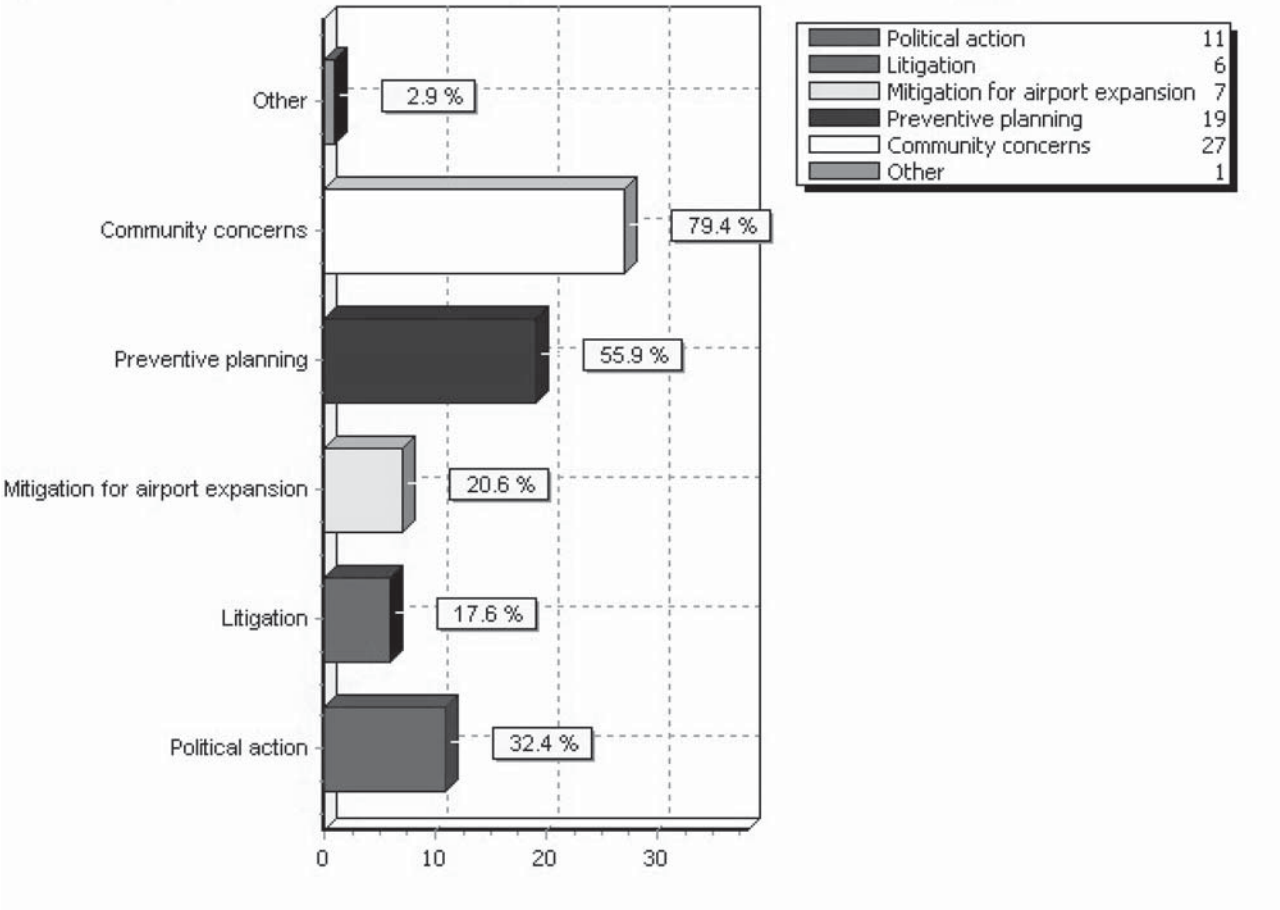
7) What method(s) does your airport use to reduce/minimize land use incompatibilities outside DNL 65 (Chec..

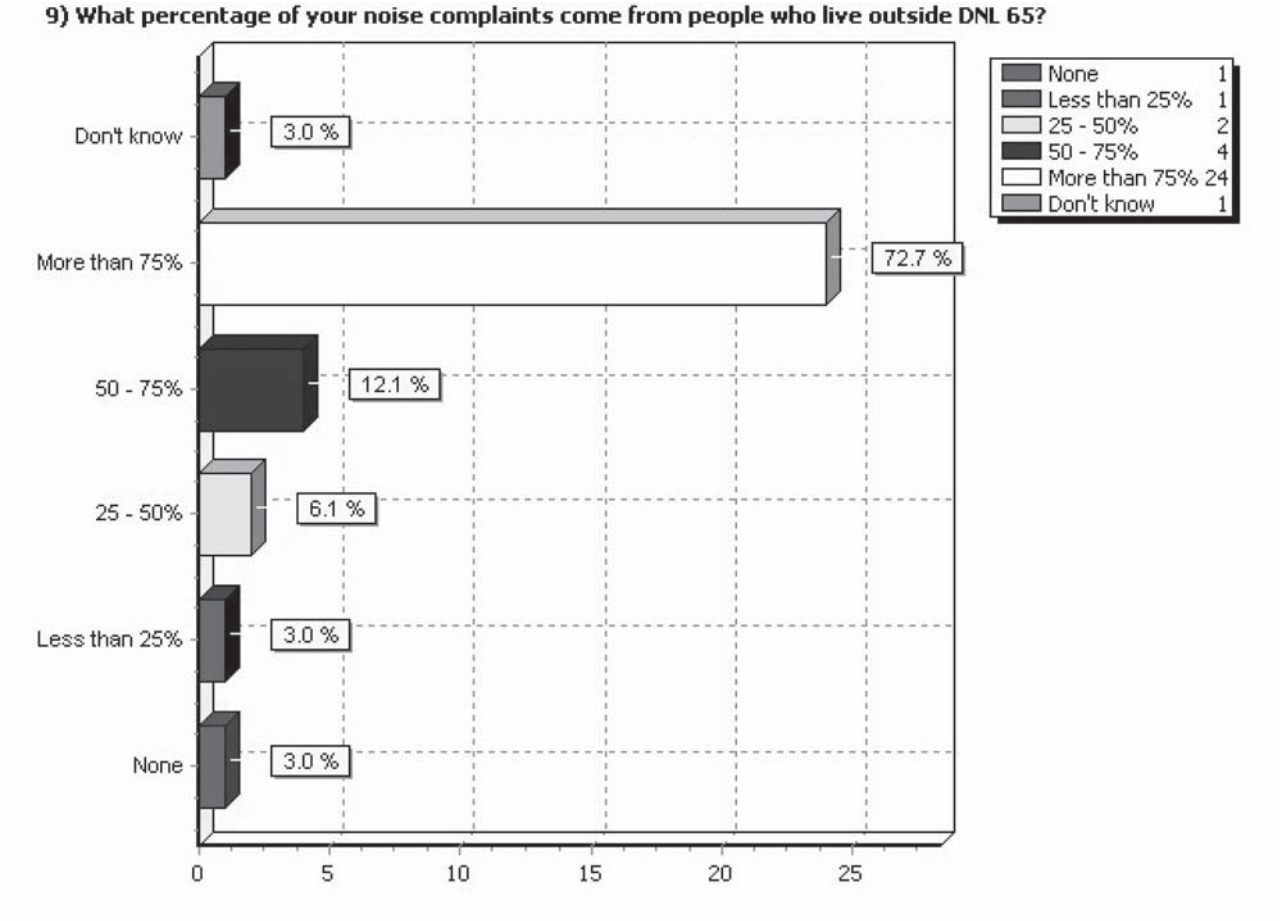


(Check all that apply)

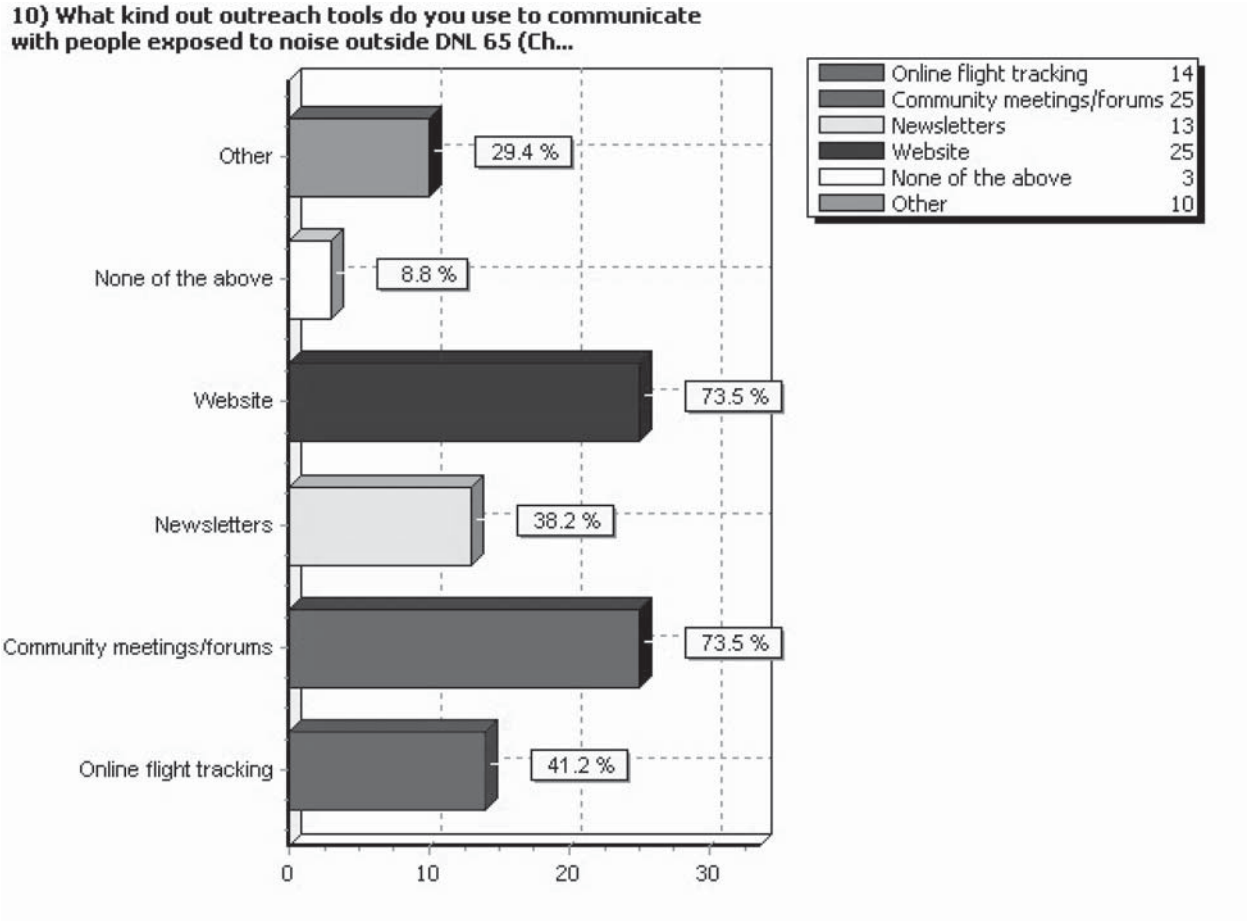
Public education and outreach
All but buyouts included in city code
Future workshops with all stakeholders
Use of policy noise contours
Place conditions on land use application
Use of policy noise contours
Public education, newsletters
End-of-the-block sound insulation

8) What was your motivation for addressing noise outside DNL 65 (Check all that apply)?





Other response: Proactive planning.



Other Responses:

E-mail, noise alerts
Responses to complaints
Local newspaper ads
Noise disclosure notification
NOMS (Noise and Operations Management System) will be operational in January 2009
E-mail listserv
Education using flight tracking tools
Noise reports.
24/7 Noise Complaint Line, Annual Report
Noise Mitigation Program Model home
Reports
Meetings with local planners

11) Has FAA denied your airport's plans to mitigate or abate noise outside DNL 65?

Response	Count	Percent
Yes, because “Noise below DNL 65 is not significant.”	2	6.3%
Yes, because “FAA does not fund actions outside DNL 65” (or it is such a low priority that it will never be funded).	10	31.3%
Yes, because “The sponsor has not shown that there is a problem outside DNL 65.”	1	3.1%
Yes, because “The local community has not enacted the local land use policies (including provision to protect areas outside DNL 65).”	0	0.0%
Yes, because “At locations outside DNL 65, community noise is equal or greater to the aircraft noise.”	0	0.0%
Yes, because “FAA has a national policy of not addressing noise from aircraft weighting less than 12,500 Online flight tracking.”	0	0.0%
Yes, because “The lack of evidence/precedent indicating sound insulation of ‘floating’ homes would be effective.”	0	0.0%
No	9	28.1%
Other	10	31.3%

Other Responses:

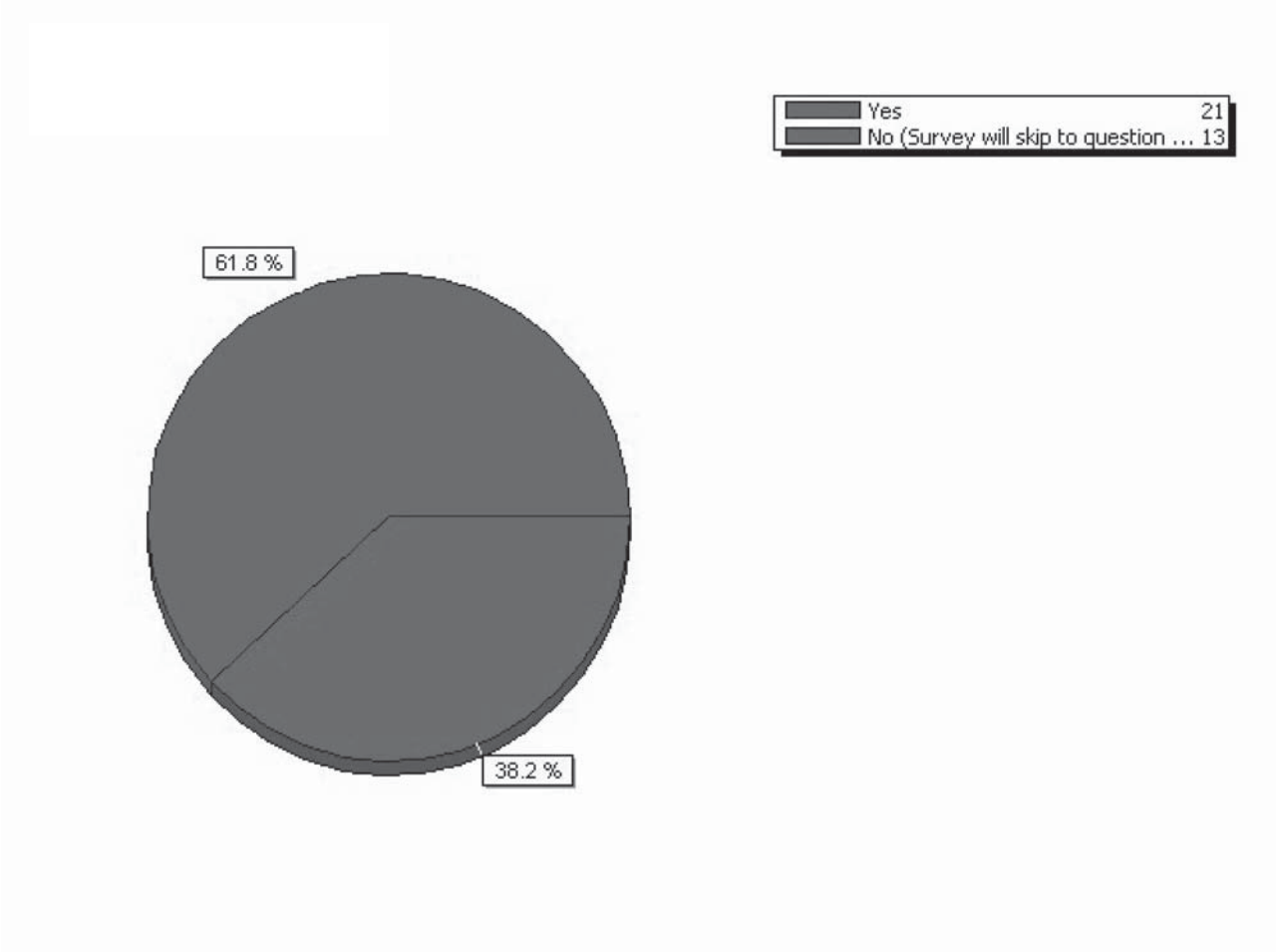
No Part 150 program at this airport for FAA to approve or deny
No Part 150 study conducted
Decision on this airport in August
Never presented to the FAA in any airport documents
Part 150 pending action by FAA. The airport is in the process of conducting a Part 161 study.
Unfair question
Not applicable
Does not apply
No. This airport has only requested FAA to fund sound insulation to end-of-the-block, which does extend outside the 65 dB CNEL.
They have agreed to use of general airport revenues for mitigation due to settlement of litigation proposed procedure opposed by local ATCT

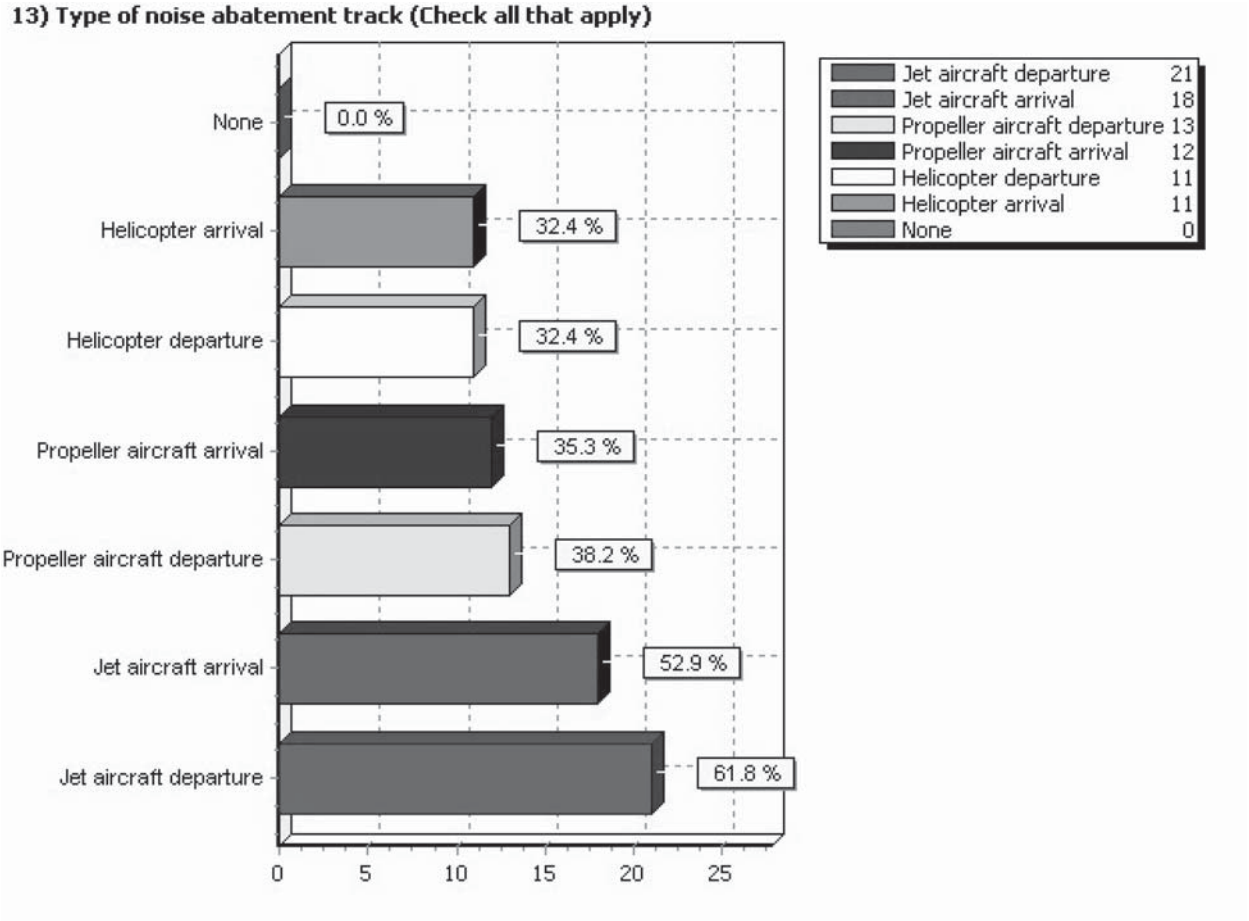
Comment Responses:

Only FAA involvement is noise abatement flight track.
We have not asked and do not intend to
This airport does not have plans to support any mitigation outside DNL 65
We don’t formally pursue because it will be denied.
Everything we are doing is not in conflict with our FAA covenants or FAA regulations.

The DNL 65 is located within the airport boundary.
We did not ask the FAA to fund mitigation, but were denied approach and departure procedures outside the DNL 65.
This question should allow for multiple answers.
Can you tell me why the burden should be placed on airports to mitigate outside the DNL 65 levels when local communities are not willing to mitigate along roads and railroads with equal or even higher levels. The policy is wrong for airports.
Airport is conducting a Part 161 study to try to restrict aircraft from departing to the east over residences between midnight and 6:30 a.m., which disturbs areas outside current 65 dB CNEL.

12) Do you use noise abatement flight tracks for noise abatement?





14) Were your noise abatement tracks developed primarily to address noise outside DNL 65, primarily to address noise within DNL 65, or both?

Response	Count	Percent
Primarily to address noise outside DNL 65	8	38.1%
Primarily to address noise within DNL 65	2	9.5%
Both	11	52.4%

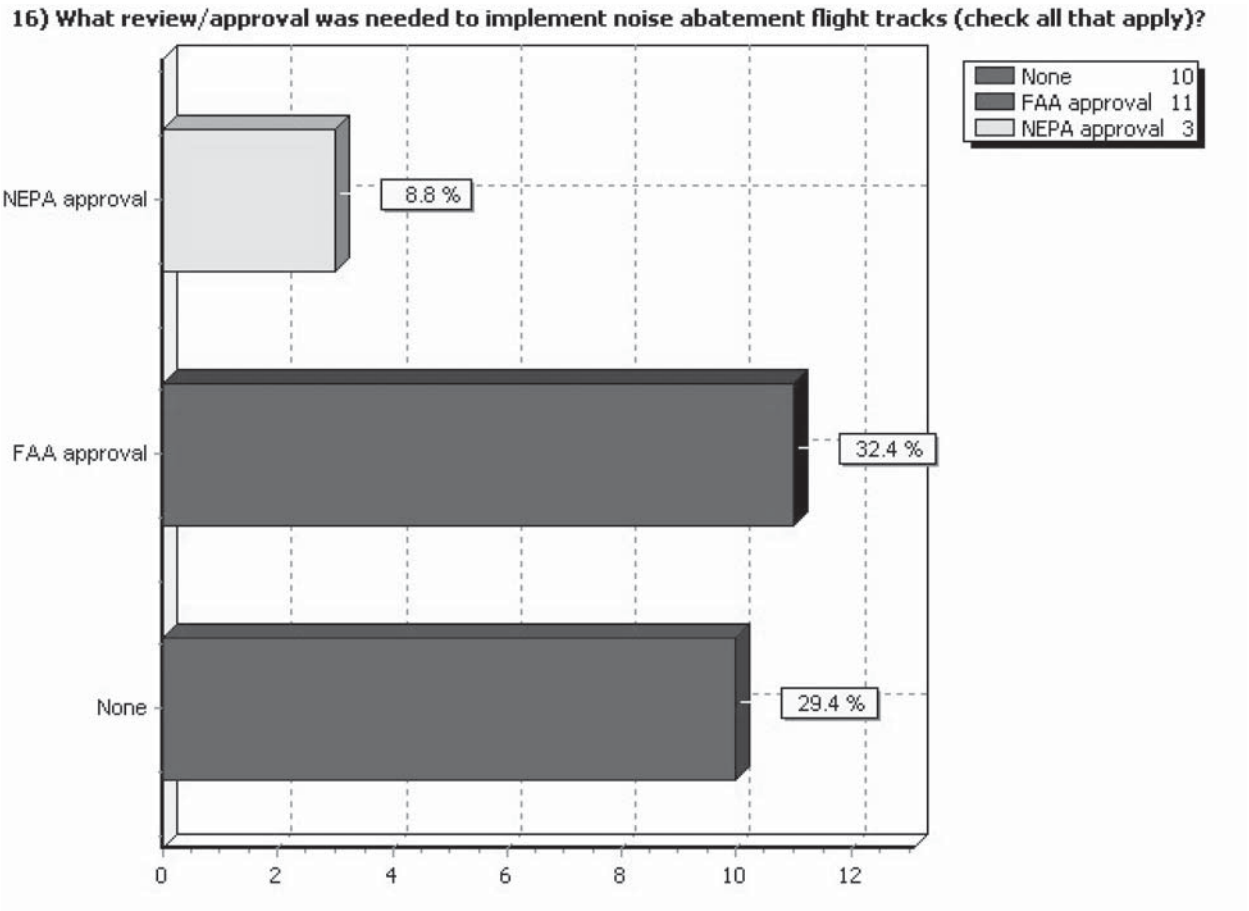
15) What noise metric(s) did you use to evaluate noise abatement flight tracks (Enter levels for all that apply)?

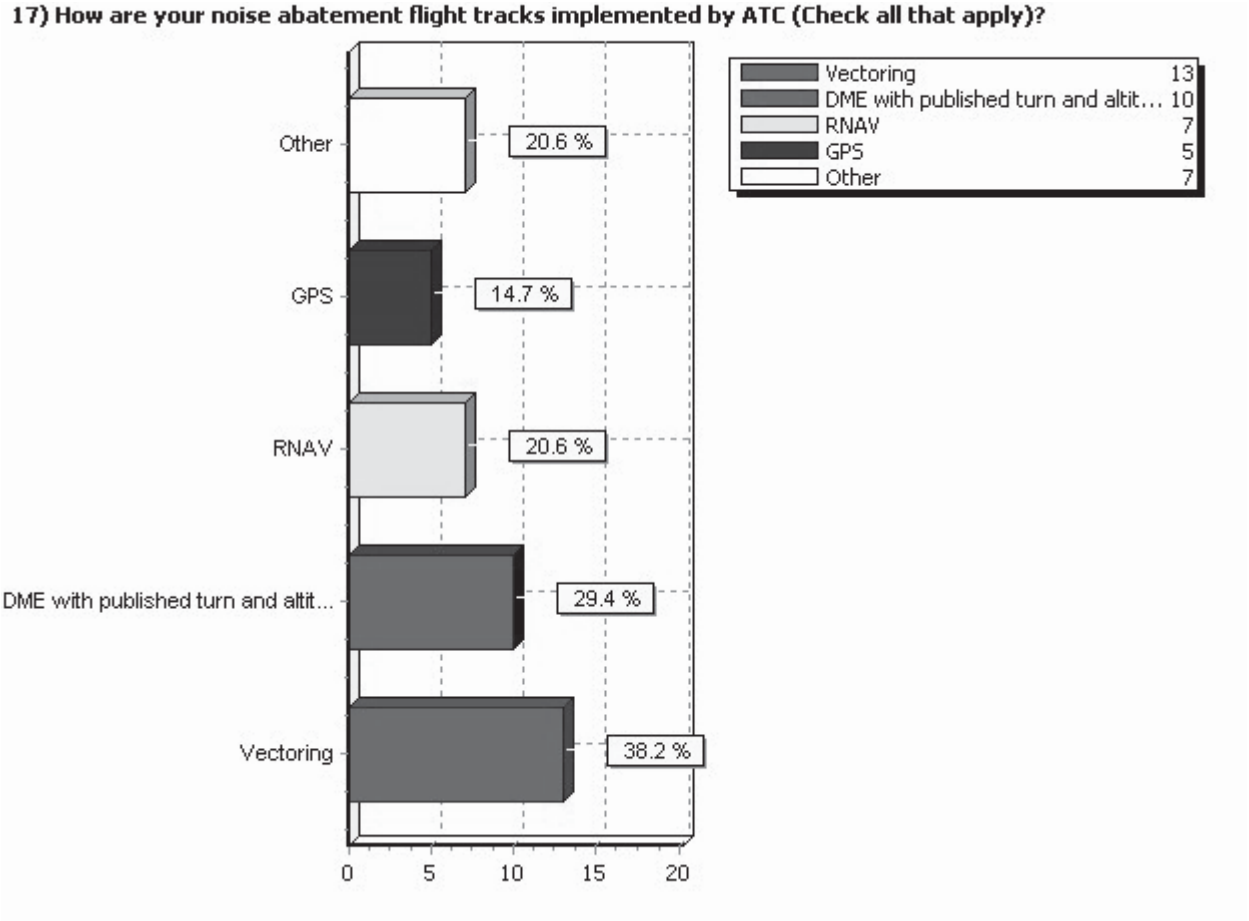
Day–Night Average Sound Level, DNL Level	Equivalent Level, L_{eq} Level	Sound Exposure Level, SEL Level	Maximum A-weighted Level, L_{max} Level	Time Above, TA Level	Number of Events Above (NA)	Other:
55, 60, 65, 70, 75			55, 60, 65, 70, 75	55,60, 65	55, 60, 65	Number of events above 65 (NA)
**		**		**		
						Flight tracks follow river corridors
						NAFTs were not designed around specific metrics, but compatible land uses.
50						
						No noise assessment was done. The intent was to avoid one subdivision with jet departures at the expense of other subdivisions in 1987.
CNEL						
65						
65 dBA		95 dBA	70–75 dBA			
		Varies; target levels for each type of aircraft selected			Varies	
Yes			Somewhat			
65	65	85	90			
Primary metric used		Secondary metric used				
						Number of flights within corridors; minimum altitude; time of use
						Perceived noise in decibels (PNDB)
						None; we used the

						local geography.
60+						
65 and 60		85				
						CNEL
x	x	x	x		x	

15.7) Other: What noise metric(s) did you use to evaluate noise abatement flight tracks (enter levels for all that apply)?

Other:
Number of events above 65 (NA)
Flight tracks follow river corridors
NAFTs were not designed around specific metrics, but compatible land uses.
No noise assessment was done. The intent was to avoid one subdivision with jet departures at the expense of other subdivisions in 1987.
Number of flights within corridors; minimum altitude; time of use
PNDB
None; we used the local geography.
CNEL





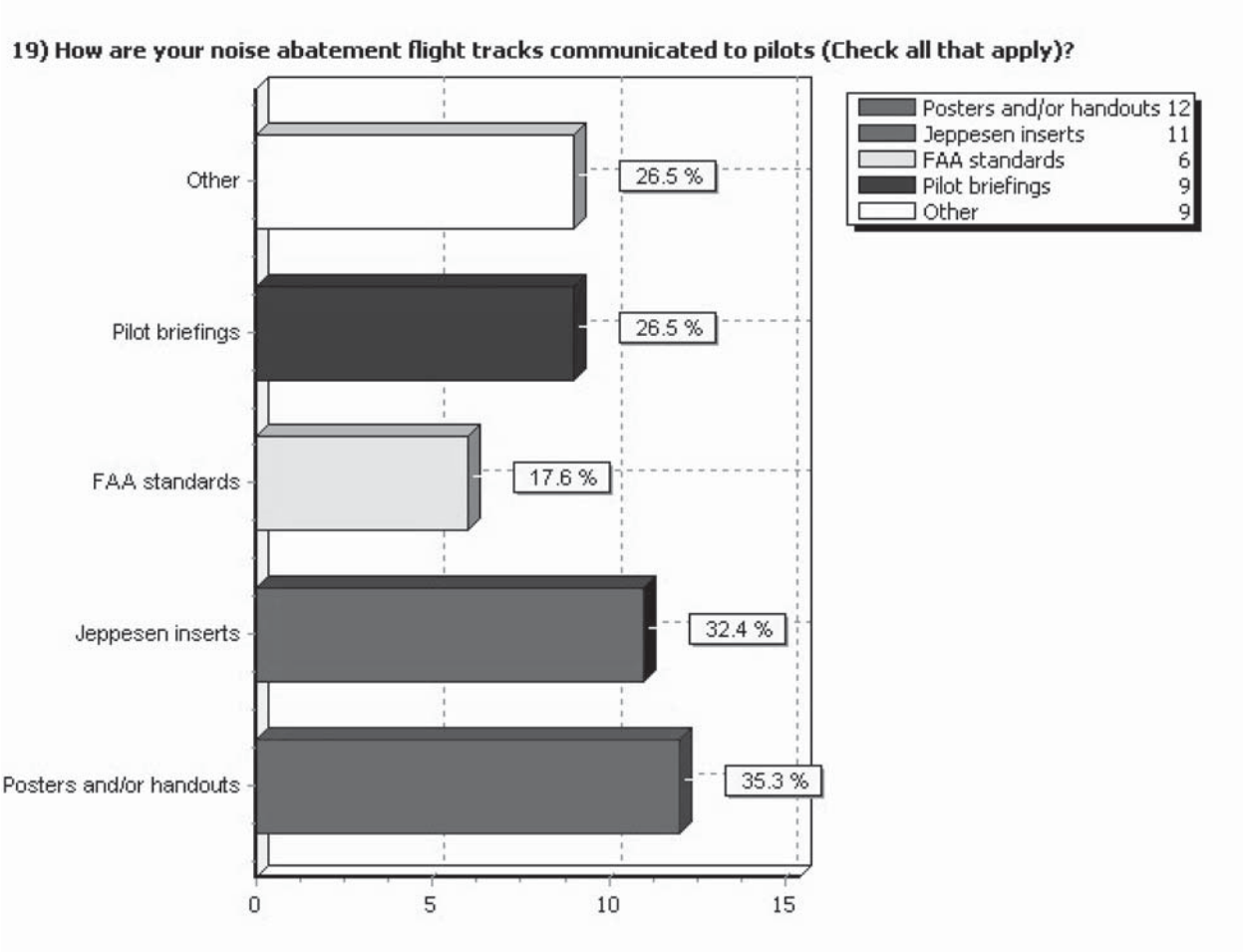
Other Responses:

Special procedures information
When traffic density is low
Voluntary, no ATC
Our program is voluntary.
By request when available through airport ATC
Local noise abatement departure procedures
RNAV currently being designed
Pilot education
Voluntary compliance only

18) Please explain the implementation process with FAA, focusing on implementation obstacles/challenges:

We have a very strong relationship with our local air traffic control management. We worked with them, as well as with airline partners, to develop a number of procedures including SIDs (Part 150 recommendation) RNAV and RNP, and preferential routing (collaboration with ATC and local operators).
The FAA does not participate nor care about noise issues. We are requesting their assistance from the highest levels.
Procedures were established in the late 1960s by the FAA and reaffirmed in the early 1980s by the FAA.
Approved measures in the FAR Part 150 update for 1999.
FAA uses preferential runway use pattern between 6 a.m. and 8 a.m. since 2000. Never able to gain cooperation at other times. Noise abatement routes are voluntary and followed by local air taxi operators. Not able to implement ATIS noise abatement message.
FAA tower personnel worked out the details quickly and efficiently.
NA
Typical Part 150 with public meetings
The Authority and the FAA ATM signed an Informal Letter of Agreement which states TPA's Noise Abatement Program. Noise abatement procedures are published in a Letter to Airmen Notice and are renewed every two years. As the FAA's mission is to operate the airport in a safe and efficient manner and with the adoption of ICAO's definition of a runway incursion; this presents new challenges to the Authority. The TPA FAA TRACON recently informed the Authority that they want the discretion to assign the noise sensitive parallel runway for turbojet arrivals regardless of noise impacts to residential communities.
Our program is voluntary. We cannot implement process until Part 161 is completed and approved.
Education. Management concurs, but line staff doesn't.
Whole system is voluntary for ATC/Instrument Flight Rules flights and Visual Flight Rules flights. Does not always work—~50% compliance.
Our local noise abatement procedures were implemented over time with the use of a special X-FAA staff consultant and much input from the community/airport users/local FAA personnel.
Existing noise abatement in place since 1980s. Currently undergoing noise abatement study as part of federal mitigation requirement for new runway
Conducted studies (before Part 150 existed) and negotiated with the FAA to implement the procedures.
FAA implemented for approved departure throughput; airport provided NEPA data for FAA determination; reduced population impacted inside the 65 from 4868 to 3800
Our flight tracks are voluntary and supported by safety issues. Our runway is in a box canyon and surrounded by mountains on three sides. Our flight track support head-to-head traffic patterns and supports safety. They also help with noise abatement outside of the 65 DNL.
Ideas are developed and researched by the airport Noise Oversight Committee (NOC) and recommendations are made to FAA. Additional review in support of FAA's consideration/implementation is conducted by MAC noise staff in consultation with the airport NOC.

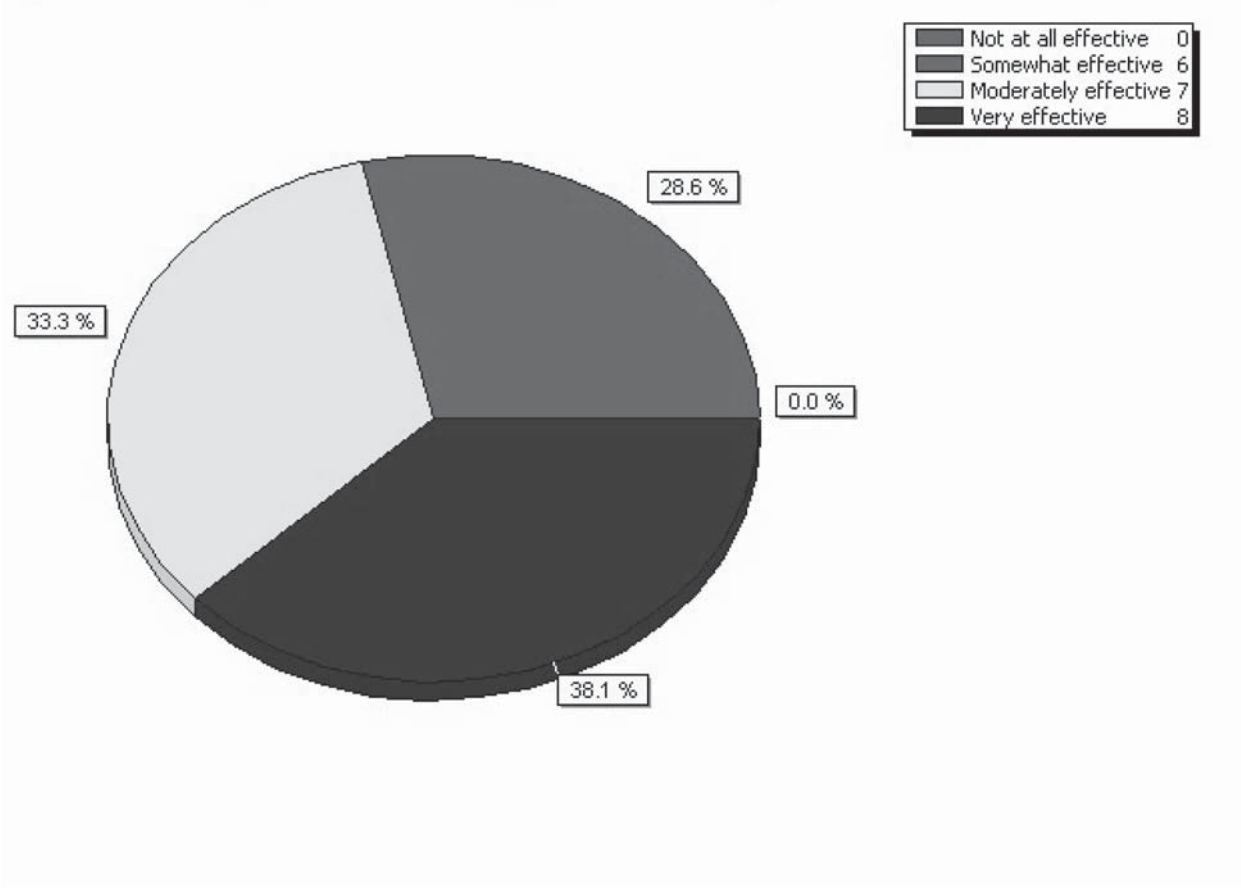
FAA ATCT will encourage noise abatement when aircraft separation and safety is not an issue.
We have encountered some challenges in implementing RNAV procedures for a number of various departures. This is done via MOA or other agreement documentation.



Other Responses:

Website, outreach with AOPA, NBAA, HAI, etc.
Pilot brochures
Airport Facility Directory Special Notices Section
ATC directive
Video presentation in terminal, website
Website and assigned headings by FAA ATCT
E-mail
AFD, airfield signing, and tower instructions
Airport website
ATC instructions

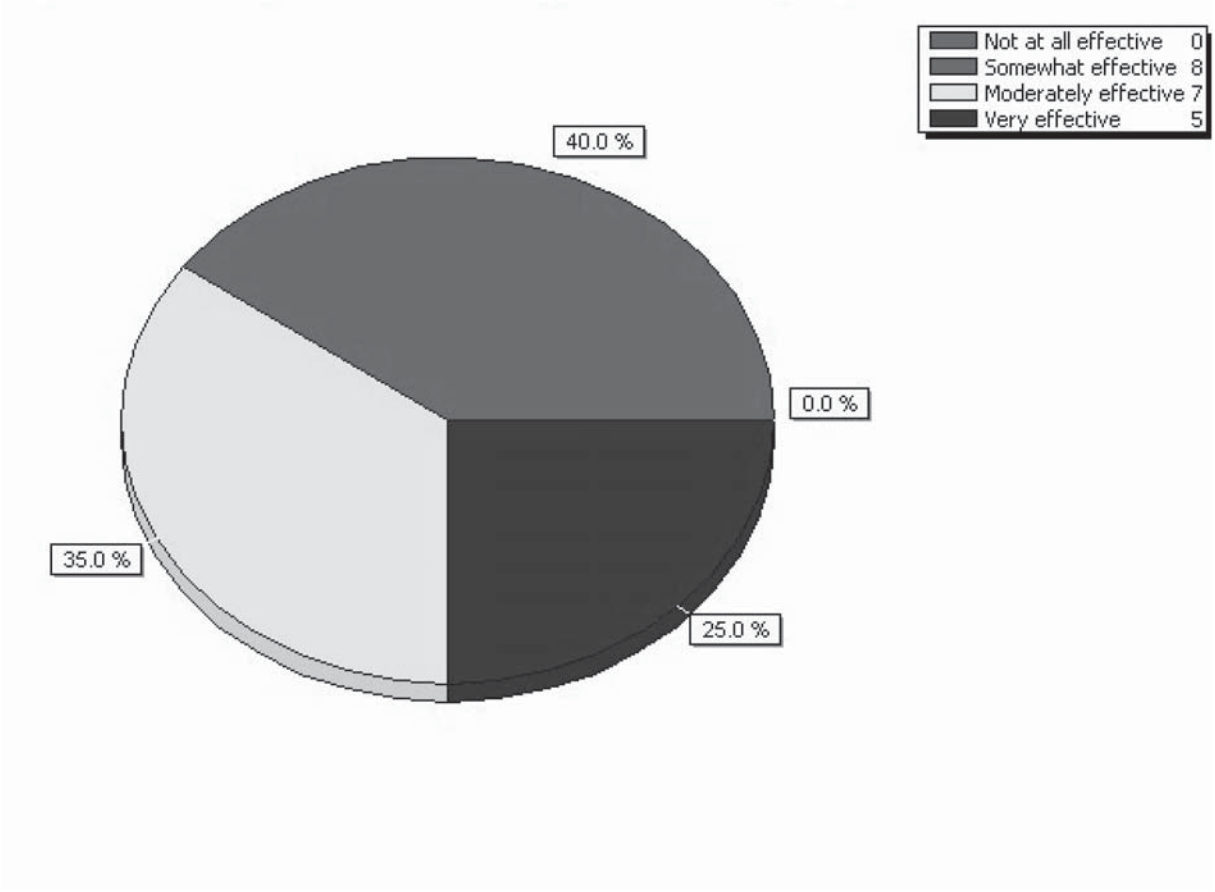
20) How effective are your noise abatement flight tracks at reducing noise over sensitive communities outs...



Comment Responses:

Would be more effective if we could get FAA support
Very effective when weather permits
Effective only for particular noise-sensitive communities at the expense of other communities.
However, we have not collected data to support this position
When adhered to by ATCT and turbojet pilots.
Turns over water, late night and shoreline crossings altitude very effective. Other close in turns not as affective.
Population under RNAV corridors more affected.

21) How effective are your noise abatement flight tracks at reducing complaints from noise-sensitive communities outside DNL 65?

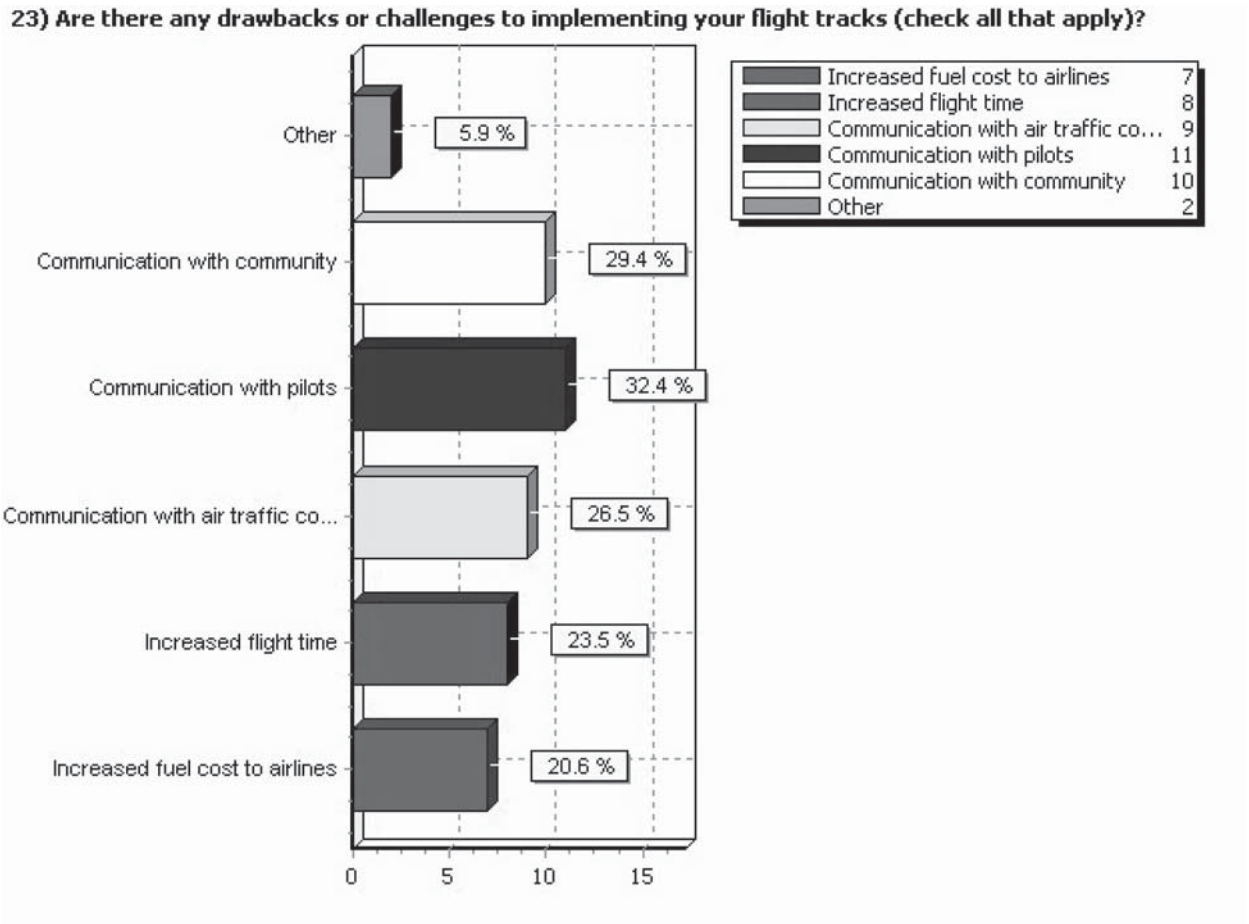


Comment Responses:

See comments from Question #20 above
Reduced complaints from particular noise-sensitive communities
However, we have not collected data to support this position
When complied by ATCT and jet pilots
High altitude overflights still generate many complaints

22) What is the estimated cost to implement this measure?

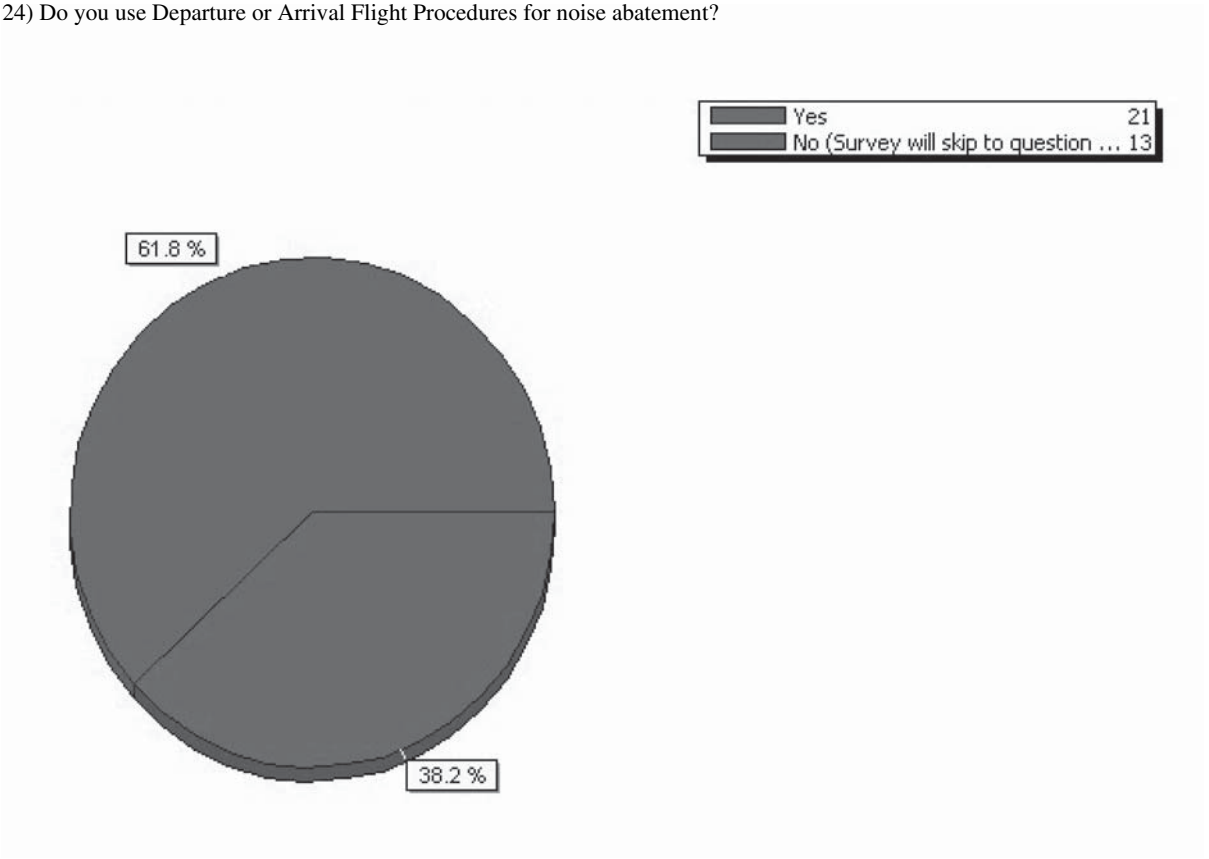
Cost to Airport	Cost to Operators	Cost to FAA	Other Costs: (explain)
Undetermined	Undetermined	Undetermined	
none	do not know	do not know	
			do not know
200K annually	750K annually	0	
0	Unknown amount of fuel cost	0	
$300,000			
$0	Unknown	Unknown	
Staff time		training	
NA	NA	NA	NA
$25 to $60K per year	0	0	
Annual noise budget—$1,500,000+			
			unknown
	175K		Cost indicated is for annual system maintenance
	a bit extra time and fuel		
$50,000 for NEPA work			
$25,000			
Staff time	Minimal	Minimal	
Just printing and communication costs			
NA	NA	NA	



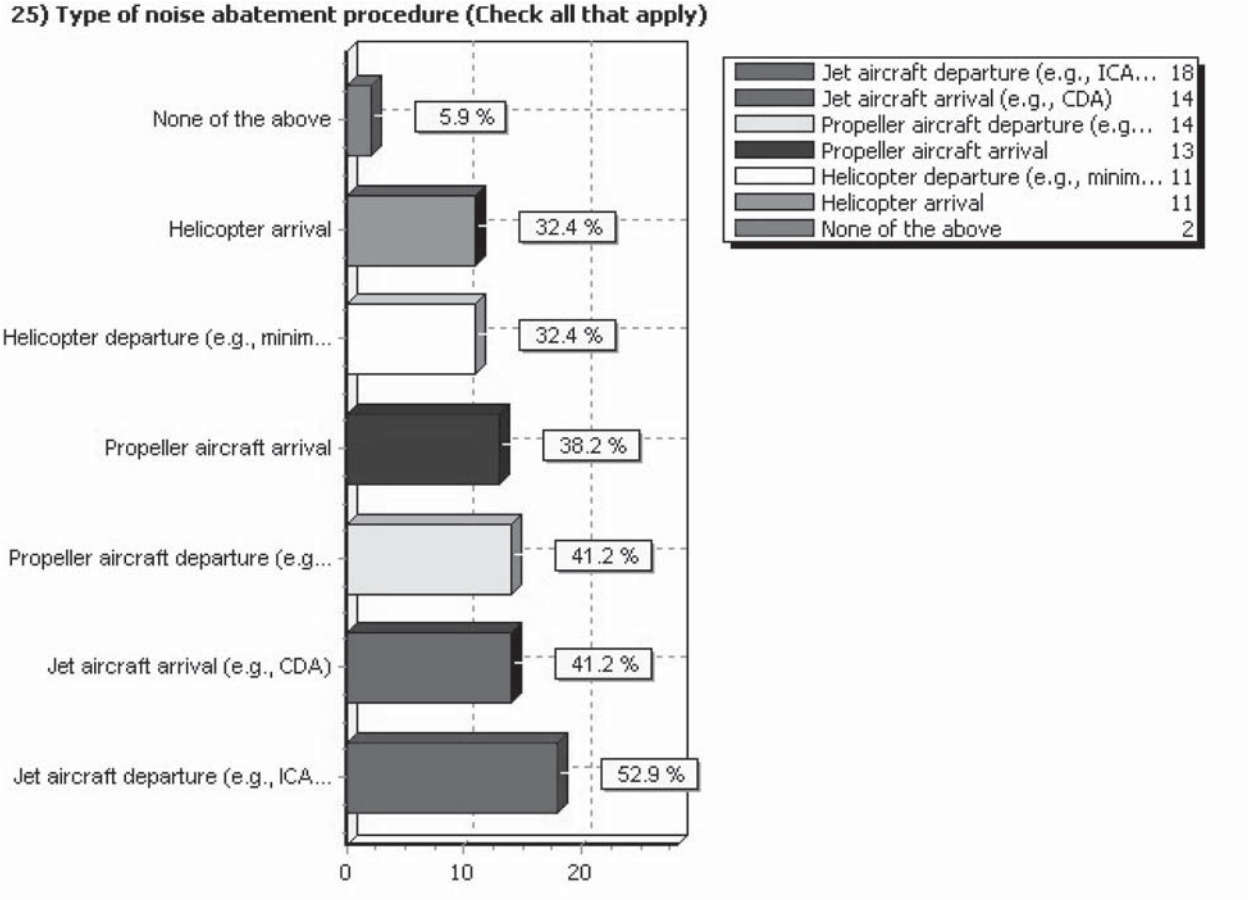
Other Responses:

ATC workload, increased emissions
Airspace congestion
No challenges to implementing flight tracks
Unknown
Prevent runway incursion and traffic
Voluntary is just hard to describe
Four of 16 routes increase flight time
The flight tracks are voluntary

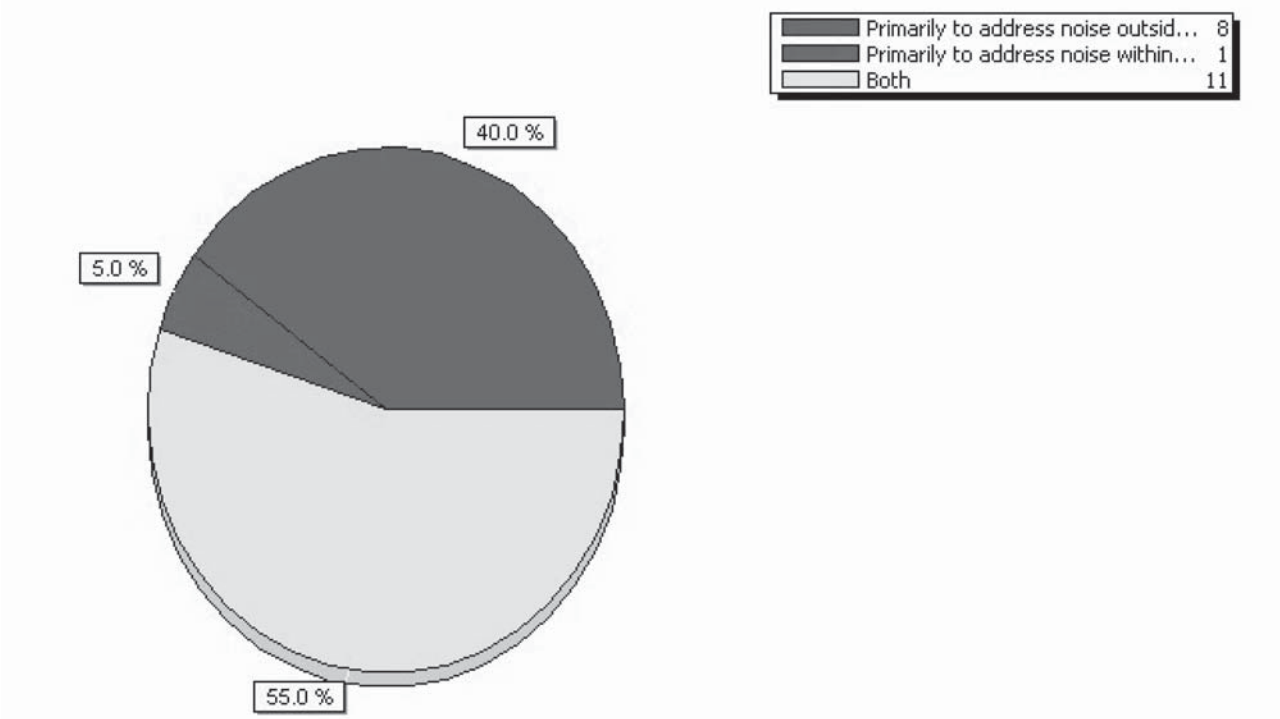
24) Do you use Departure or Arrival Flight Procedures for noise abatement?



25) Type of noise abatement procedure (Check all that apply)



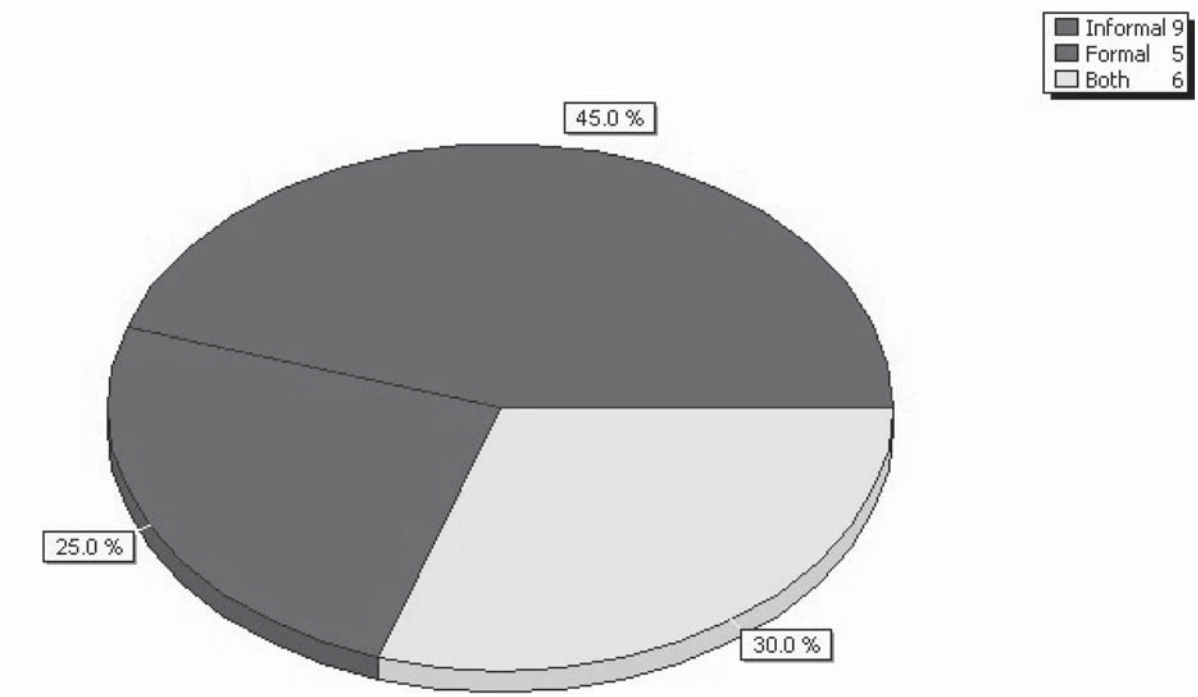
26) Were your noise abatement procedures developed primarily to address noise outside DNL 65, primarily to address noise within DNL 65, or both?



27) What noise metric(s) did you use to evaluate noise abatement procedures (enter levels for all that apply)?

Day–Night Average Sound Level, DNL Level	Equivalent Level, L_{eq} Level	Sound Exposure Level, SEL Level	Maximum A-weighted Level, L_{max} $Level_{eq}$	Time Above, TA Level	Other
DNL					
**	**	**	**	**	
					Again! Were not designed around metrics but compatible land uses.
DNL per 14 CFR 150					
65					
CNEL					
DNL	L_{eq}		L_{max}		
65 dBA		95 dBA	70–75 dBA		
		SENEL for jet departures. Target level varies according to type of jet.			
65					
					PNDB
60+					
					NEF Contours
					CNEL
65 and 60					
x	x	x	x		

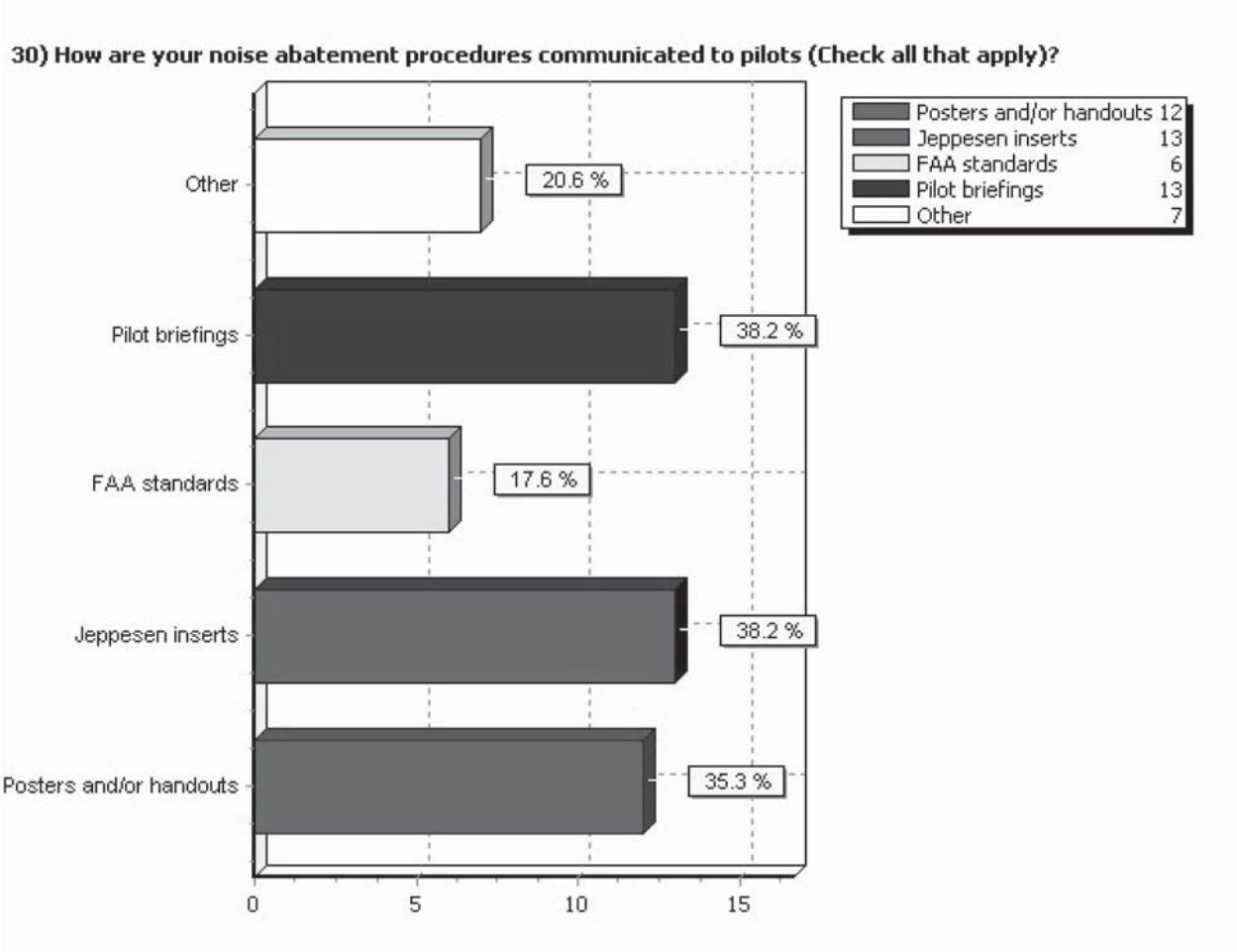
28) How are your noise abatement flight procedures implemented (Check all that apply)?



29) Please explain:

Letter of Agreement with control tower. Also, extensive operator outreach for voluntary measures.
FAA would not participate. We prepared procedures for VFR climatologic conditions.
Non-towered airport with no radar service. All voluntary.
FAR Part 150 Update of 1999.
Formal notice is published for pilots to maintain 2,000 ft altitude until 5 mile final, but this is voluntary.
Voluntary Visual Flight Tracks
Non-controlled airspace, voluntary procedure
Letter to Airmen Notice that is a local signed agreement between the Authority and the FAA airport ATM and is renewed every two years.
Informal as most procedures are voluntary. Formal as we have a partial curfew designed to prohibit departures of Stage II aircraft.
Noise rules and FAA SOP
Departures are given headings to direct aircraft over non-sensitive areas.
Closure of east outboard and diagonals at night; depends primarily on inboards; arrivals on outboards.
Procedures are voluntary.

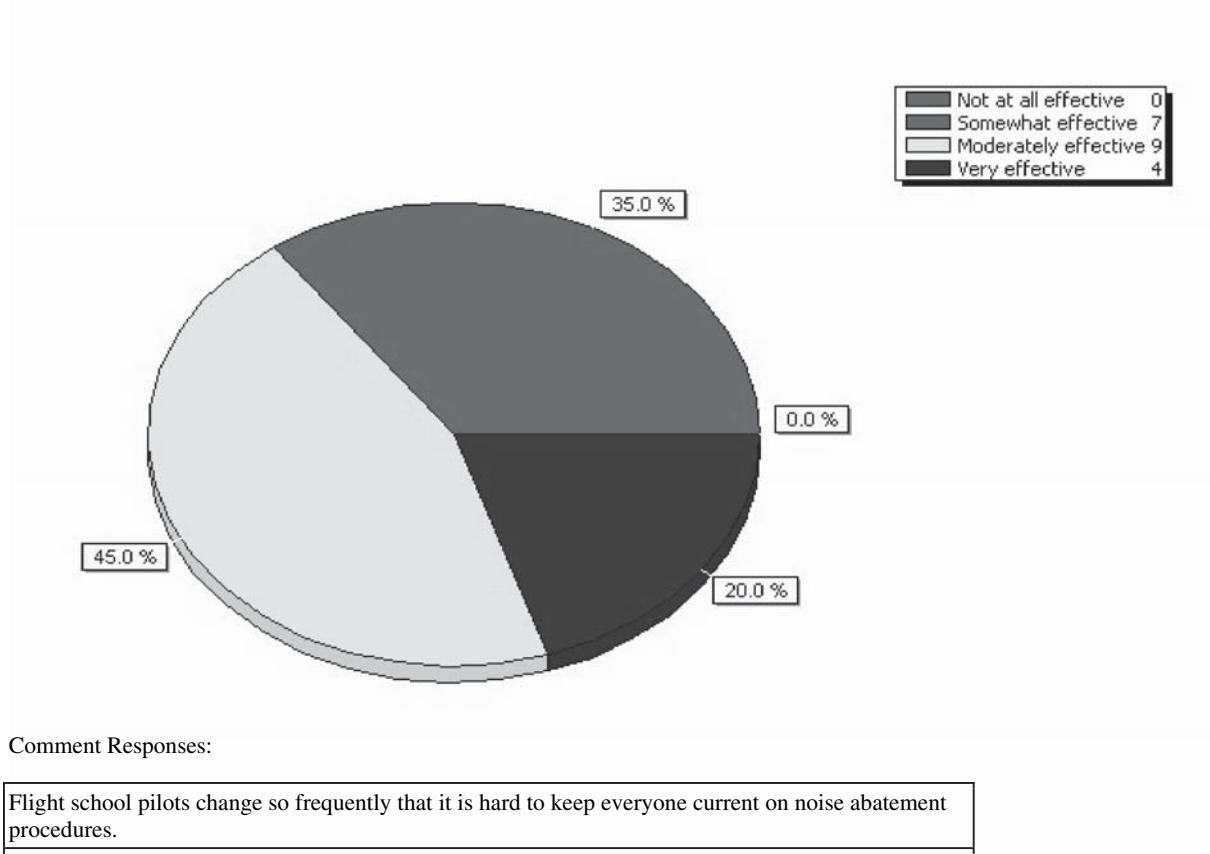
All are formal except for the “no turns before shoreline” policy to eliminate early turns. If all departures followed a published DP then there would be no early turns. LAX ATC usually directs them to "turn at the VOR" or "turn at the shoreline" which is then up for interpretation.
NADPs
They are implemented if there weather conditions allow.



Other Responses:

ATC instructions in line with LOA
Video distributed to flight schools
Pilot Brochures, letters, phone calls
Airport Facility Directory Special Notice
FAA ATC as a part of their standard SOP
Directed by ATCT
Airfield signage
ATC instructions

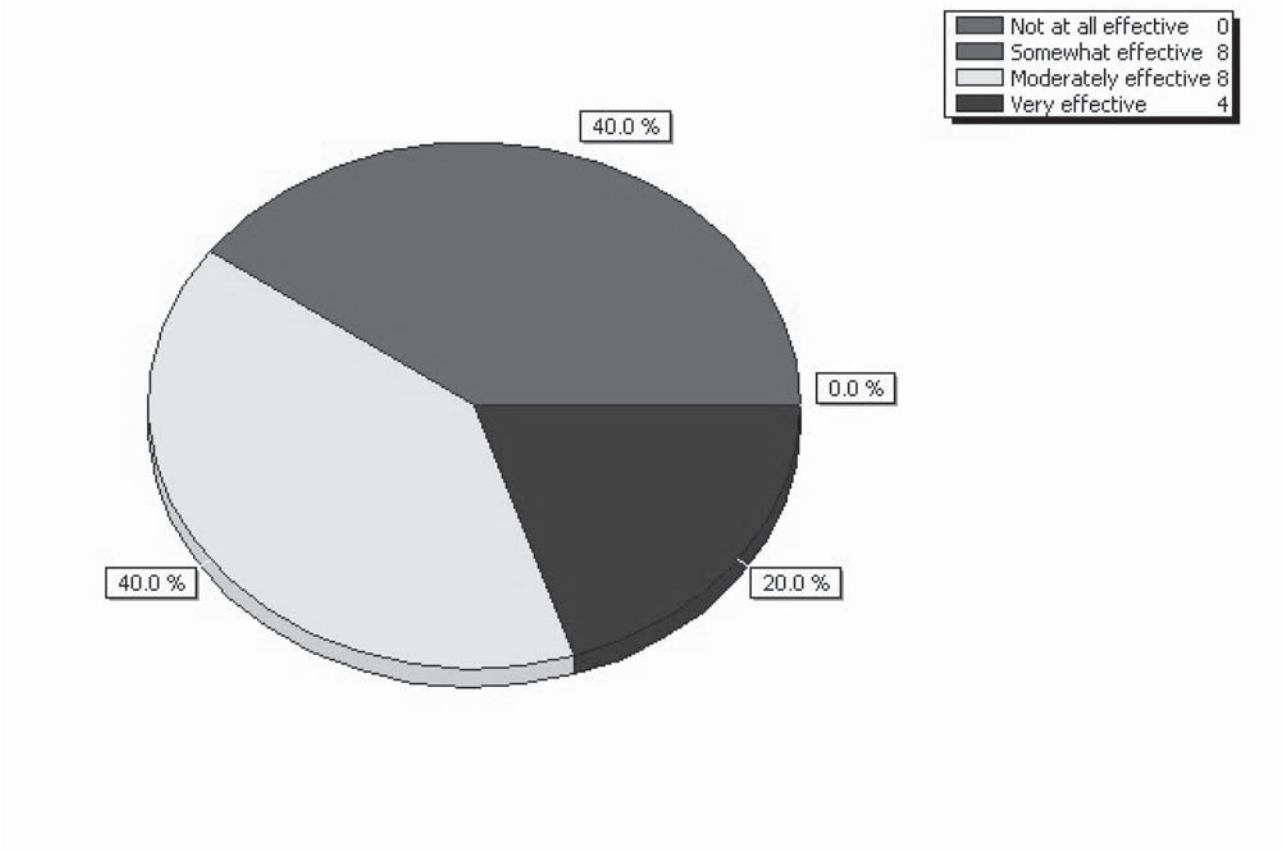
31) How effective are your noise abatement procedures at reducing noise over sensitive communities outside DNL 65?



Comment Responses:

Flight school pilots change so frequently that it is hard to keep everyone current on noise abatement procedures.
They could be very effective with FAA support
Very effective weather permitting
When adhered to by ATC and jet pilots
Late night, turns over water, minimum shoreline crossing altitudes are very effective in reducing noise. Close-in turns over populated areas less so and concentrate noise
Some problems occur during construction when runways are closed.
The majority of complaints (2–3 per year) are due to military operations.
Although the communities don’t seem to think so. They relate to what is current and can't compare to what it's like without the procedures in place.

32) How effective are your noise abatement procedures at reducing complaints from noise-sensitive communities outside DNL 65?



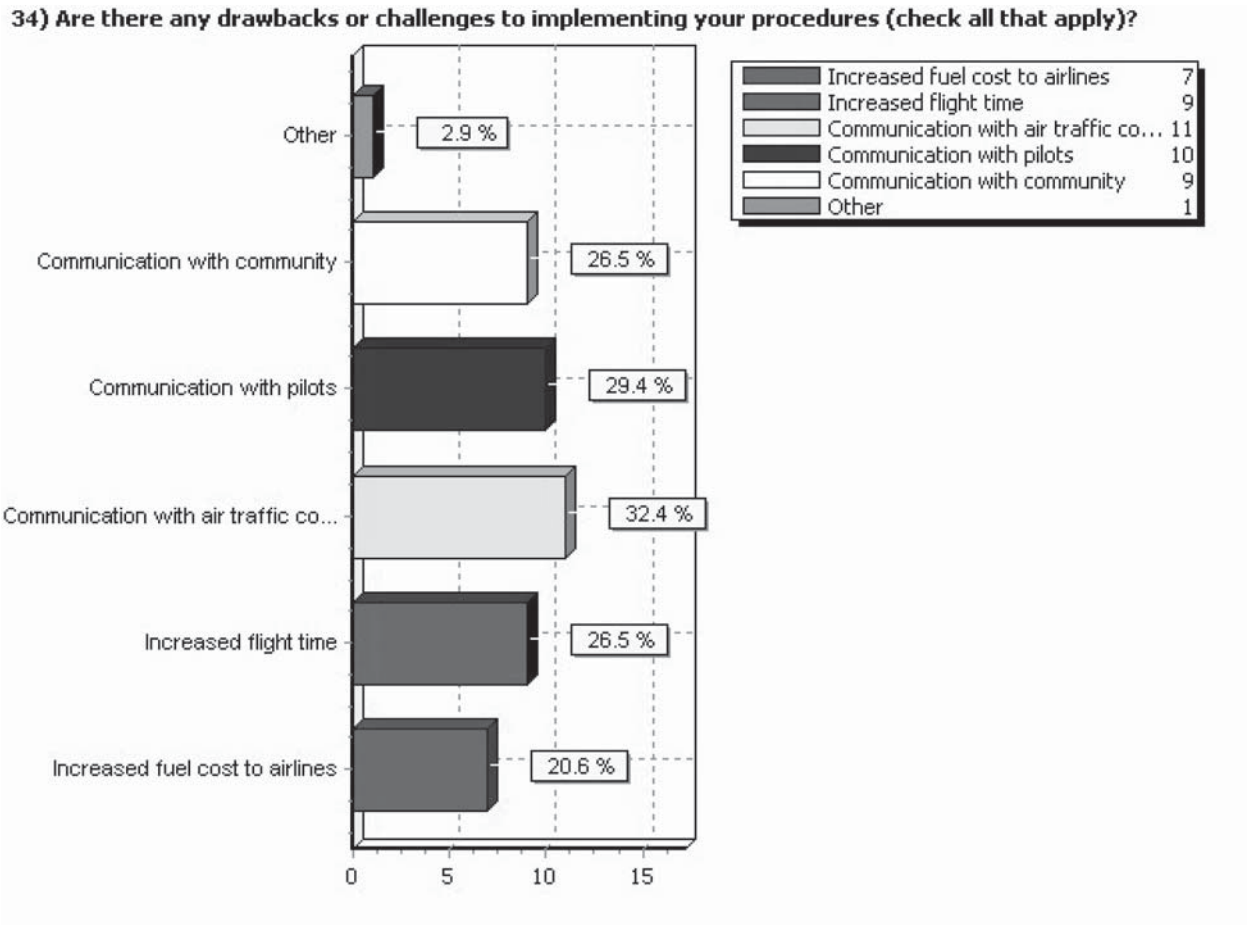
Comment Responses:

We ask that pilots stay west of the complaining community. The community does not care if there are reasons that this is not always possible.
See comments Question #32 above
When adhered to by ATC and jet pilots

33) What is the estimated cost to implement this measure?

Cost to Airport	Cost to Operators	Cost to FAA	Other Costs (explain)
Undetermined	Undetermined	Undetermined	
$13,500, part time noise position	unknown but they spend time training pilots		
considerable			
$250,000/ year			
			no idea
nil	nil	nil	Nil
200K	750K	0	
$300,000			
Staff time		Training (unknown)	
			unknown
	Extra taxiing distance and flight time		
			175K for system maintenance
0		0	
Cost of placing signs on airfield.			
$25,000			
Noise office staff to monitor procedures.	?	?	
Staff Time	Minimal	Minimal	
NA	NA	NA	

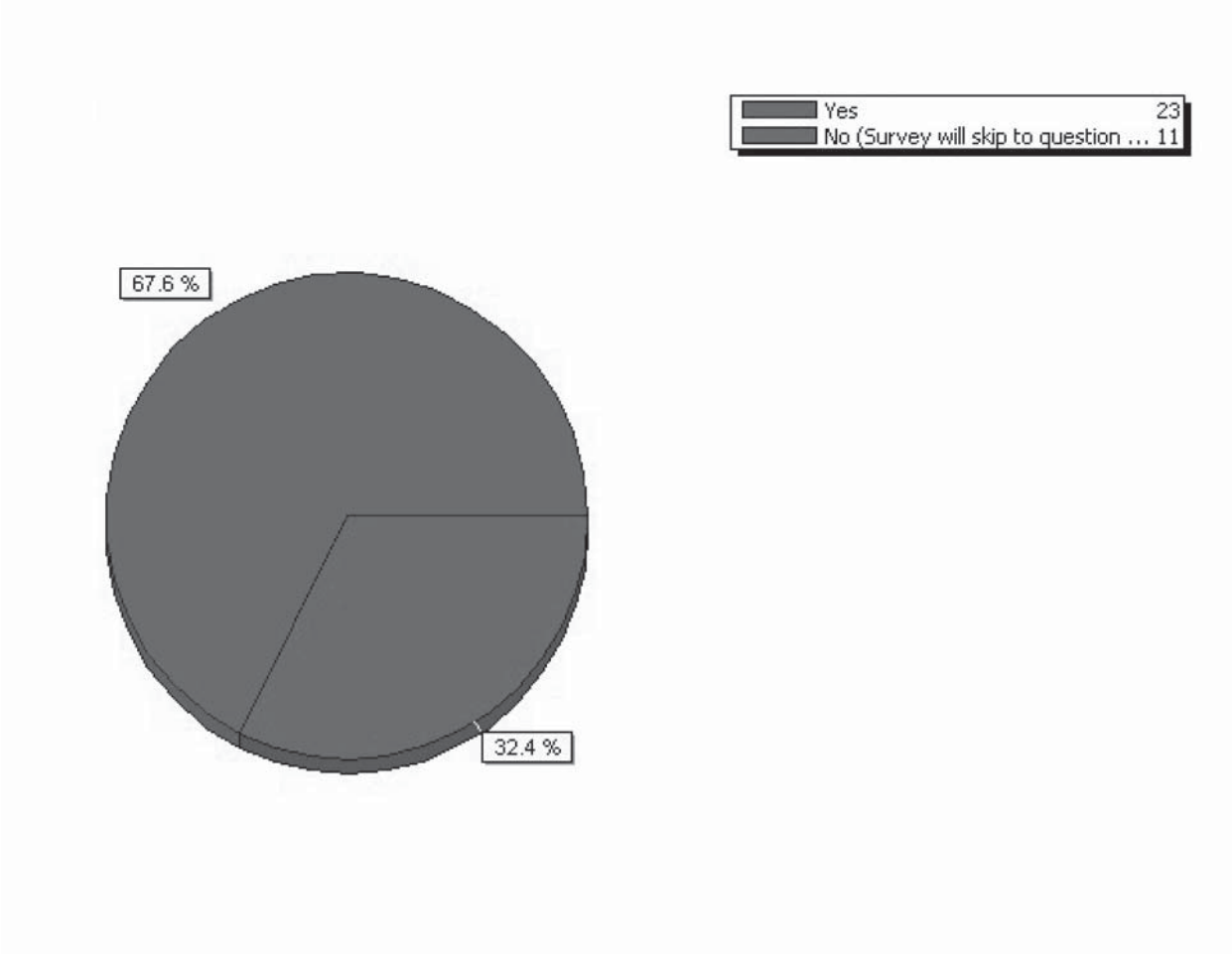
34) Are there any drawbacks or challenges to implementing your procedures (check all that apply)?

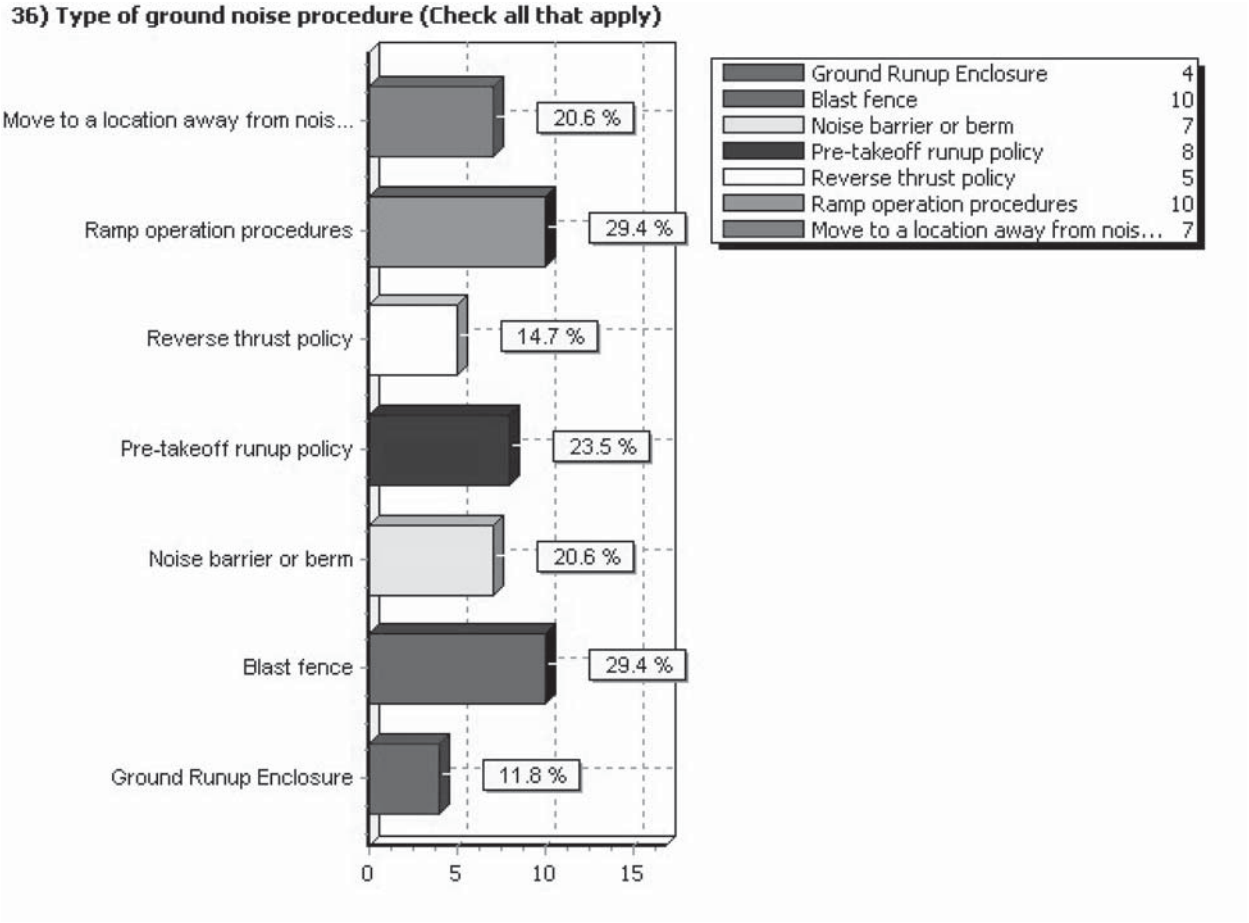


Other Responses:

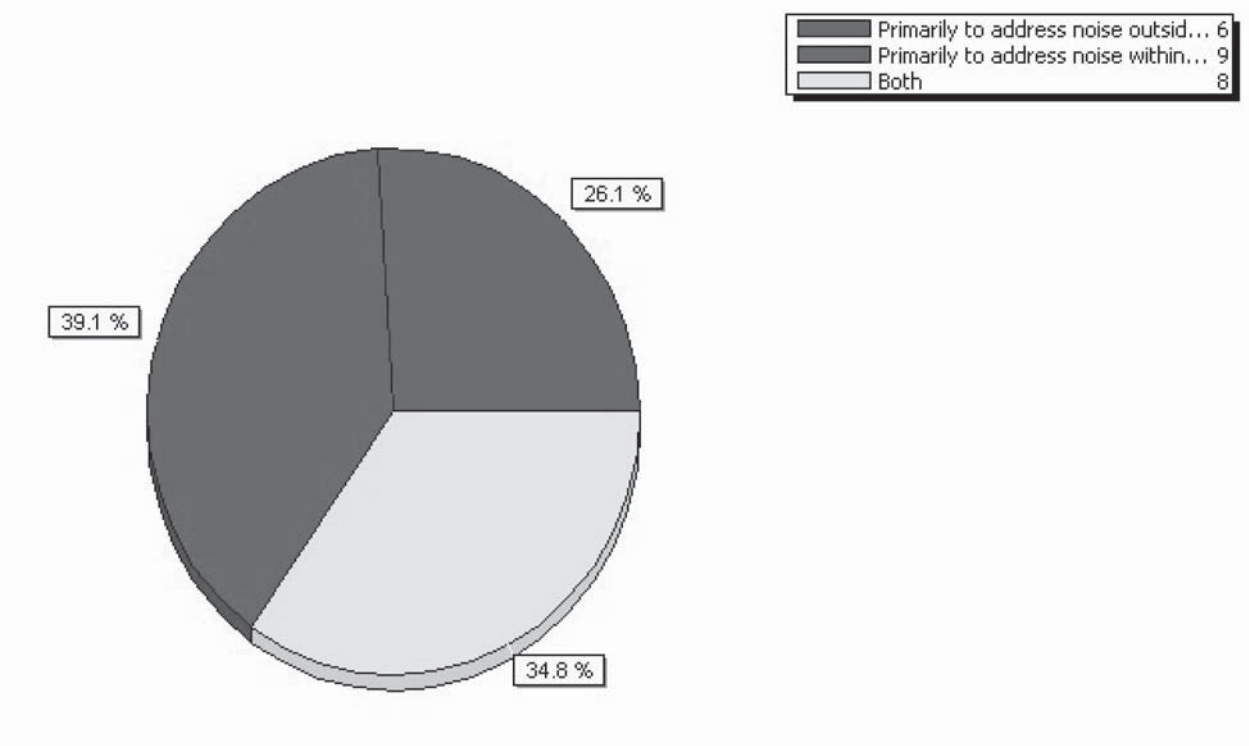
ATC workload, emissions, shifting noise
Airspace congestion
None
No costs
Procedures are voluntary

35) Does your airport have procedures to minimize Ground Noise (i.e., from takeoff roll, reverse thrust, taxi, or engine run-ups)?



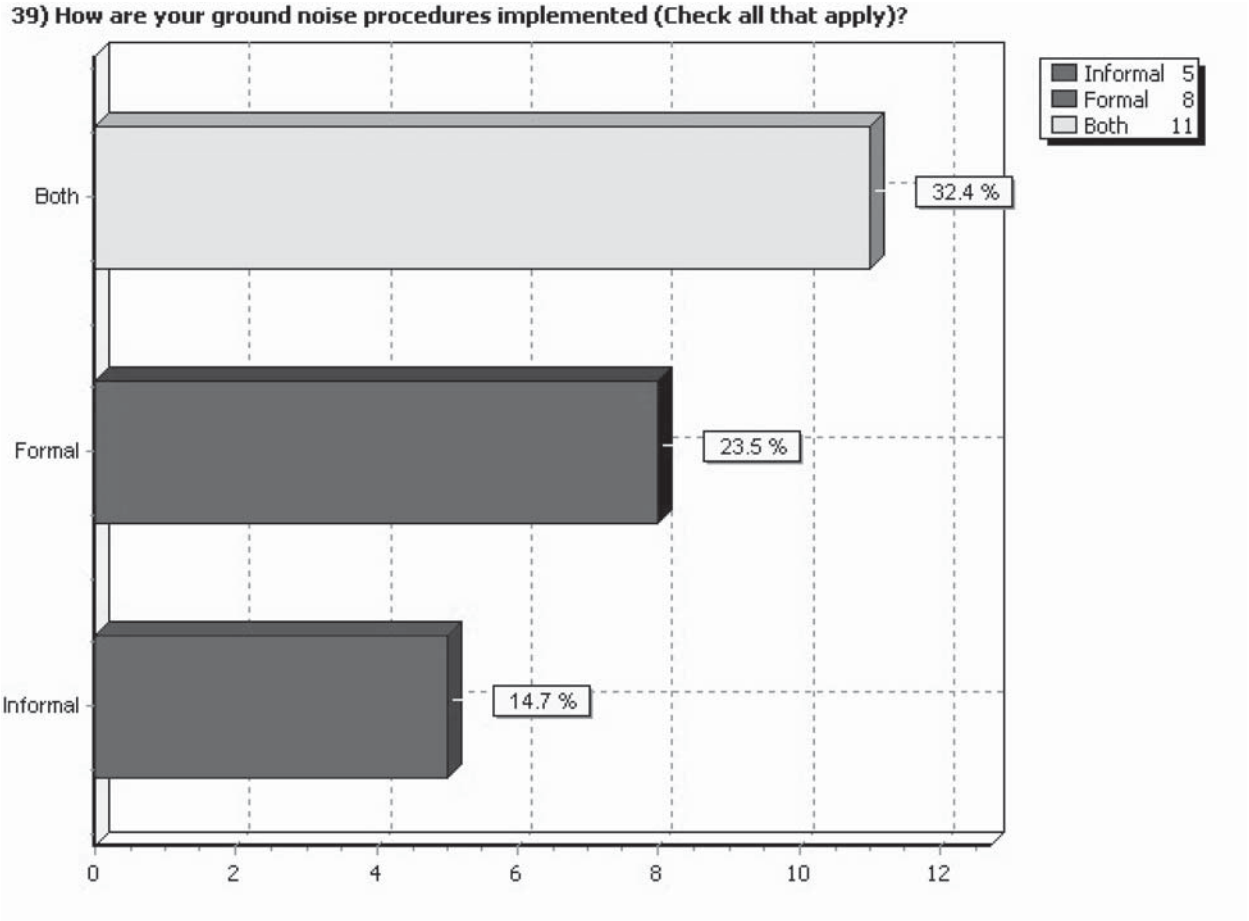


37) Were your ground noise procedures developed primarily to address noise outside DNL 65, primarily to address noise within DNL 65, or both?



38) What noise metric(s) did you use to evaluate ground noise procedures (enter levels for all that apply)?

Day–Night Average Sound Level, DNL Level	Equivalent Level, L_{eq} Level	Sound Exposure Level, SEL Level	Maximum A-weighted Level, L_{max} Level	Time Above, TA Level	Other
HMMH conducted GRE testing					
		**			
					AGAIN! Compatible land uses, not metrics!
DNL per 14 CFR 150					
65					
					None
					None
CNEL					
			65 dBA		
			L_{max}		
65 dBA		70–75 dBA			
			85	90	
		Metric used			
60					
Part 150 Study					Public complaints
					NA
					CNEL
65					

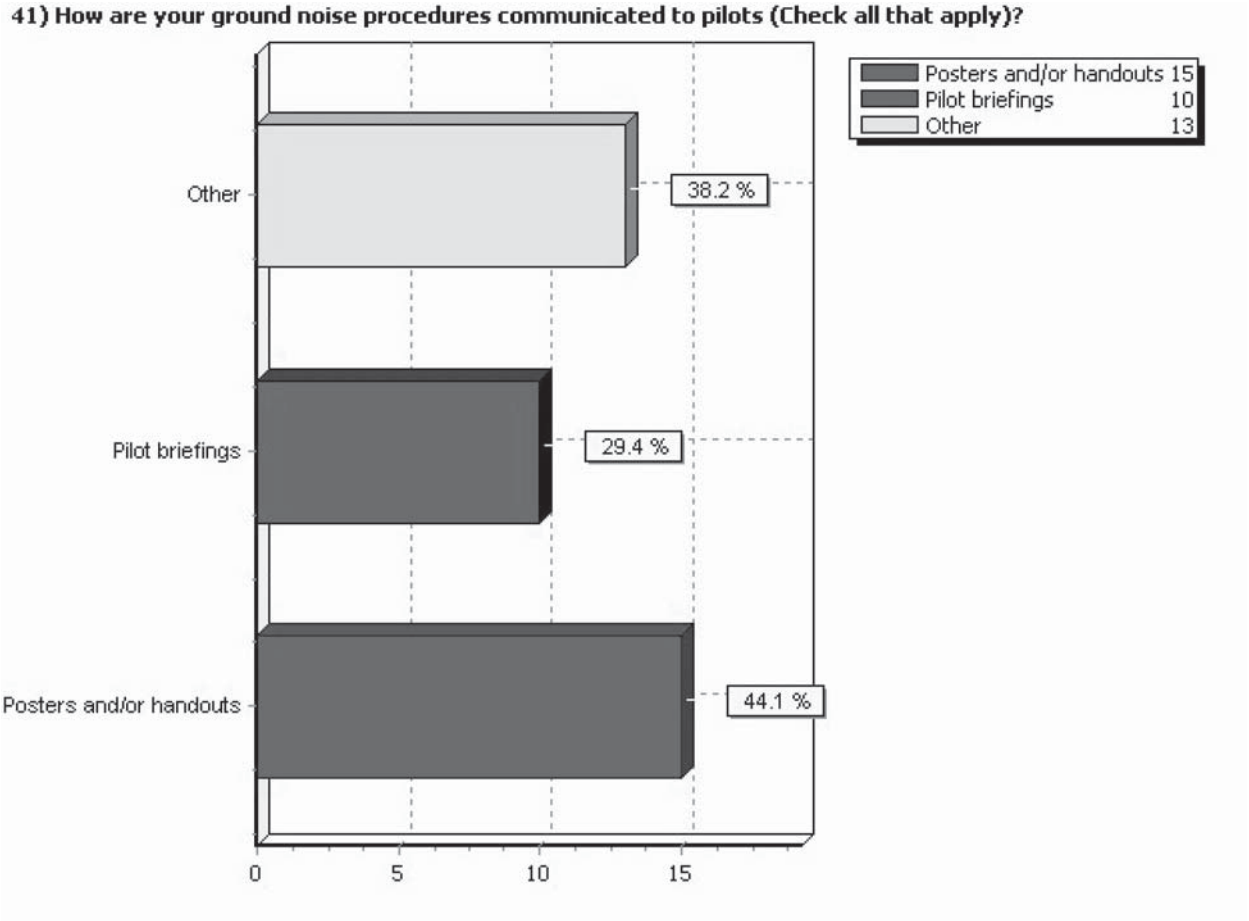


40) Please Explain:

Outreach with local operators. Airport policies and procedures. Also coordination with ATC.
We meet with tenants and ask for tower assistance.
Operators asked to limit auxilary power unit (APU) usage to 15 min.
Maintenance run-ups must be cleared by airport operations.
Operation directives to enforce run-up policy
Airport Rules and Regulations set forth operational procedures governing GRE use, enforcement, and five levels of incentive or penalties for compliance.
Voluntary APU Restrictions
Engine run-ups must be performed at specific location only and only during certain times with certain power settings and no run-ups permitted between 12 midnight and 6 a.m.
Noise curfew restrictions in place prohibit run-up or engine run between 11:30 p.m. and 6:30 a.m. daily
Airport rules and regulation control ground-based operations.
Requests for run-up operations are directed to Operations for permission prior to commencing run-up activity.

Ground run-ups allowed from 9 a.m. to 9 p.m. and in certain run-up areas as designated by Airport Operations. Operators may be asked if doing a maintenance run-up to stop or cutback power if noise complaints are coming in.
Authority SOP that requires contact to the Operations Department prior to utilization of the GRE. A form is also filled out and faxed to the Authority. Maintenance hangars are located on the eastern side of the airfield just north of the GRE facility. Training on the use of GRE is conducted with new tenants.
No nighttime run-ups for maintenance. Daytime run-ups only permitted at the blast fence.
Written in pilot handouts and inserts and as advised by our Contract Tower.
Part of Noise Rules. Designated run-up areas, towing of aircraft, limited use of APUs. Limited use of certain runways. Voluntary request on one engine taxiing.
Blast fence is installed to protect the communities from noise.
1) Run-ups are prohibited during certain times of the day. It is listed in a Notice-to-Airman Noise Compatibility Procedure document. 2) We request that the public call and give us time and dates to monitor for compliance. Should non-compliance be evident, the specific airlines are contacted. 3) Airfield signs are to be posted this year concerning power taxiing and its limits
Airport Rules and Regulations
Airport Rules and Regulations include a recommendation for operators to minimize use of reverse thrust (not usually followed). Also includes a maintenance/engine run-up curfew between 11 p.m. and 6 a.m. daily, and a two-in/out requirement for large jet aircraft operating at the Imperial Terminal. Airport Operations staff enforce these rules.
Filed Rule and Letters of Agreement with Tenants

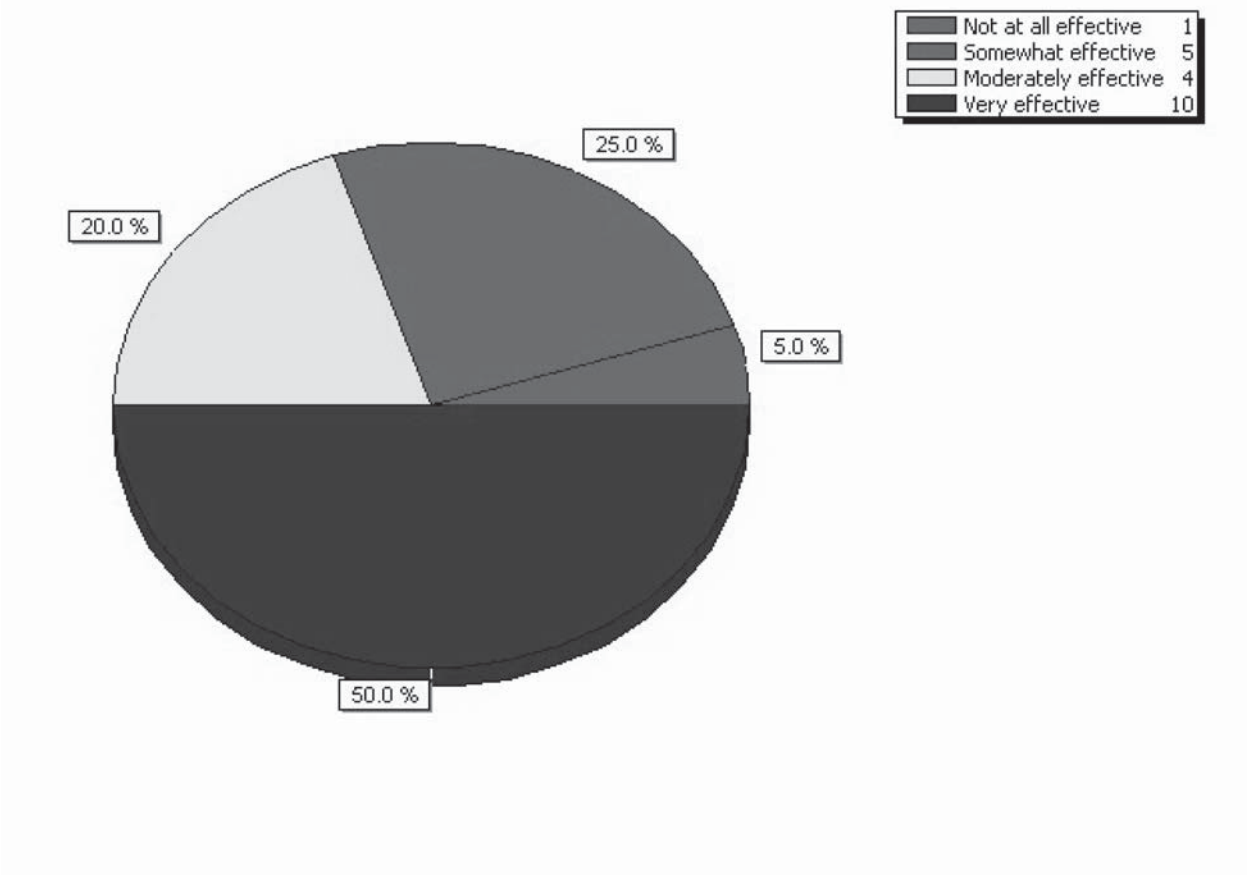
41) How are your ground noise procedures communicated to pilots (Check all that apply)?



Other Responses:

Maintenance personnel briefings
Tower
Electronic signage
Letter of Instruction on GRE Usage; all
Website
None
Airport operations personnel
Website and tenant meetings
Airport regulations
Installed at the end of the runways
Letter to Airman
Airport operations staff communicate rule
Noise abatement rules and regulations.

42) How effective are your ground noise procedures at reducing complaints from noise-sensitive communities outside DNL 65?



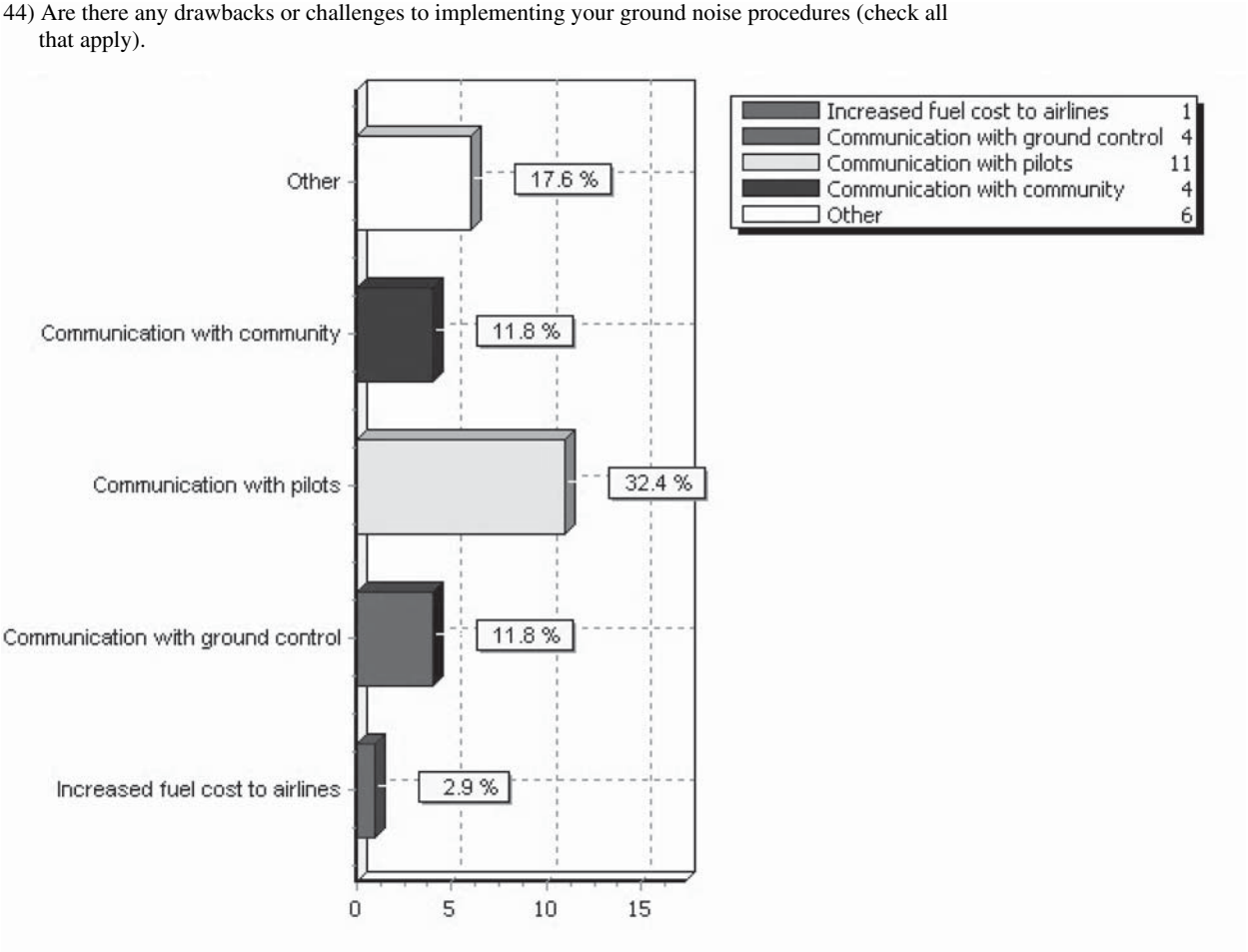
Comment Responses:

Irrelevant
No run-up complaints in years
Never had a ground noise complaint from outside CNEL 65
We rarely receive noise complaints re: run-up activity from outside the 65
NA

43) What is the estimated cost to implement this measure?

Cost to Airport	Cost to Operators	Cost to FAA	Other Costs (explain)
$8 Million (GRE) relatively no cost on reverse thrust	Undetermined	Undetermined	
Very little			
Minimal			
			no idea
nil	nil	nil	Administrative
1K initially	unknown	0	
0	Unknown fuel cost to taxi to run-up location and back	0	
$0	$0	$0	$0
GRE installation and training—$5 million		80%	Maintenance, staff time, and equipment
0	0	0	
$4,500,000		80%	
Minimal			
None	None	None	
			NA
$25,000			
Ops staff to enforce—Not much activity.	0	0	
Staff Time	minimal	minimal	

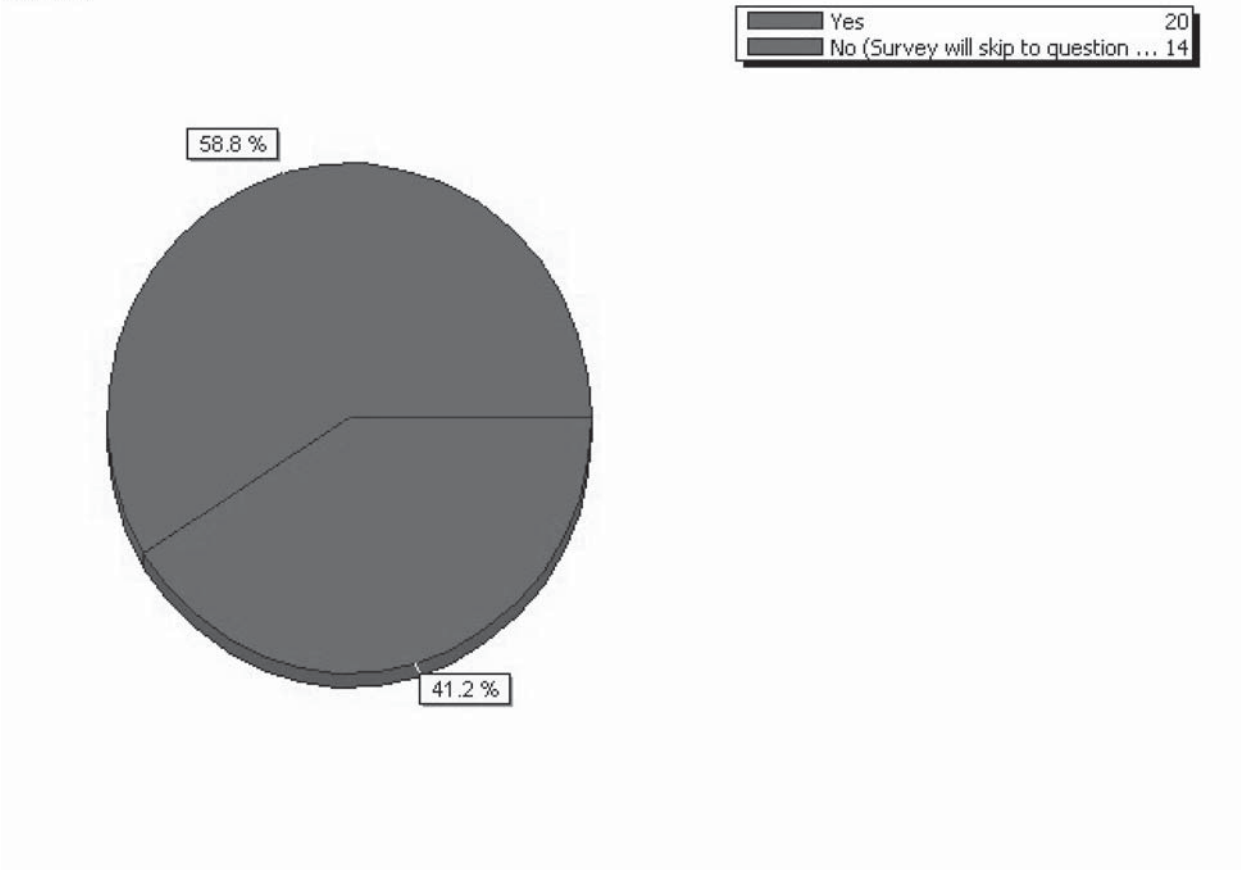
44) Are there any drawbacks or challenges to implementing your ground noise procedures (check all that apply).



Other Responses:

Additional taxi time; fuel/emissions
Private jet passenger education
No drawback; everyone cooperates
None
Doesn't seem to be any drawbacks
Our procedures are only recommended.
No
Operations staff enforcing curfew, etc.

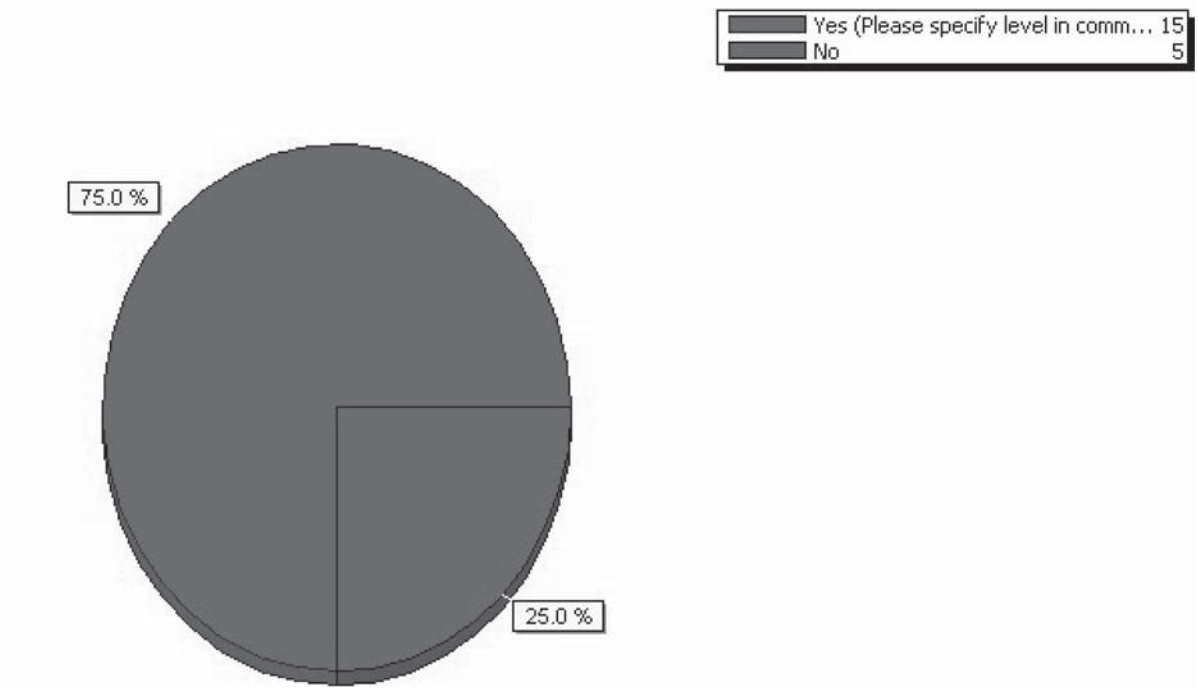
45) Do you have Land Use Measures that apply outside DNL 65?



46) What type of zoning do you or the land use governments surrounding the airport use outside DNL 65? (Enter levels for all that apply.)

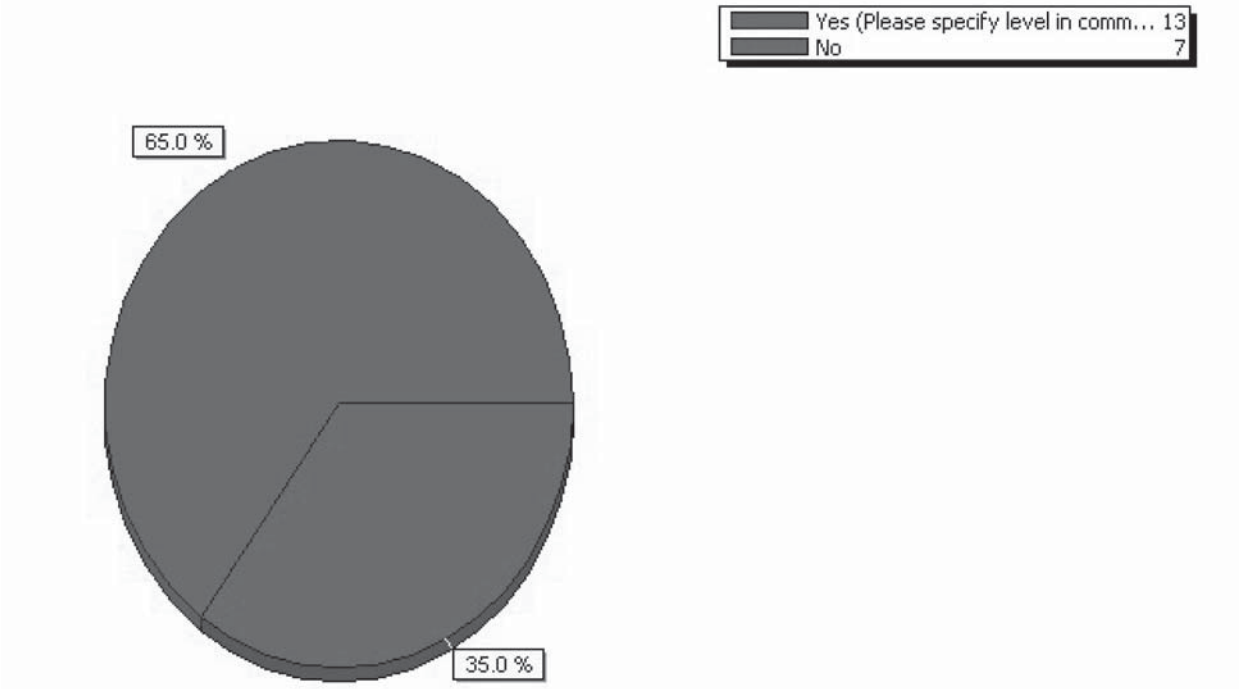
Prohibit development of residential land uses—Identify Level	Permit development of residential land uses with sound insulation—Identify Level	Other	None
68 dBA (based on 1990 contours)	65 dBA (based on 1990 contours)		
to 60 LDN			
65 CNEL			
			none
Airport Business surrounds ALB prohibiting non-compatible uses		Noise Overlay District adopted-in effect	
Current 60 DNL similar to composite 65 DNL			
		Airport Land Use Compatibility Plan, based on Caltrans Division of Aeronautics guidelines	
			No prohibited land uses
60 DNL	55 DNL	65 DNL nonresidential sound insulation required	
65 dBA		Airport District Zoning	
		Policy contours	
		Disclosure. Building restrictions vary by local.	
	Yes, since 1986		
		Control the land within the airport to insure compatible uses	
		Airport Influence Area	
65 DNL or higher	60–64.9 DNL	disclosure required for homes >65 DNL until 1 mile outside the 60 DNL contour	
		Use of policy contour	
			None
Discouraged >65 DNL	65 DNL	SLR up to 35 db	

47) Do you or the governing body(ies) with land use authority require avigation easements?



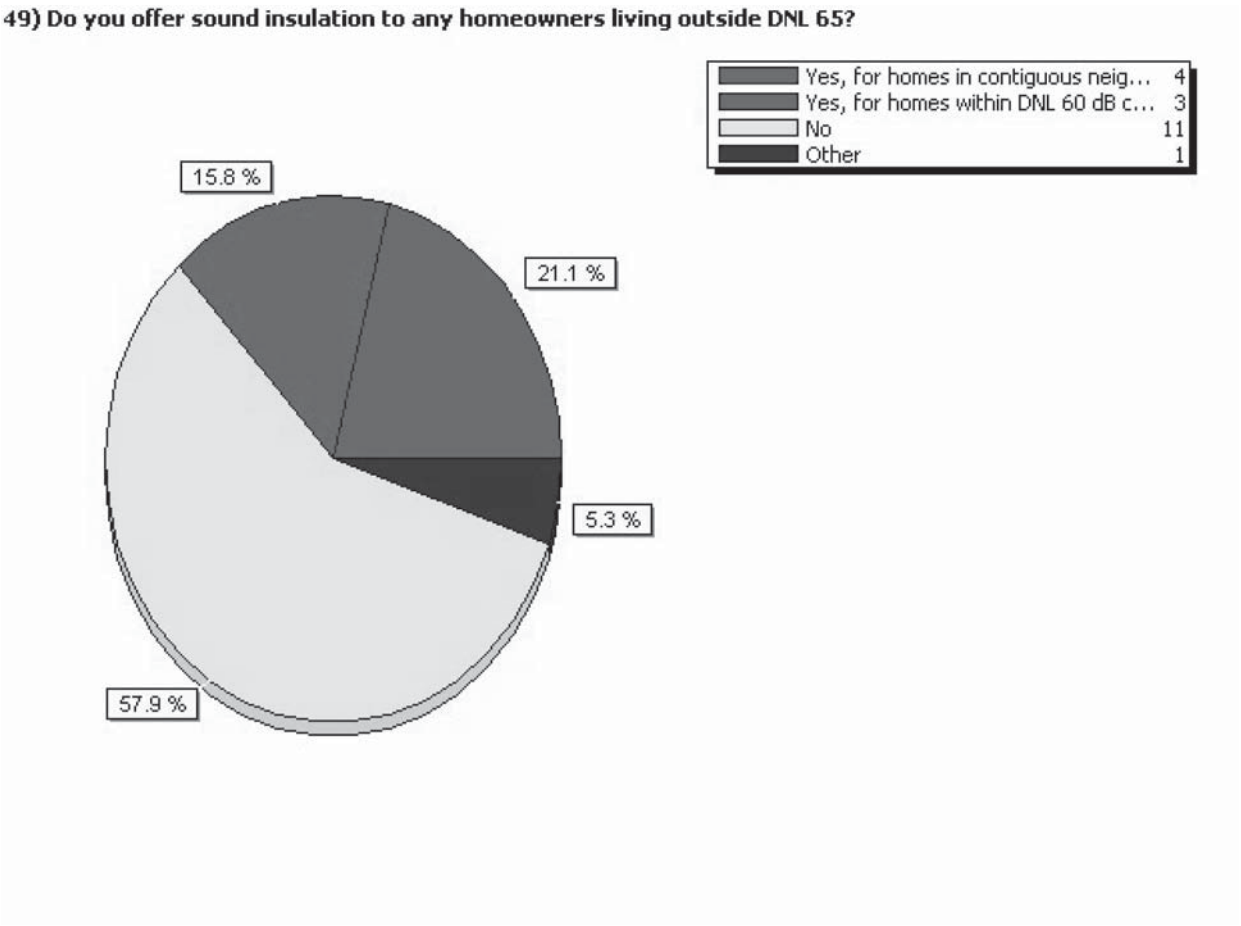
Airport requires easement
We require easements out to our 65 LDN.
Based on Land Use Compatibility Zones designated in plan
Only for non-compatible uses with airport approval
State, county, and city requirement
But only prior to the ruling Nevada court ruling on Sisalak
5 miles around airports
We have required them if property owners' accepts mitigation
Some jurisdictions only
For homes requesting soundproofing
Recent court case said not warranted
In areas that we have purchased and sold back to the public
All homes from between 60 and 65 DNL contours.
Encouraged; not required
Any use within 65 DNL

48) Do you or the governing body(ies) with land use authority require real estate disclosure?



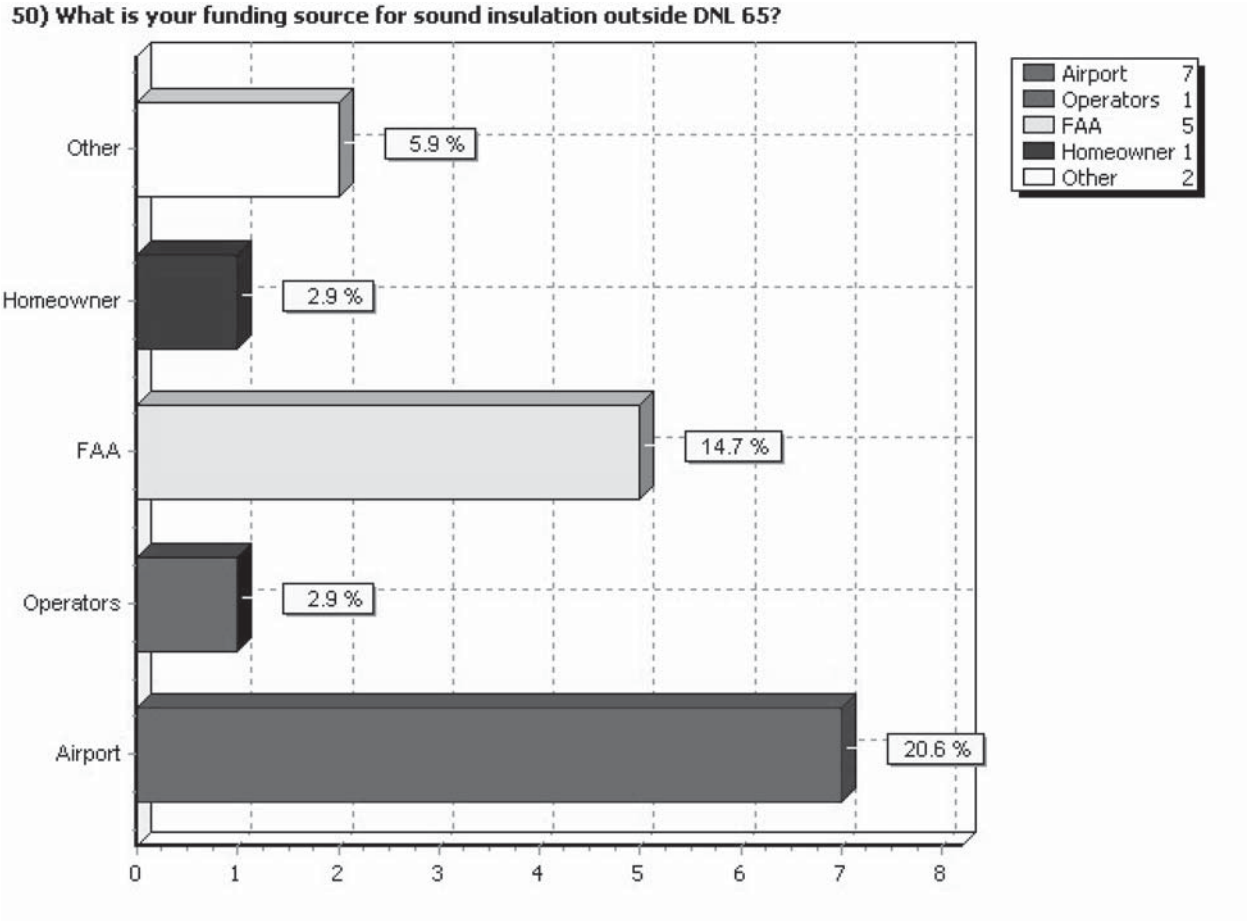
Airport requires easement
State of California requires within airport influence area
Residential use only to composite 55 DNL
State law
Must be recorded at county
Some jurisdictions only
This is done at the county level.
On a case-by-case basis for new development
All homes outside the 65 DNL contour to a distance 1 mile out
Encouraged; not required
Disclosure is required within 60 DNL

49) Do you offer sound insulation to any homeowners living outside DNL 65?



Other Responses:

Currently studying this topic
Residents should not be forced inside
Pre-existing to airport 55 DNL+ received NLR
Proposed only for less than 2 dozen homes



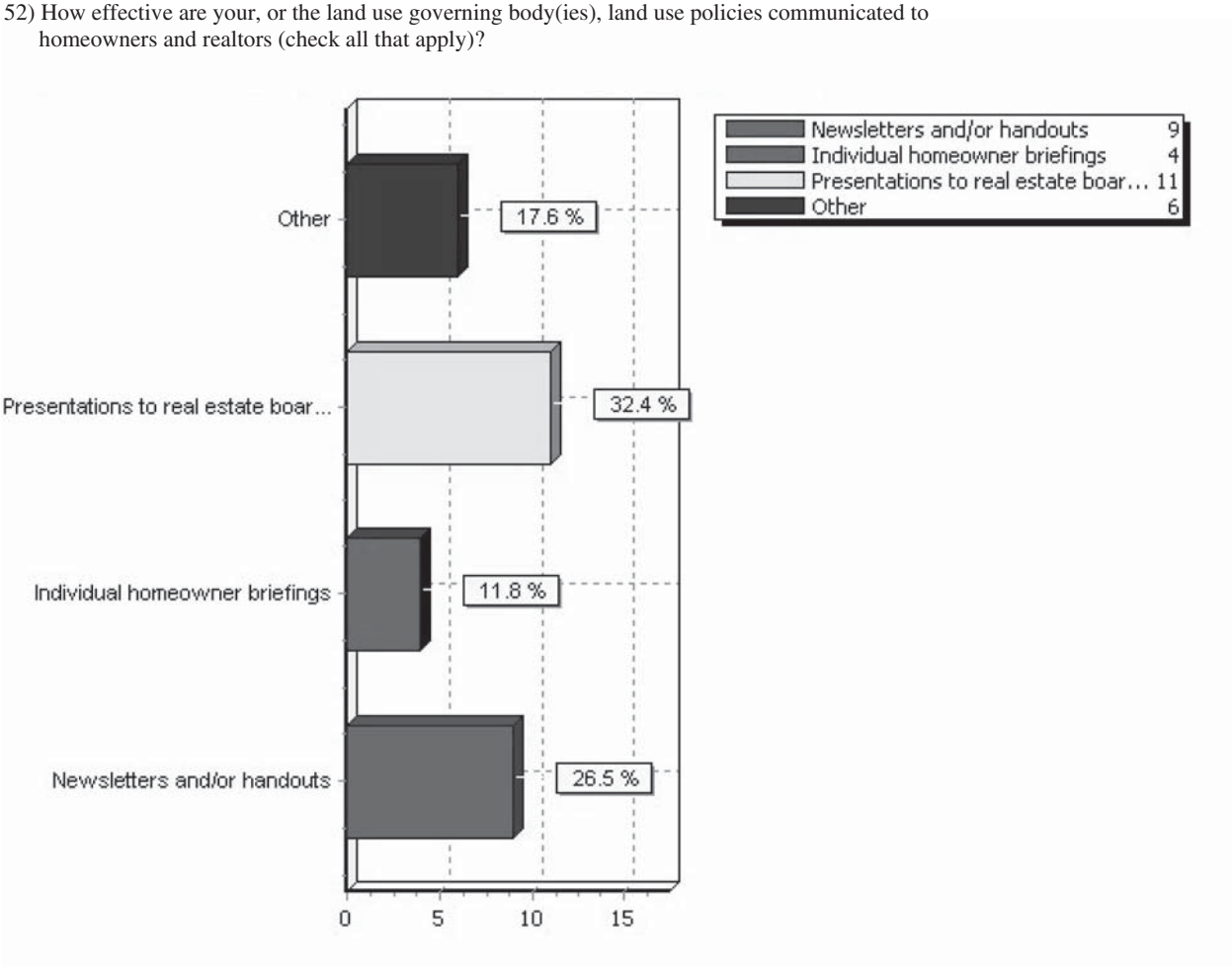
Other Responses:

NA
No sound insulation funded
We have considered
We do not insulate outside DNL 65

51) What is the estimated cost to implement this measure?

Cost to Airport	Cost to Operators	Cost to FAA	Cost to Homeowner	Other Costs (explain)
Undetermined	Undetermined	Undetermined	Undetermined	Will be evaluating as part of 2006 150 study
$150,000/ year				
NA	NA	NA	NA	NA
0	0	0	0	0
unknown				
$0	$0	$0	$0	
				City provided using penalty payments from DIA
$3.1 million	nil	80%	nil (avigation easement)	In-house construction management
NA	NA	NA	NA	Haven't implemented yet.
20% or about $10K per dwelling		80% or about $30K per dwelling		
NA				
$15,000				
130,000,000				
NA	NA	NA	NA	

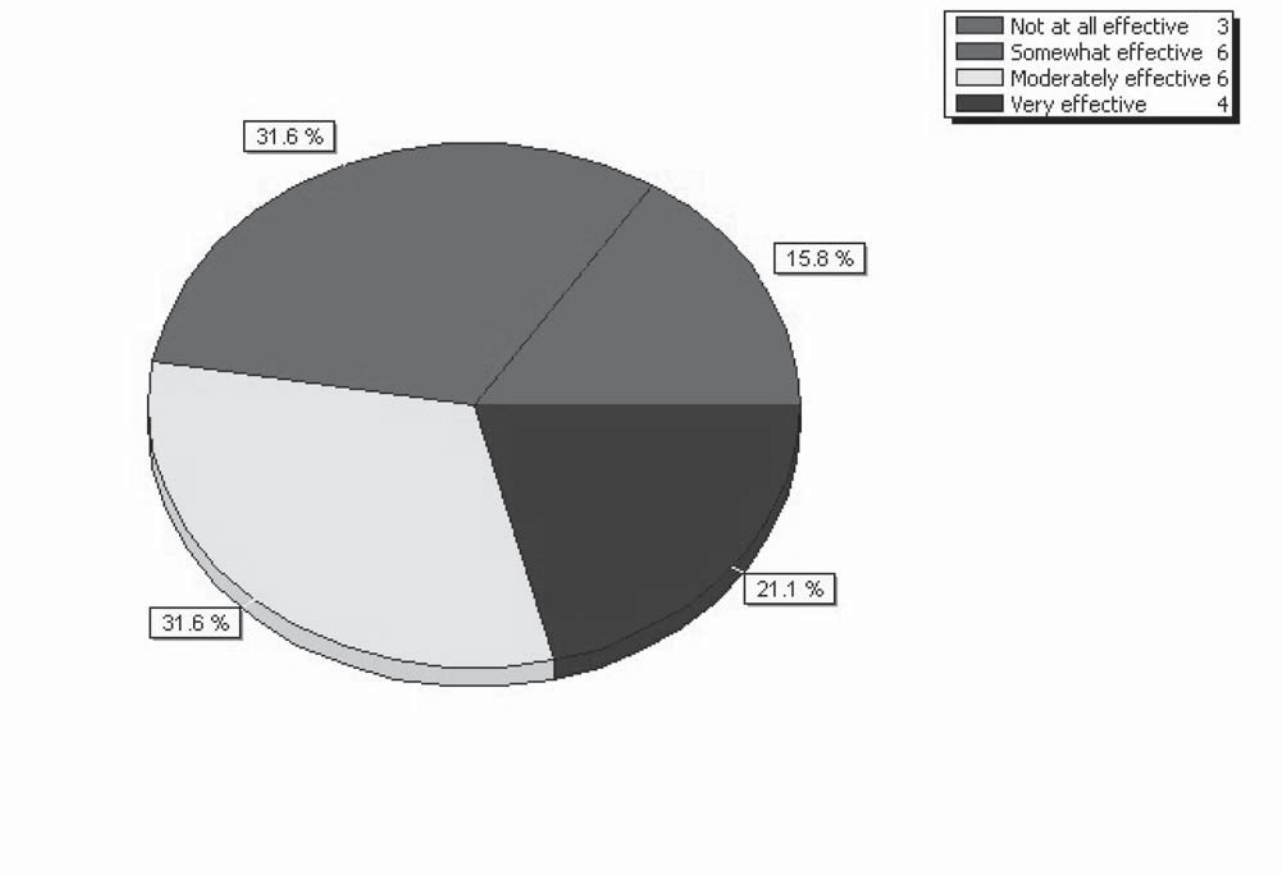
52) How effective are your, or the land use governing body(ies), land use policies communicated to homeowners and realtors (check all that apply)?



Other Responses:

We work with land-use authorities
County and city planning department
Through the complaint process
Planning departments advise petitioners
Active with development permitting process
Through public meetings
Disclosures
Resolution requiring notification

53) How effective are your, or the land use governing body(ies), land use policies at preventing non-compatible development in communities outside DNL 65?



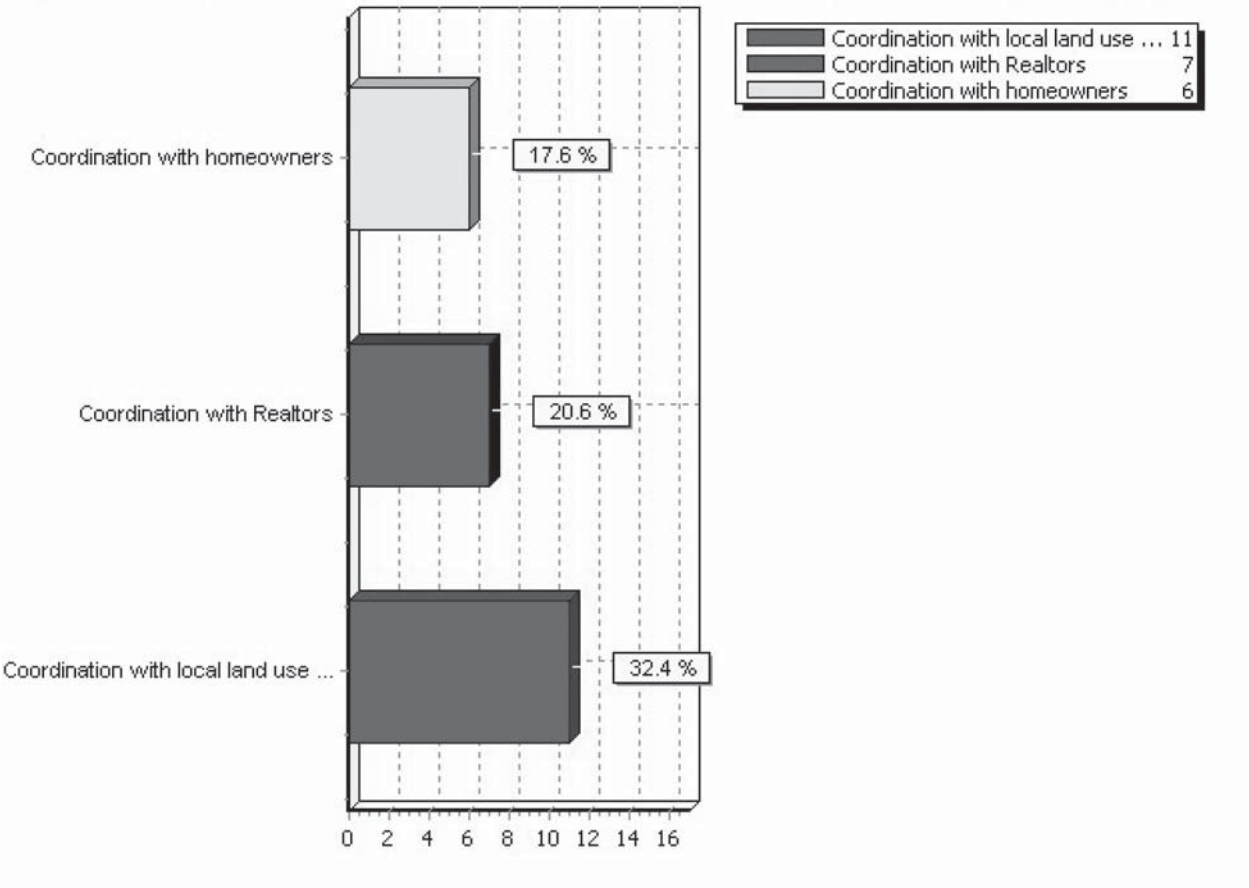
Comment Responses:

Effective inside 65 DNL but not outside 65 DNL
only implemented w/in 80 L_{max}
Unique position in Planning to review all new development
Re-zoning petitions are the biggest challenges. Authority is working to improve coordination thru mutually acceptable catchment areas for notification of the Aviation Authority.
Usually allowed with mitigation/easements

54) What is the estimated cost to implement this land use measure?

Cost to Airport	Cost to Homeowners	Cost to Realtors	Other Costs (explain)
Minimal	Undetermined	Undetermined	
Minimal			
nil	nil	Nil	Administrative
0	0	0	0
$250,000			
$0	Unknown	Unknown	
0	0	0	
In-house construction, legal and staff time			City and County Planners & Zoning Agencies
NA	NA	NA	NA
Minimal			
NA			
0	0	0	
$15,000			
NA	NA	NA	
NA	NA	NA	

55) Are there any drawbacks or challenges to implementing the land use policies around your airport (Check..



Comment Responses:

None
Not all realtors or homeowners are cooperative even though they can be sued for non-compliance.
No drawbacks
Voluntary compliance—No oversight
Developers seeking P&D rezoning in our airport district zones for in-fill development
Recommendations not always heeded
Sometimes the local officials do not contact the airport on critical land development.
Pressure from developers to abandon policy contour

58) Do you have any information that you believe would be helpful to this study? If so, please indicate below.

I'd be happy to provide additional information. I am not sure what is meant by a "case study" but the Port has worked on many projects to address noise outside the 65 DNL contours including pursuing RNAV, building a GRE (due to state requirements) and establishing helicopter training patterns at HIO.
On file with HMMH.
All components of our program are based on issues outside the 65 CNEL.
This facility was among the very first U.S. airports to implement ANCLUC–Airport Noise Control and Land Use Compatibility in 1979 and have completed 2 FAR Part 150 Study Updates.
The airport has a fully cooperative relationship with the local jurisdictions for land use in the 65 DNL. Outside of the 65 DNL, the local jurisdictions do not prohibit noise sensitive land uses. The airport must impose noise disclosure on its own and must convince school district to sound insulate new schools outside of but close to 65 DNL.
With a population exceeding 20,000 and over 10,000 dwelling units inside the SDIA CNEL 65, we estimate it will take 30+ years to mitigate through residential insulation. Before FAA authorizes money to be spent to mitigate aircraft noise issues beyond CNEL 65, perhaps someone should consider whether we need to re-evaluate first generation sound insulated homes and decide whether money is better spent on those closest to the source and most susceptible to injury.
Some sort of participation by the FAA would be helpful outside the 65.
In general, we believe the industry is opposed to mitigation beyond the 65 db DNL. Mitigating beyond the 65 db DNL would significantly increase the numbers of homes eligible for sound insulation. Consequently, this will increase the financial burden on the FAA and airport operators (local share of grants). The majority of airports (medium and small hub) do not have adequate funding or resources to complete existing noise programs within the 65 db DNL contour. Airports that successfully completed 65 db DNL mitigation programs will be required to initiate new noise programs and this would take away the limited federal funding from those airports not yet finished with their existing 65 db DNL mitigation programs. Background and other noise sources (roadways) can greatly influence noise levels in a neighborhood. Beyond the 65 db DNL, it is not a given that aircraft generated noise will remain the prime noise issue.
This community has a unique program in the U.S. Full-time Airport Noise Coordinator although the city doesn't own/operate an airport.
Airports are seriously handicapped in dealing with ATCT staff if their noise abatement programs are not formal. They have told us (Authority) that they can do anything they want at this facility because we have an informal program.
The airport and the local jurisdictions use policy contours not acoustic contours, adopted by ordinance, to govern land use. Areas in acoustic 60–65 within policy 65. Also facility has 18,500 acres. 65 DNL nearly on airport property. Local cities regulate areas beyond airport based on policy contours.
Just Part 150 info on the number of homes/residents in the 60 to 65 DNL area and recommendations that were not adopted by the FAA in 2001.
Currently undergoing Noise Study. Most issues outside of 65. Use of alternative metrics; community extensive role. Very difficult on consensus due to shifting of noise.
A lot of our noise complaints occur during flight changes due to runway closures. Also, aircraft approaching the runways will follow ILS procedures until they get visual contact of the runway and

drop their elevation by 2000 feet over the community. We are working with the ATCT to try to eliminate this procedure.
Currently we have no formal program for addressing noise outside of the 65 DNL. We are trying to keep the lines of communications open. We do offer the following on a limited basis: 1) Open the Noise Model Home to general public for noise mitigation ideas. 2) Will be putting together a “Tips on” flyer handout for hiring contractors and home mitigation. 3) The local municipality is considering a community-wide property reassessment. We are in current discussions for the potential for “Grandfathering” homes in the 60–64 DNL from being reassessed or freeze them at the current value for 10–20 years. That commitment may or may not be approved.
Airport uses pre-ANCA noise contours; Actual 65 on airport property, which would invite residences at fence; local jurisdictions adopted policy contours and understand benefits to continued use until pressure from developers caused the cities to request new noise contours; updated contours in process now.
The expert studies that were developed and presented in court as part of the litigation related to mitigation beyond the 65 DNL contour at MSP.

APPENDIX C

Case Study: Dallas/Ft. Worth International Airport

AIRPORT BACKGROUND

Dallas/Ft. Worth International Airport (DFW) first opened to traffic on January 13, 1974. It is jointly owned by the cities of Dallas and Fort Worth and is operated by the DFW Airport Board. DFW covers more than 29.8 square mile (18,076 acres), and now has seven runways (Figure C1) (Much of the information in this case study came directly from DFW's Noise Compatibility Office, specifically its memorandum entitled "Mission Relevance," February 18, 2008.) DFW had 685,491 operations in 2007, making it the third busiest airport in the world based on operations; with 59,786,476 passengers in 2007, it was also the seventh busiest based on passengers ["Facts about DFW" http://www.dfwairport.com/visitor/index.php?ctnid=24254 (accessed Sep. 8, 2008)].

Aircraft noise was not a serious community issue prior to the launch of DFW's Airport Development Plan in 1987. In 1990, an Environmental Impact Statement (EIS) for the building of two new runways and redevelopment of terminals was released. Neighboring cities challenged DFW Airport on zoning authority; court tests ensued on the EIS. In 1992, the FAA issued a favorable Record of Decision (ROD), approving Runways 16/34 East and West. Three cities filed suit to challenge DFW's expansion in state and federal courts. In 1993, the Texas Legislature passed Senate Bill 348 reaffirming that DFW is exempt from local zoning ordinances; the U.S. Court of Appeals ruled in favor of DFW on the EIS lawsuit, and DFW held the ground breaking for Runway 16/34 East. The ROD on the 1992 Final EIS tasked the Airport to "implement an extensive noise mitigation program . . . to mitigate for the increased noise levels to residences and other noise-sensitive uses." In particular, the ROD required DFW to establish a noise and flight track monitoring system to assure communities that noise would not exceed predicted levels.

NOISE COMPATIBILITY PROGRAM

DFW has never conducted a formal Part 150 study; nevertheless, DFW has a comprehensive noise abatement program, which includes operational procedures [most notably preferential runway use program and RNAV (area navigation) procedures], land use measures (preventive land use planning as well as mitigation for limited areas), and outreach (a state-of-the-art noise and flight track monitoring system, and public outreach facilities).

Arguably, the most important element of DFW's noise program is the adoption of "noise policy contours" and diligence on the part of DFW Noise Compatibility Office (NCO) staff to meet its FAA Grant Assurances obligation to protect lands in the airport environs from incompatible development. DFW is currently under pressure from local municipalities to update its policy contours to reflect actual (current) noise conditions, and has committed good faith efforts to provide this noise contour update by January 2009. An important question remains whether local jurisdictions will adopt updated noise contours for land use planning purposes, which will no doubt result in noise-sensitive development closer to DFW.

OPERATIONAL MEASURES

DFW has two operational noise abatement measures: (1) a Preferential Runway Use Plan, and (2) Area Navigation Flight Procedures (RNAV).

The DFW Runway Use Plan was developed following the 1992 Final EIS for two proposed runways and other capacity improvements (FEIS Section 4.5.1.1 and ROD Chapter 4). The Preferential Runway Use System identified in that plan "provides a hierarchical rating of runway use for arrivals and departures by aircraft type." This system is used under typical operations conditions and during typical operating hours; additional stipulations are applied during late night hours (10 p.m. to 7 a.m.) (*Runway Use Plan* 1996). The preferential runway use plan for turbojet aircraft is shown in Table C1.

At DFW, the FAA has replaced conventional departure procedures, which rely on controller instructions and vectoring, with RNAV departure procedures. RNAV relies on preprogrammed routing and satellite navigation. Deployment of RNAV at DFW contributed to FAA's nationwide implementation strategy to develop more precise and efficient arrival and departure procedures at U.S. airports enhancing airspace efficiency and safety, reducing air emissions, and reducing delays. DFW was one of the first airports in the nation to use this departure technology.

According to the Air Transport Association, RNAV technology increases the number of aircraft departures handled at DFW by approximately 14%. RNAV Departure Procedures can be accommodated generally within existing flight corridors and using existing approved headings. The use of RNAV reduces the overall number of population over-flown. RNAV departure corridors are compressed, which concentrates large volumes of aircraft activity over relatively small areas. RNAV effects on DFW's departure patterns are illustrated in Figure C2. Ninety-five percent of DFW's turbojet fleet was equipped to fly the RNAV procedures by 2007. The FAA estimates an $8.5 million annual savings with the new

FIGURE C1 Dallas/Fort Worth International Airport and environs.

procedures, resulting from reduced delays and increased departure throughput (Marion Blakley, *Aviation Today,* May 11, 2007).

Land Use Measures

Built on a greenfield site, there was little noise-sensitive development surrounding DFW when it opened. At the time of DFW's opening, the North Central Texas Council of Governments (NCTCOG) developed a forecast set of DNL contours for future 1985 activity (Figure C3). These contours have been used over the years as "policy contours" and serve as an important factor in minimizing and preventing incompatible land use from developing around DFW.

TABLE C1
DFW PREFERENTIAL RUNWAY USE SYSTEM FOR TURBOJET AIRCRAFT (6:00 A.M. TO 10:59 P.M.)

Flow	Type of Activity	Rating	East Airfield	West Airfield
South	Arrivals	1st	17C	18R
		2nd	17L	13R
		3rd	17R	18L
	Departures	1st	17R	18L
		2nd	17C	18R
		3rd	17L	
North	Arrivals	1st	35C	36L
		2nd	35R	36R
		3rd	31R	
		4th	35L	
	Departures	1st	35L	36R
		2nd	35C	36L
		3rd	35R	

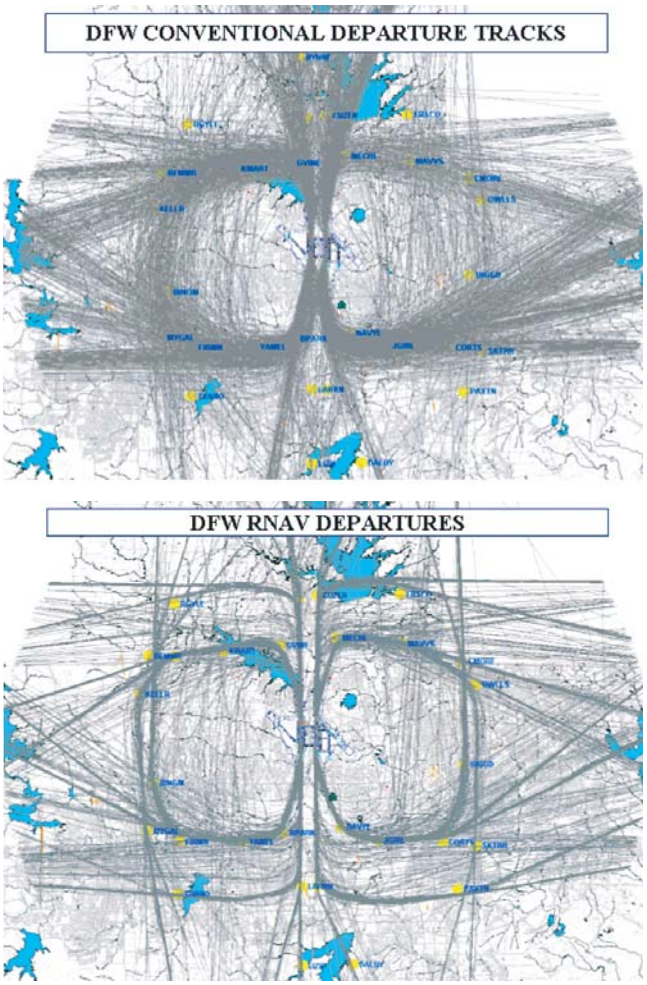


FIGURE C2 Comparison of conventional departure flight tracks with RNAV departure flight tracks.

The NCTCOG contours established the following zones (see Table C2):

DFW's NCO takes a number of actions to implement its responsibilities to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations. Specifically, the NCO:

- Reviews weekly the meeting agendas for ten local cities surrounding DFW for potential incompatible land use proposals and takes proactive measures to influence local city decisions to ensure compatible land use development;
- Recommends measures to convert incompatible land use(s) to a compatible land use by means of structure

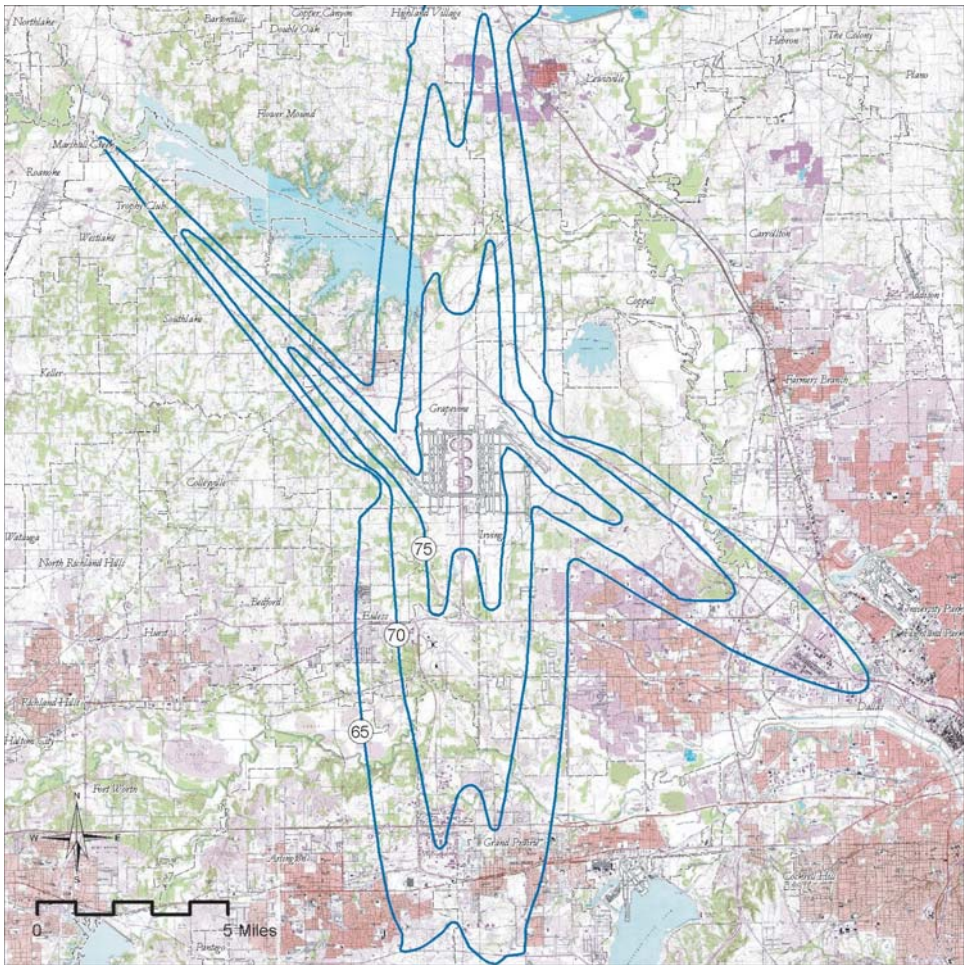


FIGURE C3 DNL contours for 1985 operations at DFW (as projected in 1971).

sound attenuation, avigation easements, and public disclosure requirements. Nearly 4,600 residential units, 11 churches, and two schools have been made compatible with airport operations during the past ten years; 76% of which occurred in the past four years.

- Commented on proposed incompatible developments over the first 5 years of the past decade involving an average of 173 units or parcels per year. In the last five years development pressures have increased by an estimated 300% to an average of 746 units per year. Developments proposed in the Southlake area are shown in Figure C4; NCO commented on each of these.

Monitoring and Outreach Measures

Relationships with local communities became contentious during and following DFW's 1992 Final EIS, and the construction of the eastern-most north/south runway. DFW man-

TABLE C2
NOISE–LAND USE PLANNING COMPATIBILITY GUIDELINES ESTABLISHED BY NCTCOG

Zone	Noise Level (DNL)	Comment
C	>75	Non-compatible development restricted
B	65–75	Non-compatible development permitted, with modifications (acoustic treatment)
A	<65	No restrictions

NCTCOG = North Central Texas Council of Governments.

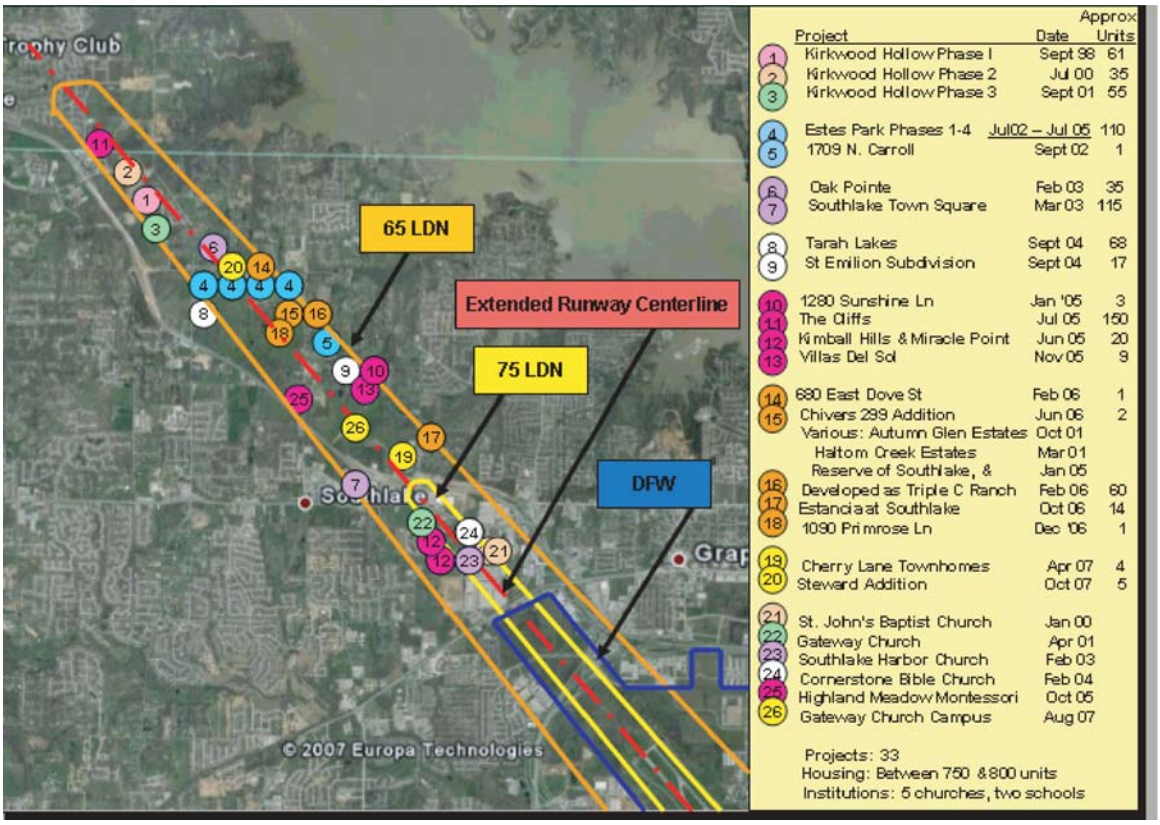


FIGURE C4 Southlake land use proposals acted on by the DFW Noise Compatibility Office.

agement designated the NCO the community liaison to restore trust and reestablish credibility. The following tools are responsive to this declared responsibility:

- DFW instituted several community forums and outreach programs pursuant to the above referenced legislation and responsive to the provisions embodied in the 1992 Final EIS.
- DFW's Noise Center (Figure C5) was established with aircraft noise and flight track displays. This NCO function provides "real time" data presentations to interested audiences, large and small. This graphic capability has proven, over time, to be a premier tool in furthering community and stakeholder education, outreach, demonstrating transparency, and restoring credibility in the context of DFW meeting its Final EIS noise-related mandates.
- DFW NCO staff often use noise and flight track data to inform communities about proposed modifications in flight track corridors and application of new technology [e.g., RNAV].
- DFW NCO tracks and responds to its Noise Complaint Hotline; since 1999, noise complaints have dropped an average of 20% per year (Figure C6).
- DFW has developed a number of informational brochures and reports, including: Runway Use Plan, Noise Monitoring Brochure(s), and related informational takeaway(s).

FIGURE C5 DFW Noise Compatibility Center.

SUMMARY OF PROGRAM MEASURES OUTSIDE DNL 65

The most recent DNL contours for DFW were prepared in 2002 for the Environmental Assessment of RNAV procedures. Those contours show that the 65 DNL noise contour of 2002 is almost entirely within the airport property boundary. Figure C7 presents a comparison of DNL 65 contours at DFW over time, including: NCTCOG contours prepared in 1971

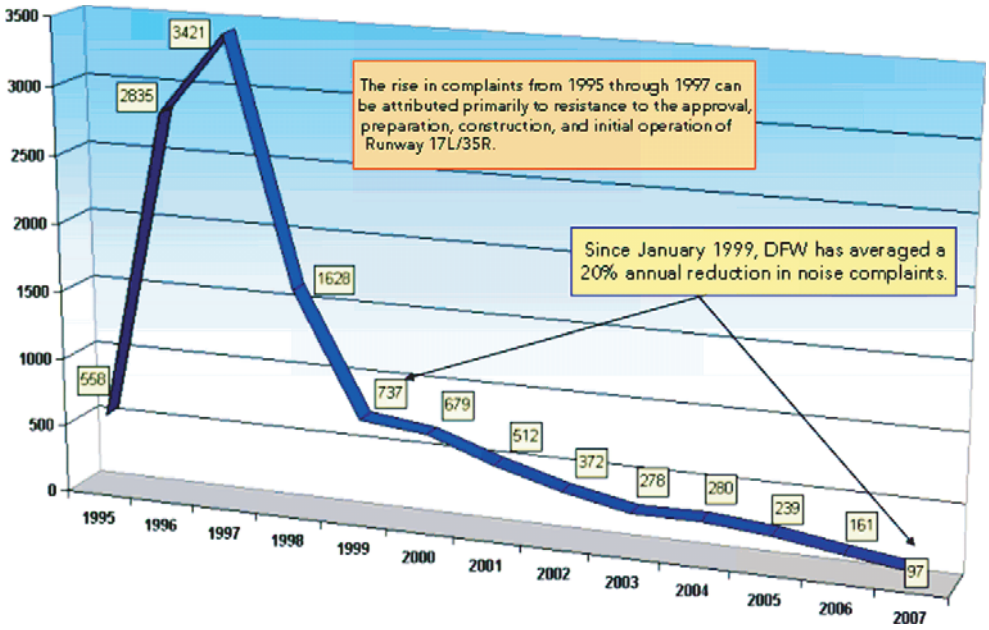


FIGURE C6 DFW Noise Complaint Trends, 1995–2007.

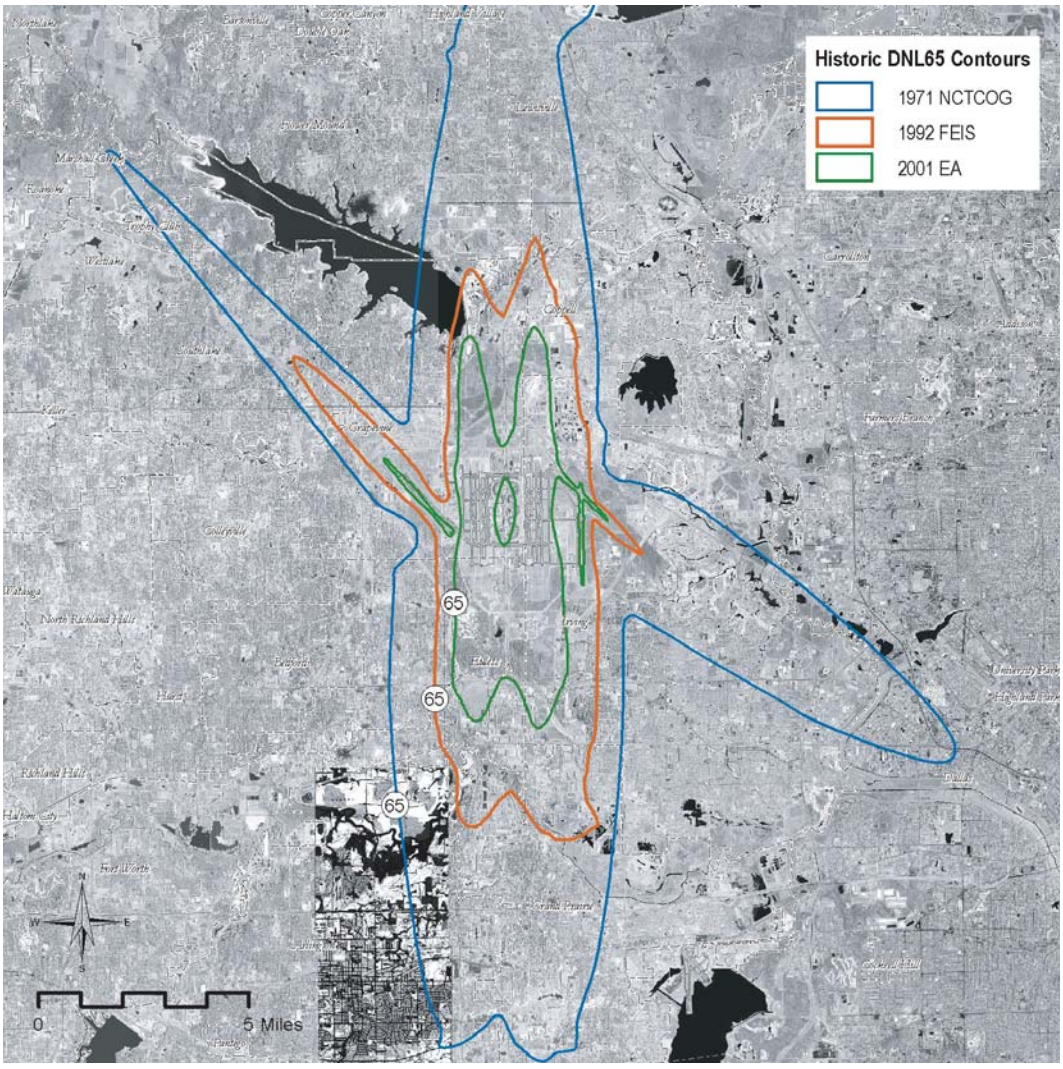


FIGURE C7 Comparison of historic DNL contours at DFW.

(for 1985 future operations—the policy contour); 1992 contours prepared for the Final EIS, and 2002 contours prepared for the RNAV Environmental Assessment.

As a result, most of DFW's noise program is focused on areas outside DNL 65, including:

- Operational procedures to minimize noise in neighborhoods surrounding the airport: FAA has implemented precision navigation procedures for departure using RNAV; this is estimated to improve efficiency and reduce noise in some areas—all outside DNL 65.
- Policy contours that limit noise-sensitive development in non-compatible areas. The DNL 65 noise contour as depicted on the policy contour is well outside the DNL 65 noise contour based on an acoustic contour of today; hence, DFW protects a substantial amount of land in its environs that is outside of the current 65 DNL.
- A state-of-the-art monitoring system to track noise levels over time.

One of the biggest challenges currently facing the airport is the continued application of policy contours for land use planning that do not reflect acoustic reality. DFW has committed to update noise contours by 2009. An important question remains whether local jurisdictions will adopt updated noise contours for land use planning purposes, which will no doubt result in noise-sensitive development closer to DFW.

APPENDIX D

Case Study: Naples Municipal Airport

BACKGROUND

In 1942, the city of Naples and Collier County, Florida, leased land to the U.S. government for construction of the Naples Airdrome. After World War II, the field was returned to the city and county; they operated the airport jointly until 1958 when the county sold its interest to the city. In 1969, with the facility operating at a loss, the Florida Legislature created the Naples Airport Authority (NAA) to independently operate the airport. The NAA was given no taxing authority and has operated the Naples Municipal Airport (APF) at a profit with income from airport users and state and federal grants.

Today, APF operates as a certificated air carrier airport with 130,917 operations in 2007. This includes one commercial air taxi service (Yellow Air Taxi), flight schools, fire/rescue services, car rental agencies, and other aviation and non-aviation businesses.

APF is surrounded by residential land use (see Figure D1), but there *are no residential or other noise-sensitive properties within the DNL 65 dB contour.* Nevertheless, aircraft noise remains a serious issue and concern for the NAA. The policies and programs APF has developed to address noise outside Day–Night Average Sound Level (DNL) 65 is the focus of this case study.

NOISE COMPATIBILITY PROGRAM

In 1987, the NAA conducted its first FAR Part 150 study, which recommended six noise control measures that were ultimately implemented. In 1989, an "Airport High Noise Special Overlay District" was established that required rezoning for any new development or significant redevelopment of land within the 65 dB DNL contour.

In February 1997, the NAA submitted a revised Part 150 submission to the FAA, which adopted DNL 60 dB as its threshold of compatibility for land use planning (described later). The FAA approved 14 of 15 measures, including noise abatement measures—such as preferential flight tracks and runway use, and maintenance run-up procedures; land use measures—such as compatible zoning districts and comprehensive plan elements; and continuing program measures—such as a noise officer, noise committee, and recurring noise monitoring. Perhaps most importantly, the FAA approved a ban on non-emergency night operations in Stage 1 jet aircraft.

In February 1998, the NAA submitted a second Part 150 update to the FAA. That update included a single measure: a 24-hour ban on non-emergency Stage 1 jet operations. In March 1999, the FAA approved this measure. The implementation of this measure essentially eliminated any population within the DNL 65 dB contour.

Despite diligent—and successful—NAA efforts to implement the approved measures, including the Stage 1 ban, the NAA continued to receive community pressure regarding noise exposure. In August 1999, the NAA initiated a Part 161 study to identify potential operational restrictions that would be appropriate for addressing these community concerns.

The Part 161 study determined that Stage 2 jets were the principal source of the noise impact that caused community concern; Stage 2 jet operations were more than 25 times more likely to cause noise complaints than Stage 3 operations and nearly 250 times more likely to cause noise complaints than propeller operations. Even more importantly, the analysis indicated that individual Stage 2 operations were more than 50 times more likely than Stage 3 jets to cause multiple citizens to complain (and more than 800 times more likely than propeller aircraft to do so). The number of people estimated to live within the 60 dB DNL contour if there were no restrictions in 2000 was about 1,400; a 24-hour ban on Stage 2 operations would reduce this to approximately 130. The Part 161 study was published in June 2000 and recommended the total ban on Stage 2 aircraft operations as the most reasonable and cost-effective measure to minimize incompatible land use. On January 1, 2001, the Stage 2 restriction went into effect.

Following publication of the Part 161 study a complicated series of events unfolded, which ultimately resulted in the finding that the Stage 2 ban was permissible; these are summarized in Table D1.

APF is the only airport with an FAA-approved FAR Part 161 study. For the purposes of this ACRP Synthesis, the most relevant aspect of the APF Part 161 Study is the establishment—and legal determination—of DNL 60 dB as a threshold of residential land use compatibility, described here.

Operational Measures

APF uses flight tracks and procedures to minimize noise effects on surrounding communities. APF's flight tracks have received formal FAA approval and are implemented by air traffic controllers. APF has also developed informal Visual Flight Rules noise abatement procedures; the noise metrics used to evaluate these procedures have varied, and include: DNL, Sound Exposure Level (SEL) and Time Above, Continuous

FIGURE D1 General location of Naples Municipal Airport (APF).

Equivalent Sound Level (L_{eq}), and Maximum A-weighted Sound Level (L_{max}). APF reported that both flight tracks and procedures are somewhat effective at reducing aircraft noise and complaints from noise-sensitive communities. These procedures have been developed and refined through FAR Part 150 processes.

Land Use Measures

Most noise and land use compatibility studies, in conformance with the guidelines of FAR Part 150, use 65 dB DNL as the determinant of compatibility—all noise-sensitive land uses, such as residential areas, are considered compatible with aircraft noise exposure less than 65 dB DNL. However, the 1996 APF Part 150 study and the associated Noise Compatibility Program (NCP) found that no noise-sensitive land uses would lie within the 65 dB DNL contour. Consequently, the FAR Part 150 study provided the 60 dB DNL contour, Figure D2, and recommended that zoning be used by the city of Naples and Collier County as a preventive measure to preclude the development of incompatible uses in the vicinity of the airport. Specifically, the study recognized that although both FAA guidelines and Florida statutes, Chapter 333, encourage airport compatible zoning, those guidelines applied at the 65 dB DNL level. The study contained the following recommendation:

> For Naples Municipal Airport, the FAA and FDOT guidelines do not apply since these guidelines use the 65 Ldn contour as the threshold of incompatibility, and the 65 Ldn contour does not contain any incompatible uses in the revised 2001 NEM which includes the noise abatement alternatives. However, it is important to create a buffer of compatible land use around the Airport. As such, another standard should be designated by the local land use planning agencies to ensure that residential and noise sensitive uses are not developed too close to the Airport. One possible standard is the 60 Ldn contour.
>
> Figure 13 depicts the 60 Ldn contour for the revised NEM including the noise abatement measures. Applying the land use compatibility guidelines normally used for the 65 Ldn contour to this 60 Ldn contour should create an adequate area of compatible land use.

Summary of City Land Development Policy History Within the Noise Zone

The city's Comprehensive Plan contained specific information regarding rezoning of areas affected or potentially affected by the airport for the first time in 1984. In 1989, the city updated the Comprehensive Plan to establish an Airport High Noise Special Overlay District ("City Special District"), depicted in the 1989 Comprehensive Plan as the area of land exposed to noise in excess of 65 dB DNL according to the five-year forecast case (1991) in the 1987 APF FAR Part 150 Study. Any applicant proposing to develop or significantly redevelop land in the City Special District was—and is today—required to first obtain a rezoning of the property to Planned Development. To

TABLE D1
CHRONOLOGY OF EVENTS LEADING TO IMPLEMENTATION OF STAGE 2 RESTRICTION

Date	Event	Comments
June 23, 2000	NAA invitation to public to comment on proposed restriction on Stage 2 jet operations at Naples Municipal Airport	
June 30, 2000	Part 161 study published	Notice of study availability and opportunity for comments distributed widely
Nov. 16, 2000	Response to Comments published	Responses provided for 36 comment categories
Dec. 2000	FAA initiates enforcement action alleging Stage 2 ban violated Part 161	NAA suspends enforcement of ban while responding to FAA.
Dec. 2000	National Business Aviation Association (NBAA) and General Aviation Manufacturers Association (GAMA) sue NAA in federal court alleging the ban is unconstitutional	Ban upheld in federal district court, September 2001.
Jan. 18, 2001	NAA meeting w/FAA staff	Discuss FAA comments. FAA staff offer to work with the NAA in an informal process to resolve any agency concerns, approach to supplemental analysis.
Aug. 2001	Part 161 Supplemental Analysis published	
Oct. 2001	FAA found that the study fully complied with the requirements of Part 161	
Oct. 2001	FAA initiates second enforcement action under Part 16 rules which require (1) Investigation, (2) Hearing, and (3) Final Decision.	FAA alleges that Stage 2 ban violates the grant assurance that "the airport will be available for public use on reasonable conditions and without unjust discrimination."
March 2002	NAA enforces ban	Grant money withheld
March 2003	INVESTIGATION: FAA issues 94-page "Director's Determination" that Stage 2 ban is preempted by federal law and violated Grant Assurance 22—"make airport available for public use on reasonable terms and without unjust discrimination to all types, kinds, and classes of aeronautical activities."	NAA appeals decision, provides responses to all FAA allegations
June 2003	HEARING: FAA attorney appointed as Hearing Officer and conducts hearing on NAA appeal.	Hearing Officer issues 56-page "Initial Decision" that ban *not* preempted, *not* unjustly discriminatory, but was (1) unreasonable, (2) Part 161 compliance does not affect Grant Assurance obligations, and (3) FAA not bound by prior federal court decision [see Dec. 2000, above]
July 2003	Both NAA and FAA appeal the Initial Decision	
Aug. 2003	FINAL DECISION: Associate Administrator issues Final Agency Decision and Order—Grant funding to be withheld so long as NAA enforces Stage 2 ban.	Decision: (1) FAA is not bound by prior federal court decision because FAA was not a party to the case. 2) Compliance with Part 161 has no effect on Grant Assurance Obligations. 3) Stage 2 ban unreasonable because there is no incompatible land use problem in Naples that warrants a restriction on airport operations [because there is no incompatible land use inside 65 dB DNL].
Sept. 2003	Naples Airport Authority files petition for review	Petition to U.S. Court of Appeals for the District of Columbia.
June 2005	U.S. Court of Appeals for the District of Columbia Circuit rules Stage 2 ban is reasonable (and Grant Assurances not affected)	Circuit Court found that it is permissible for NAA to consider the benefits of the restriction to noise-sensitive areas within 60 dB DNL. It also found that Grant Assurances do apply, but that because the ban is not unreasonable, the Grants are not affected.

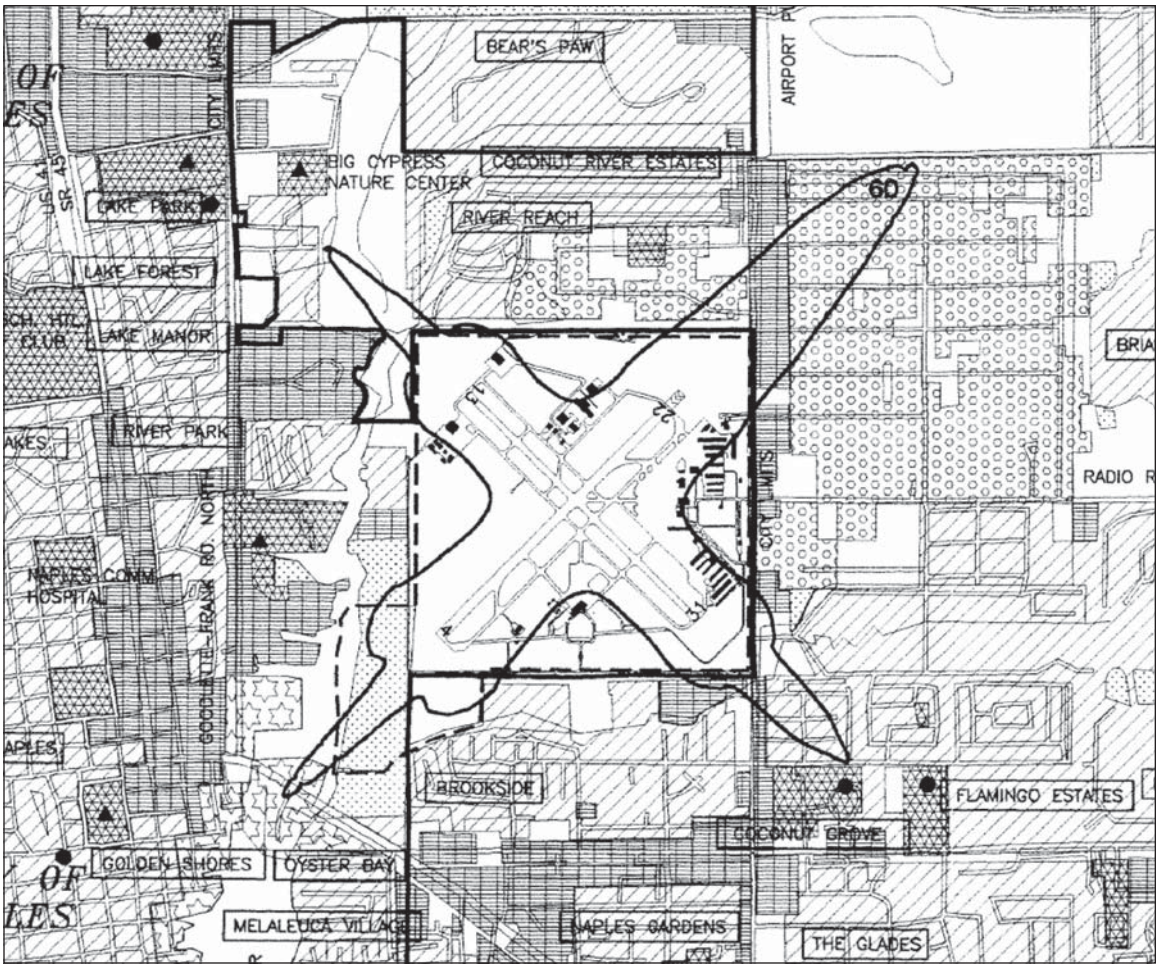


FIGURE D2 Forecast 2001 APF 60 dB DNL with NCP implemented.

obtain the rezoning, the proposed development or redevelopment must conform to existing zoning standards and must, after specific review for this purpose, be deemed compatible with the airport in terms of safety and noise.

In 1997, the city revised the map of the City Special District in the Comprehensive Plan to reflect the five-year forecast case (2001) 60 dB DNL contour from the 1996 NEM. In February 2001, the city and the NAA executed an interlocal agreement to update the District and Comprehensive Plan to reflect the 2005 forecast case 60 dB DNL contour from the FAA-approved 2000 NEM update.

Summary of County Land Development Policy History within the Noise Zone

In June 1986, Collier County developed zoning maps indicating aircraft noise boundaries. In 1987, the Collier County planning department began referencing standards for sound control. In October 1991, Collier County approved Ordinance 91-102 that redesigned aircraft noise zones using the five-year forecast case (1991) 65 dB DNL contour ("County Special District"), added land use restrictions, and notification and sound level requirements for buildings and structures. These requirements are contained in the county's Land Development Code.

In June 1999, the NAA requested that the county adopt the five-year forecast case (2003) 60 dB DNL contour from the 1998 NEM. Collier County adopted the resolution in June 2000. That same month, the NAA requested the County use the five year forecast case (2005) 60 dB DNL contour from the 2000 NEM Update for future land use planning. The County updated its zoning map in December 2000 to reflect those contours.

City and County Development Application Processes

In May 2001, NAA staff met with city and county planning, zoning, and building department staffs to review the processes that they follow on a day-to-day basis to identify development applications for properties located in the City Special District and the County Special District. As discussed earlier, both of these overlay districts are based on 60 dB DNL contours.

For the city, any applicant proposing development in the City Special District must submit a General Development Site Plan that provides the City Council and staff the opportunity to consider the compatibility of the proposed development with the airport. This review process also provides city staff with the opportunity to ensure consistency with the Comprehensive Plan and Zoning Code.

The County Special District is incorporated directly in the Zoning Code, which provides applicants and county staff the ability to readily identify whether proposed development is located in the County Special District. As part of the county staff's review of the development application, staff considers whether the applicant has included necessary information to ensure compliance with the noise compatibility standards identified in the Land Development Code (i.e., land use restrictions, notifications, and sound insulation).

Monitoring and Outreach Measures

APF does not have a permanent noise and operations monitoring system. However, it does monitor noise and operations through the following:

- As part of the implementation of the 1996 NCP Study, NAA purchased two portable noise monitoring field kits, which have allowed staff to conduct portable monitoring in the communities that surround the airport. The two main objectives of this program are to provide the public with useful, understandable, and geographically representative information on long-term noise exposure patterns, and to answer community questions with regard to levels of noise in their areas with solid reliable data.
- APF has an online flight tracking program on the homepage of its website; the program shows real-time flight tracks and aircraft information for the entire country, as well as archives of that data for three months.

APF also has an extensive public outreach program, including:

- In 1997, an Airport Noise Compatibility Advisory Committee was established. This Committee's nine members meet regularly to review the Airport Noise Abatement Program and make appropriate recommendations to airport staff and the authority. All Noise Compatibility Committee members are local residents and volunteers who donate their time and expertise to help maintain a high quality of life in Naples. The Committee meets quarterly.
- APF also produces quarterly noise reports, which provide data on aircraft operations and noise complaints.
- APF has an extensive website (http://www.flynaples.com/Noise%20Abatement%20Office%20index.htm), which provides information on noise abatement procedures, the portable noise monitoring program, aircraft noise terminology, quarterly noise reports, online complaint form, and other noise-related topics.

In November of 2000, the NAA Board of Commissioners adopted a Noise Abatement Award Program for operators, tenants, or transient flight crews that continually operate or work toward furthering the airport's Noise Abatement Program.

SUMMARY OF PROGRAM MEASURES OUTSIDE DNL 65

There are no residential or other noise-sensitive land uses inside the DNL 65 contour at APF. As a result, the entire noise program is devoted to addressing noise outside DNL 65, which includes:

- Operational measures such as noise abatement flight tracks and procedures, as well as ground noise control, and a use restriction that prevents Stage 1 or Stage 2 aircraft from operating at APF.
- Land use measures, most notably the adoption—and implementation by local authorities—of DNL 60 as the threshold of compatibility with residential land use.
- Monitoring of noise and operations using technology that is appropriate to the size of the airport.
- Extensive public outreach, including a Noise Compatibility Committee, Quarterly Noise Reports, public website, and Noise Abatement Awards.

APF has just initiated another update of its Part 150.

Abbreviations used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation