ENVIRONMENTAL ASSESSMENT
T-1, T-6, AND T-37 AIRFIELD OPERATIONS
AT
PERRY MUNICIPAL AIRPORT

Department of the Air Force
Air Education and Training Command
71st Flying Training Wing
Vance Air Force Base, Oklahoma

April 2006

Report Documentation Page

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14. ABSTRACT

Vance AFB T-6 and T-37 aircrews use Kegelman Auxiliary Field (Kegelman AUX), a sub-installation of the Base, for traffic pattern training to reduce traffic pattern congestion at Vance AFB caused by four aircraft types operating at a single airfield. T-1 aircrews at Vance AFB currently use Kegelman AUX for emergency operations. The condition of the runway at Kegelman AUX has deteriorated and extensive repairs are necessary, requiring closure of the runway. Thus, Vance AFB has a need for another airfield at which T-6 and T-37 aircraft could conduct traffic pattern training while Kegelman AUX is closed for repairs. Additionally, Vance AFB also has a need for an airfield at which the Base's T-1 aircraft could practice tactical approaches to PMA on a recurring basis. Under the Proposed Action, the 71 FTW would conduct ..... ---? instrument-and .. visual-approaGh--training .. -fm~T--6-and~T~JJ .. aircraft,. as~we1Las.takeoff, .. landing, and closed pattern training at PMA for an initial 6 to 9 month period followed by substantially reduced flying operations upon the reopening of Kegelman AUX and transfer of operations. No Air Force persoilllel would be based at PMA. No aircraft maintenance activities would be anticipated to occur at PMA other than the rare occasion when a T -6 or T-3 7 aircraft might land at the ahport due to an emergency tl1at would require maintenance before being capable of a subsequent flight. This EA evaluates the No Action Alternative and the Proposed Action. Additionally, the EA evaluates the cumulative condition ofrecmTing T-1 aircraft operations at PMA in combination with the T -6 and T-3 7 aircraft. Takeoff and landing training would not be conducted by T -1 aircraft at the PMA. Under the No Action Alternative, the 71 FTW would not conduct T-1, T-6, and T-37 training at PMA. Resources considered in the impact analysis were airspace and airfield operations; noise; land use; air quality; and environmental justice. Socioeconomic resources, infrastructure and utilities, water resources, earth resources biological resources, cultural resources, and hazardous material and waste are not analyzed in the EA because of their non-applicability to the Proposed Action.

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Standard Form 298 (Rev. 8-98)
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Finding of No Significant Impact
T-1, T-6, and T-37 Airfield Operations at Perry Municipal Airport

AGENCY

Department of the Air Force, Air Education and Training Command, 71st Flying Training Wing (71 FTW), Vance Air Force Base (AFB), Oklahoma.

BACKGROUND

Vance AFB T-6 and T-37 aircrews use Kegelman Auxiliary Field (Kegelman AUX), a sub-installation of the Base, for traffic pattern training to reduce traffic pattern congestion at Vance AFB caused by four aircraft types operating at a single airfield. T-1 aircrews at Vance AFB currently use Kegelman AUX for emergency operations. The condition of the runway at Kegelman AUX has deteriorated and extensive repairs are necessary, requiring closure of the runway. Thus, Vance AFB has a need for another airfield at which these aircraft could conduct traffic pattern training while Kegelman AUX is closed for repairs.

NO ACTION ALTERNATIVE

The 71 FTW will not conduct T-1, T-6, and T-37 training at the Perry Municipal Airport (PMA). Kegelman AUX will not be available because it will be closed for repair. Vance AFB will conduct T-6 and T-37 traffic pattern training and T-1 tactical approach training at the Base or other outlying municipal airports on a limited basis, which will impose severe limitations to conducting Joint Specialized Undergraduate Pilot Training (JSUPT), and could result in a reduction in the number of sorties flown due to traffic pattern saturation. Additionally, the JSUPT program will forfeit training efficiencies because of the increased travel times to these other airfields.

PROPOSED ACTION

71 FTW T-6 and T-37 aircrews will use PMA in Perry, Oklahoma for practice instrument and visual approach and traffic pattern training. Additionally, PMA will be used for tactical approach training for T-1 aircraft on a recurring basis. Cumulatively, T-1, T-6, and T-37 aircraft will accomplish as many as 880 average daily airfield operations at the PMA. No aircraft maintenance activities are anticipated to occur at PMA other than the rare occasion when a T-6 or T-37 aircraft might land at the airport due to an emergency that requires maintenance before being capable of subsequent flight. Crash, rescue, and fire protection for T-6 and T-37 aircraft operations will be provided by the Vance AFB fire department personnel who will commute between the Base and PMA. Existing City of Perry-owned facilities will be used to house rescue crews and equipment, and only minor interior upgrades to the facilities will be required. No Air Force personnel will be based at PMA.

SUMMARY OF FINDINGS

The following paragraphs summarize the findings of the attached environmental assessment (EA) for the No Action Alternative and Proposed Action.

EVALUATION OF THE NO ACTION ALTERNATIVE

No significant impacts occur from the existing activities at the PMA.

EVALUATION OF THE PROPOSED ACTION

Airspace and Airfield Operations. The airspace surrounding the airport and the anticipated air traffic control procedures will accommodate the T-6 and T-37 patterns, to include the emergency landing pattern, without conflict from other aviation activity. The T-6 and T-37 aircraft will avoid overflying residential areas to the maximum extent possible.

Noise. There will be an additional 3,203 acres and 31 persons within the day-night average sound level (DNL) 65 A-weighted sound pressure levels (dBA) and greater noise exposure area. These 31 persons equate to 13 percent of the estimated 233 persons who live within the approximate 5-mile radius area associated with the airfield airspace environment.

Land Use. Although the noise exposure area will increase, the additionally exposed areas will continue to be farmland and oil production land, and no other land use types will be exposed to aircraft noise. There will be no change to land use patterns.

Air Quality. The proposed aircraft activities will occur within an air basin designated as attainment for all criteria pollutants. Therefore, a conformity determination is not required. Aircraft operation emissions will be considered recurring emissions. The greatest amount in emissions will be from carbon monoxide at 167 tons per year, which is 0.20 percent of baseline emissions.

EVALUATION OF CUMULATIVE IMPACTS

Airspace and Airfield Operations. The evaluation for the Proposed Action applies.

Noise. There will be an additional 3,215 acres and 31 persons within the DNL 65 dBA and greater noise exposure area. These 31 persons equate to 13 percent of the estimated 233 persons who live within the approximate 5-mile radius of the airfield.

Land Use. The evaluation for the Proposed Action applies.

Air Quality. The highest amount in emissions will be from carbon monoxide at 177 tons per year, which is 0.22 percent of baseline emissions. Therefore, a conformity determination is not required.

ENVIRONMENTAL JUSTICE

Activities associated with the No Action Alternative, Proposed Action, and cumulative operations will not impose adverse environmental effects on adjacent populations. Therefore, no disproportionately high and adverse effects will occur to minority and low-income populations.

PUBLIC INVOLVEMENT

A notice announcing a 30-day public comment period and the availability of the draft EA was published in *The Perry Daily Journal* on March 24, 2006. Vance AFB received one letter from the Federal Aviation Administration stating their policies do not require assessment of temporary actions such as those proposed at PMA. The letter is included in Appendix B of the EA.

DECISION

Based on my review of the facts and analyses contained in the attached EA and incorporated by reference, I conclude that implementation of the Proposed Action will not have a significant impact, either by itself or when considering cumulative impacts from T-1 aircraft operations at PMA in combination with the T-6 and T-37 aircraft operations. Accordingly, requirements of the National Environmental Policy Act, regulations promulgated by the Council on Environmental Quality, and 32 Code of Federal Register 989 are fulfilled and an environmental impact statement is not required.

24 Apr 06

Colonel Terry I. Siegel
Vice Commander, 71st Flying Training Wing
246 Brown Parkway, Suite 224
Vance AFB OK 73705-5015

ENVIRONMENTAL ASSESSMENT
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Vance Air Force Base, Oklahoma

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COVER SHEET

ENVIRONMENTAL ASSESSMENT
T-1, T-6, AND T-37 AIRFIELD OPERATIONS AT
PERRY MUNICIPAL AIRPORT

Responsible Agency: Department of the Air Force, Air Education and Training Command, 71st Flying Training Wing (71 FTW), Vance Air Force Base (AFB), Garfield County, Oklahoma.

Proposed Action: Use of T-1, T-6, and T-37 Aircraft at Perry Municipal Airport (PMA) by the 71 FTW.

Written comments and inquiries regarding this document should be directed to: Mr. Bob Farrell, Chief, Community Relations, 71 FTW/PA, 246 Brown Parkway, Suite 120, Vance AFB, Oklahoma 73705-5028, (580) 213-7136.

Report Designation: Final Environmental Assessment.

Abstract: Vance AFB T-6 and T-37 aircrews use Kegelman Auxiliary Field (Kegelman AUX), a sub-installation of the Base, for traffic pattern training to reduce traffic pattern congestion at Vance AFB caused by four aircraft types operating at a single airfield. T-1 aircrews at Vance AFB currently use Kegelman AUX for emergency operations. The condition of the runway at Kegelman AUX has deteriorated and extensive repairs are necessary, requiring closure of the runway. Thus, Vance AFB has a need for another airfield at which T-6 and T-37 aircraft could conduct traffic pattern training while Kegelman AUX is closed for repairs. Additionally, Vance AFB also has a need for an airfield at which the Base's T-1 aircraft could practice tactical approaches to PMA on a recurring basis. Under the Proposed Action, the 71 FTW would conduct instrument and visual approach training for T-6 and T-37 aircraft, as well as takeoff, landing, and closed pattern training at PMA for an initial 6 to 9 month period followed by substantially reduced flying operations upon the reopening of Kegelman AUX and transfer of operations. No Air Force personnel would be based at PMA. No aircraft maintenance activities would be anticipated to occur at PMA other than the rare occasion when a T-6 or T-37 aircraft might land at the airport due to an emergency that would require maintenance before being capable of a subsequent flight. This EA evaluates the No Action Alternative and the Proposed Action. Additionally, the EA evaluates the cumulative condition of recurring T-1 aircraft operations at PMA in combination with the T-6 and T-37 aircraft. Takeoff and landing training would not be conducted by T-1 aircraft at the PMA. Under the No Action Alternative, the 71 FTW would not conduct T-1, T-6, and T-37 training at PMA. Resources considered in the impact analysis were: airspace and airfield operations; noise; land use; air quality; and environmental justice. Socioeconomic resources, infrastructure and utilities, water resources, earth resources, biological resources, cultural resources, and hazardous material and waste are not analyzed in the EA because of their non-applicability to the Proposed Action.

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ACRONYMS AND ABBREVIATIONS

71 FTW	71st Flying Training Wing
71 OSS	71st Operations Support Squadron
AQCR	air quality control region
AFB	Air Force Base
AFI	Air Force Instruction
AFIERA	Air Force Institute for Environmental, Safety, & Occupational Health Risk Analysis
AGL	above ground level
ANSI	American National Standards Institute
CAA	Clean Air Act
CEQ	President's Council on Environmental Quality
CFR	Code of Federal Regulations
dB	decibel
dBA	A-weighted sound level measured in decibels
DNL	day-night average sound level
DoD	Department of Defense
DoDD	Department of Defense Directive
EA	environmental assessment
EIAP	environmental impact analysis process
EIS	environmental impact statement
ELP	emergency landing pattern
EO	executive order
FAA	Federal Aviation Administration
FAR	Federal aviation regulation
FICAN	Federal Interagency Committee on Aviation Noise
FICON	Federal Interagency Committee on Urban Noise
FICUN	Federal Interagency Committee on Urban Noise
FONSI	finding of no significant impact
JSUPT	Joint Specialized Undergraduate Pilot Training
L_{max}	maximum sound level
MOA	military operations area
NAAQS	national ambient air quality standard
NEPA	National Environmental Policy Act
PMA	Perry Municipal Airport
ppm	parts per million
RAPCON	Vance AFB radar approach control
ROI	region of influence
RSU	runway supervisory unit
SEL	sound exposure level
SR	slow speed, low altitude training route
SUPT EA	Environmental Assessment, Specialized Undergraduate Pilot Training Production Increases, United States Air Force, Air Education and Training Command, Columbus AFB, Mississippi, Laughlin AFB, Texas, Vance AFB, Oklahoma, February 1997

the Base	Vance AFB, Oklahoma
tpy	tons per year
USC	United States Code
USEPA	United States Environmental Protection Agency
VFR	visual flight rule

CHAPTER 1
PURPOSE OF AND NEED FOR ACTION

The 71st Flying Training Wing (71 FTW) at Vance Air Force Base (AFB, the Base), Oklahoma, proposes to conduct instrument and visual approach training for T-6 and T-37 aircraft, as well as takeoff, landing, and closed pattern training (referred to as traffic pattern training in this document) at the Perry Municipal Airport (PMA), Oklahoma, for an initial 6 to 9 month period. Vance AFB would continue to use PMA after Kegelman AUX is reopened. Although the level of activity at PMA after Kegelman AUX is reopened would be at reduced levels compared to those at PMA when Kegelman AUX is closed for repair, it is possible that PMA could be used at the daily levels assessed under the Proposed Action in this environmental assessment (EA) if Kegelman AUX had to be closed for shorter periods due to weather conditions that preclude use of the AUX or other unforeseen events.

This chapter has five sections: a statement of the purpose of and need for action; location of the Proposed Action; scope of the environmental review; identification of regulatory requirements; and an outline of the document.

1.1 PURPOSE OF AND NEED FOR ACTION

The mission of the 71 FTW is to conduct Joint Specialized Undergraduate Pilot Training (JSUPT). The 71 FTW conducts JSUPT for qualified United States military officers (*i.e.*, Air Force, Navy, Air National Guard, and Air Force Reserve) as well as the air forces of several allied countries. Students flew only the T-37 in the first phase of JSUPT until March 2005, at which time the 71 FTW began converting from the T-37 to the T-6. The conversion is expected to be completed in September 2006 with the arrival of the last T-6 aircraft and the departure of the last T-37. Students currently fly the T-37 or T-6 in the first phase of JSUPT before branching into specialized training. Students destined for aerial refueling and transport aircraft assignments after completing JSUPT, train in the T-1. Students with fighter and bomber aircraft assignments after JSUPT train in the T-38.

Vance AFB T-6 and T-37 aircrews use Kegelman Auxiliary Field (Kegelman AUX), a sub-installation of the Base, for traffic pattern training in order to reduce traffic pattern congestion at Vance AFB caused by four aircraft types operating at a single airfield. The condition of the runway at Kegelman AUX has deteriorated and extensive repairs are necessary, requiring closure of the runway. Thus, Vance AFB has need for another airfield at which T-6 and T-37 aircraft could conduct traffic pattern training while Kegelman AUX is closed for repairs.

1.2 LOCATION OF THE PROPOSED ACTION

The PMA is located in Noble County about 35 miles east of Vance AFB, which is located approximately 5 miles south of the City of Enid in Garfield County. Kegelman

AUX is located approximately 45 miles west northwest of Vance AFB. Figure 1-1 shows the location of Vance AFB, PMA, and Kegelman AUX.

1.3 SCOPE OF THE ENVIRONMENTAL REVIEW

The National Environmental Policy Act (NEPA) requires federal agencies to consider environmental consequences in the decision-making process. The President's Council on Environmental Quality (CEQ) issued regulations to implement NEPA. The Air Force Environmental Impact Analysis Process (EIAP) is accomplished through adherence to procedures set forth in Air Force Instruction 32-7061, dated March 12, 2003, which adopts the current Title 32, Code of Federal Regulation (CFR), Part 989 (32 CFR Part 989), *Environmental Impact Analysis Process*. These federal regulations establish both the administrative process and substantive scope of the EIAP designed to ensure that deciding authorities have a proper understanding of the potential environmental consequences of a contemplated course of action. AFI 31-7061 and CEQ regulations require that an EA:

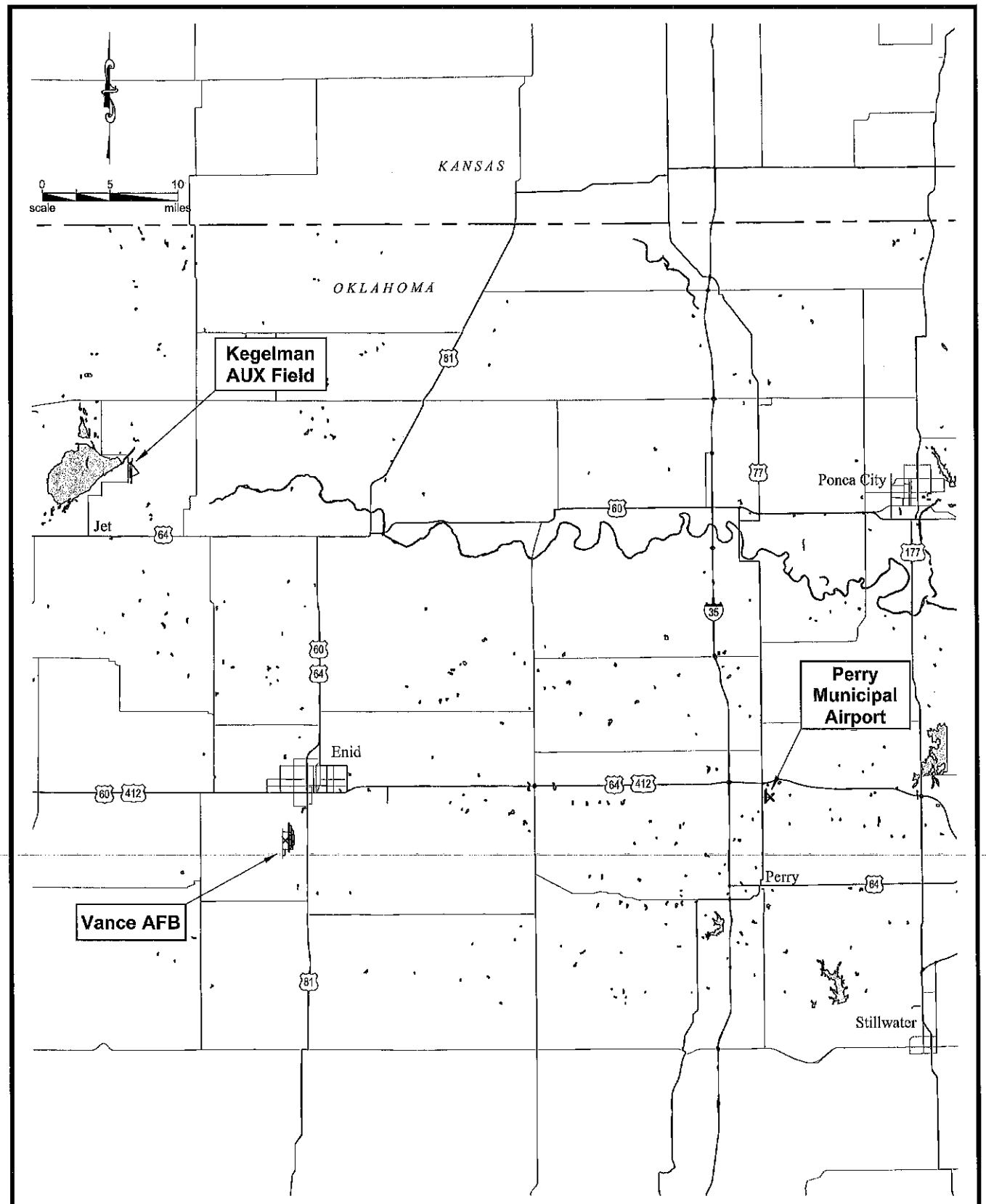
- Briefly provide sufficient evidence and analysis to determine whether an environmental impact statement (EIS) or Finding of No Significant Impact (FONSI) should be prepared;
- Aid in an agency's compliance with NEPA when no EIS is required; or
- Facilitate preparation of an EIS, when required.

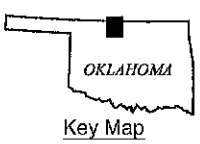
1.3.1 Identification of Resources Applicable to the Environmental Assessment

As appropriate, the affected environment and environmental consequences of the No Action Alternative and the Proposed Action may be described in terms of site-specific descriptions or regional overview. Airspace and airfield operations, noise, land use, air quality, and environmental justice are assessed in the EA.

For the reasons identified in the following paragraphs, socioeconomic resources, infrastructure and utilities, water resources, earth resources, biological resources, cultural resources, and hazardous material and waste are not analyzed in the EA.

Socioeconomic Resources, Infrastructure and Utilities, and Water Resources. There would be no population, housing, employment, economic, water (water distribution system, surface water, and ground water), wastewater, energy, and solid waste changes at Vance AFB or PMA because no additional personnel would be added at either location. Electricity connections are available to operate the runway supervisory unit (RSU), and the water and wastewater systems are in place.





Key Map

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Figure 1-1

Location of Vance AFB, Kegelman AUX Field, and Perry Municipal Airport

Perry Municipal Airport, Oklahoma

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Earth Resources, Biological Resources, and Cultural Resources. No new structures would be constructed nor would any existing facilities be modified at PMA. Therefore, no ground-disturbing activities would occur that would affect earth resources. PMA does not have any structures of historical significance. Additionally, neither the T-6 nor T-37 produces sound pressure levels that would cause structural damage; therefore, noise is not anticipated to affect cultural resources.

Two federally listed species are known to be seasonal residents of the regional area, the bald eagle (*Haliaeetus leucocephalus*) and the whooping crane (*Grus americana*). The closest known sightings of the bald eagle are around Kaw Lake and Sooner Lake, which are outside the airspace region of influence (ROI) within an approximate 5-mile radius of PMA. The closest known sighting of the whooping crane are on the Great Salt Plains National Wildlife Refuge, which is also outside the ROI of PMA. It is unlikely that these species would forage along creeks and open areas on or adjacent to PMA, as these habitats are of poor quality for the subject species (ODWC 2006). Therefore, no effects to biological resources would be anticipated.

Hazardous Material and Waste. No facilities would be constructed. Routine aircraft maintenance or refueling activities would not occur; however, these events would occur only if an aircraft had to make an unanticipated full stop landing due to an aircraft malfunction that occurred while airborne.

1.3.2 Environmental Justice

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued by the president on February 11, 1994. In the EO, the president instructed each federal agency to make "achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Adverse is defined by the Federal Interagency Working Group on environmental justice as "...having a deleterious effect on human health or the environment that is significant, unacceptable, or above generally accepted norms." Based on analysis of impacts, a determination on significance of impacts will be made. If impacts would be significant, the Air Force would either prepare an EIS or not implement the proposal. Accordingly, environmental justice will be addressed either in a FONSI (after determination on significance of impacts) or in a Record of Decision based on an EIS.

1.4 APPLICABLE REGULATORY REQUIREMENTS

No permits would be required by the Proposed Action.

1.5 ORGANIZATION OF THE DOCUMENT

This EA is organized into seven chapters.

Chapter 1 Contains background information; a statement of the purpose of and need for action; the location of the Proposed Action; the scope of the environmental review; presents the applicable regulatory requirements; and describes the organization of the EA.

Chapter 2 Provides a discussion on the development of alternatives; describes the alternatives eliminated from further consideration; details the No Action Alternative and Proposed Action; presents information on past and reasonably foreseeable future actions; summarizes the environmental impacts for all alternatives; and lists mitigation that could reduce the potential for impacts.

Chapter 3 Contains a general description of the biophysical resources and baseline conditions that potentially could be affected by the No Action Alternative and Proposed Action.

Chapter 4 Discusses the environmental consequences.

Chapter 5 Lists preparers of this document.

Chapter 6 Lists the persons and agencies consulted in the preparation of this EA.

Chapter 7 Lists the sources of the information used in the preparation of this EA.

Appendix A Air Force Form 813

Appendix B Public Involvement

Appendix C Supplemental Noise Information

CHAPTER 2
ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter has six sections: a discussion on alternatives development; identification of alternatives eliminated from further consideration; a description of the No Action Alternative; a detailed description of the Proposed Action; past, present, and reasonably foreseeable actions in the region of influence; a comparison of the environmental impacts of all alternatives; and discussion of mitigation.

2.1 ALTERNATIVES DEVELOPMENT

Personnel from the 71st Operations Support Squadron (71 OSS), the organization that oversees flying training at Vance AFB, preliminarily identified four airports as suitable for further consideration as an instrument and tactical approach and traffic pattern training airfield for T-6 and T-37 aircraft. The 71 OSS supports the training mission by providing air traffic control, airspace management, aircraft scheduling, life support, weather, flight records, intelligence, and quality assurance of contract academic and similar training and airfield management. The airports were identified by reviewing aeronautical charts for the areas below the Vance Military Operations Area (MOA) and the airspaces used for flying training by Vance AFB aircrews. Table 2.1 lists the four airports identified in the chart review process.

Table 2.1 Airports Identified for Further Consideration as an Airfield for T-6 and T-37 Training

Airport
Enid Woodring Regional, Enid, OK
Perry Municipal Airport, OK
Stillwater Regional, Stillwater, OK
Wichita Mid-Continent, Wichita, KS

2.2 ALTERNATIVES CONSIDERATION AND ELIMINATION

Personnel from the 71 OSS developed five criteria for use in selecting a nearby airport that could be used while the runway at Kegelman AUX are being repaired. The specific criteria identified and used in the selection process are:

- **Airport Aircraft Traffic.** The airport must be one at which the T-6 and T-37 would be the primary operating aircraft. Additionally, the airport must not have an existing high use rate by other military or civil aircraft that would limit or restrict use for T-6 and T-37 operations. As a general rule, the airport should not average more than 100 average daily operations by other aircraft. The airport should be able to accommodate as many as 880 average daily T-6 and T-37 operations, the estimated number of operations to be accomplished at the airfield designed to improve the efficiency of the T-6 and T-37 portions of the JSUPT program. This level of operations by Vance AFB aircraft is necessary

while Kegelman AUX being closed for an initial 6 to 9 month period for actions such as airfield repair, as well as for shorter periods (*e.g.,* 1 day) when the auxiliary airfield could be closed due to weather. The airport must not be near airspaces (*i.e.*, MOAs, alert areas, restricted areas, military low-level navigation training routes, or federal airways) or other airports with air traffic that would interfere with T-6 and T-37 operations at the training airport. The airspace surrounding the airport must permit establishment of arrival and departure routes compatible with T-6 and T-37 traffic patterns at the airport.

- **Instrument Approaches.** The airport must have instrument approaches compatible with navigation equipment on the aircraft.
- **Relationship of the Airport to Vance AFB.** Locating the airport as close as possible to Vance AFB would reduce the enroute time between the airport and the Base. As a general rule, enroute time to the airport should not be greater than 15 minutes. The goal is to minimize enroute time to training airfields to the maximum extent possible to allow more time to accomplish events such as instrument and visual approach training, takeoffs, and landings. A more distant airport could require extension of the training sortie to offset the increased enroute time. An airport close to Vance AFB would facilitate repair of a T-6 or T-37 in the rare situation where an aircraft would have to make an unscheduled full stop landing due to aircraft equipment malfunction necessitating a landing a the airfield instead of returning to Vance AFB. The shorter distance would reduce the drive time for aircraft maintenance personnel to the disabled aircraft.
- **Runway Dimensions and Aircraft Arresting Cables.** The minimum runway length and width for T-6 and T-37 operations is 5,000 feet long and 75 feet wide. No aircraft-arresting cables should be installed on the runway because neither the T-6 nor T-37 should operate from runways having this equipment.
- **Infrastructure.** The airport should have an operating air traffic control tower and/or radar service for arriving and departing aircraft. The airport must have the ability to provide crash, rescue, and fire protection at the level required for T-6 and T-37 aircraft. If services are not available, an agreement between the airport authority and the Air Force must be possible to allow the Air Force to provide such equipment and emergency services. The airport must have the ability to provide jet fuel should a T-6 or T-37 need to make an unscheduled full stop landing due to aircraft equipment malfunction. Any understandings of agreement between Vance AFB and the airport must be uncomplicated and easy to execute.

71 OSS personnel gathered the applicable information and data for each airport and compared the data with the five criteria to determine if the airport could be used for T-6 and T-37 training. An "X" in a criterion column in Table 2.2 indicates the airport ***did not meet*** the requirements of that specific criterion.

Table 2.2 Airport Elimination from Further Consideration Matrix

Airport	Criterion				
	Airport Aircraft Traffic	Instrument Approaches	Relationship of the Airport to Vance AFB	Runway Dimensions and Aircraft Arresting Cables	Infrastructure
Enid Woodring	X				
Perry					
Stillwater	X		X		
Wichita	X		X		

Note: An "X" in a criterion column indicates the airport *did not meet* the requirements of that specific criterion.

Based on the criteria and the elimination process described in the preceding paragraphs and as summarized in Table 2.2, the PMA would be the airport most suitable for use as an outlying T-6 and T-37 training airport.

2.3 DESCRIPTION OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, Vance AFB would not conduct T-1, T-6 and T-37 training at the PMA. Kegelman AUX would not be available because it would be closed for repair. Vance AFB would conduct T-1, T-6 and T-37 aircraft operations training at the Base and limited operations at outlying municipal airfields that have been environmentally assessed in separate documentation.

2.4 DESCRIPTION OF THE PROPOSED ACTION

Under the Proposed Action, Vance AFB T-6 and T-37 aircrews would use the PMA for practice instrument and visual approach and traffic pattern training. No Vance AFB aircraft or personnel would be based at PMA. No aircraft maintenance or refueling activities would occur at the PMA other than the rare occasion when a T-6 or T-37 aircraft would need to land at the airport as a result of an emergency. Routine aircraft maintenance and refueling would be accomplished at Vance AFB. Figure 2-1 shows the runway and general layout of PMA.

An Air Force Use Area has been defined that delineates the portions of the PMA the Air Force would utilize in the agreement with the City of Perry, Oklahoma. The Air Force Use Area consists of roadways leading to and from the airport property, a parking apron east of the Main Terminal Building for an RSU, the Main Terminal Building and adjacent parking area, and the north-south runway and taxiway. The Air Force Use Areas are shown on Figure 2-1.

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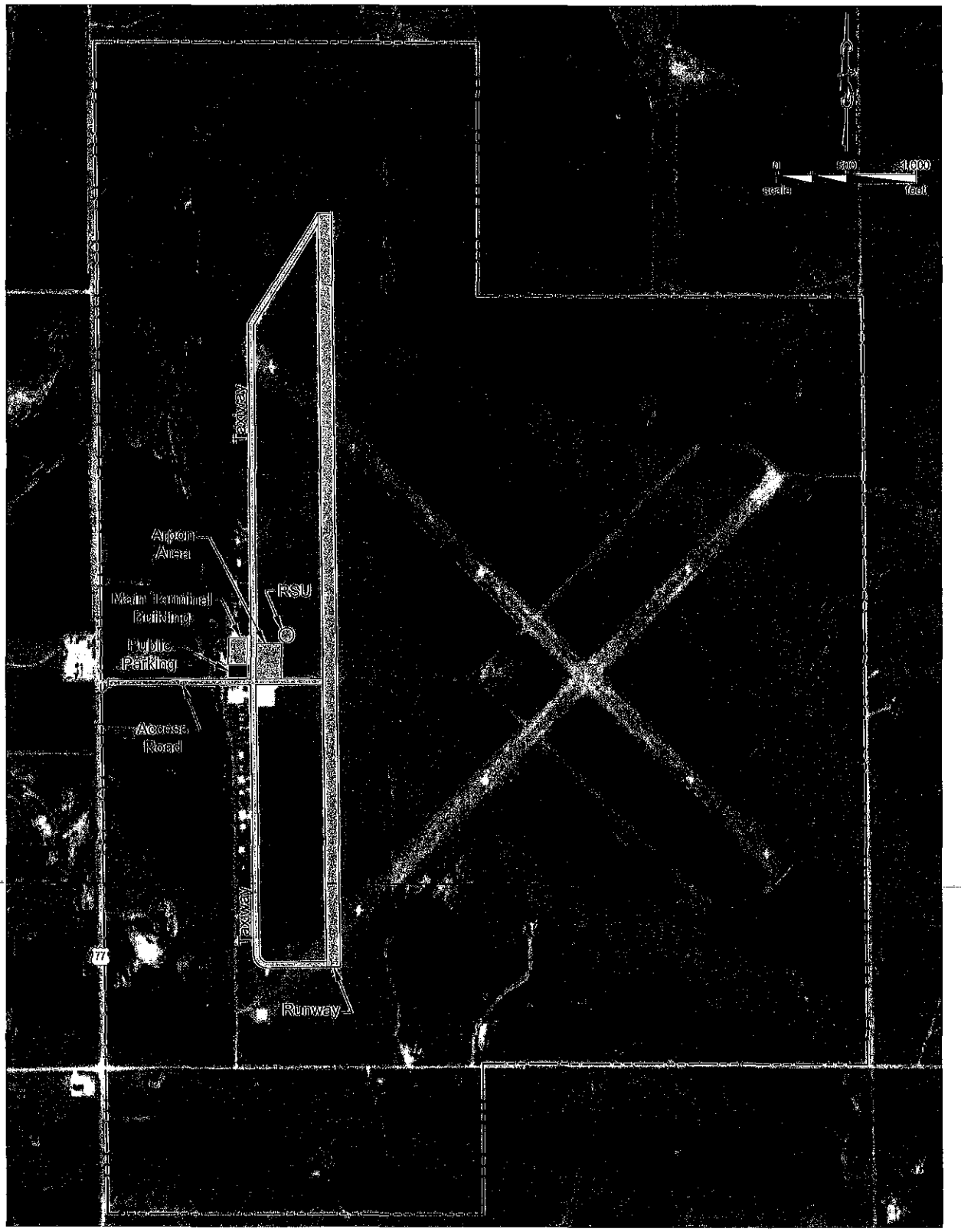

Legend

Air Force Use Area

Aerial: USGS, February 20, 1995

Figure 2-1

Air Force Use Areas

Perry Municipal Airport, Oklahoma

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Crash, rescue, and fire protection for T-6 and T-37 aircraft operations would be provided by Vance AFB fire department personnel who would commute between the Base and PMA. A hangar adjacent to the Main Terminal Building would be used to house rescue crews and equipment at night, and only minor interior upgrades would be required. During the day, the emergency vehicles would be parked on the apron area near the center of the airfield and RSU.

T-6 and T-37 aircraft would be controlled by Vance AFB personnel from an RSU that would be temporarily installed on the northeast corner of the aircraft parking apron and 360 feet west of the runway at approximately the center of the airfield. The RSU would be used to control operations on both Runways 17 and 35. The controllers would direct only the type of aircraft they are qualified to fly and would only provide traffic advisories to non-Air Force aircraft.

The RSU would be provided by Vance AFB and would have the appropriate wind measuring equipment included. No excavation would be required for the RSU electricity requirements because it is available at the proposed RSU location.

A typical T-6 or T-37 sortie would consist of a departure from Vance AFB on which the aircraft proceeds to the MOA for airmanship maneuvers training or to PMA for traffic pattern training (or vice versa) and then returns to the Base for sortie termination. The Vance AFB Radar Approach Control (RAPCON) would provide air traffic control services for aircraft proceeding to PMA by directing the aircraft to a point about 10 miles west of the airport at 2,000 feet AGL. From that point, aircraft would descend and maneuver to a point about 5 miles to the north or south of the airport for a visual approach to the runway or climb to an altitude of 3,000 feet AGL over the airfield and execute an Emergency Landing Pattern (ELP). From points north or south of the runway, the aircraft would accomplish a visual straight-in approach initiated from 500 feet AGL ~~or an arrival at 1,000 feet AGL to an overhead pattern. An instrument approach could be~~ accomplished by using one of the two published approaches for Runway 17. An ELP is an approach in which the aircraft accomplishes a descending turn to align with the runway to simulate landing without an engine. Aircraft traffic patterns would be accomplished both east and west of Runway 17/35. Overhead patterns would be flown at an altitude of 1,000 feet AGL. The aircraft would depart the airport traffic area by proceeding straight-out to a point about 3 miles to the north or south of the airport, climb and turn west and proceed to the point about 10 miles west of the airport, and obtain radar service from the Vance AFB RAPCON for the return to the Base or to proceed to the MOA for airmanship training. Closed pattern operations would include ELP training for T-6 aircraft up to an altitude of 3,000 feet AGL. Standard speeds of 200 knots indicated airspeed would be used for the aircraft.

It is anticipated that flying activity would occur at PMA 5 days per week from sunrise to sunset. Operations could occur on weekend days if required to maintain the flying training schedule. There would be an average of approximately 125 arrivals, 125 departures, and 300 closed pattern operations each day, for a total of 850 daily

operations by T-6 and T-37 aircraft. About 75 percent, and 25 percent of the operations would be accomplished by T-6 and T-37 aircraft, respectively. The maximum number of aircraft in the traffic pattern at any time would be 12 with a limit of eight in night patterns. The maximum number of aircraft in the pattern, if pattern operations need to be restricted due to deteriorating weather conditions, would be eight. Table 2.3 lists the maximum average daily T-6 and T-37 airfield operations that could occur at PMA.

Table 2.3 Summary of Average Daily Airfield Operations

Aircraft	Arrival and Departure Operations	Closed Pattern Operations	Total Operations
T-37	62	150	212
T-6	188	450	638
Total	**250**	**600**	**850**

The training syllabus requires students to accomplish training during the hours of darkness; accordingly, about 10 percent of the operations would occur during environmental nighttime (*i.e.*, 10:00 p.m. through 7:00 a.m.), which is referred to as "nighttime." Environmental night receives special consideration for noise analysis because it represents a period when the effects of aircraft noise on people are accentuated.

Throughout this document, two terms are used to describe flying operations: sortie; and airfield operation. Each has a distinct meaning and commonly applies to a specific set of activities in particular airspace areas.

- A sortie is a single military aircraft flight from the initial takeoff through the termination landing.
- An airfield operation is the single movement or individual portion of a flight in the airfield environment, such as one departure (takeoff), one arrival (landing), or one transit of the airport traffic area. The airfield environment (*i.e.*, airport traffic area) typically is considered as the airspace allocated to the air traffic control tower and includes the airspace within an approximate 5-mile radius of the airfield and up to 2,500 feet AGL. A touch and go landing, a low approach, or a missed approach consists of two airfield operations, *i.e.*, one arrival and one departure. A closed pattern, which includes touch and go operations, consists of two airfield operations (*i.e.*, one takeoff and one landing), and includes successive takeoffs and landings or low approaches where the aircraft does not exit the traffic pattern. A touch and go landing is accomplished when the aircrew adds power as the aircraft wheels contact the runway on landing and then immediately transitions to a takeoff without stopping. A low approach is similar to a touch and go; however, power is added before the aircraft touches the runway and transitions into a takeoff without landing. The minimum number of airfield operations for one sortie is two operations, one takeoff (departure) and one landing (arrival).

2.5 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTION IN THE REGION OF INFLUENCE

A cumulative impact, as defined by the CEQ (40 CFR 1508.7), is the "impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." PMA personnel do not anticipate any past, present, or reasonably foreseeable actions at the airport during the same time T -1, T-6, and T-37 aircraft would operate at the airport.

The Air Force T-1 training syllabus recently added the requirement for student pilots to practice tactical approaches to an airfield to simulate approaches that might be encountered in a combat environment when flying the aircraft to which they are assigned after JSUPT. These tactical maneuvers approach the airfield from random directions at an altitude of 500 feet above ground level (AGL) and align on final approach for landing. The high density of traffic at Vance AFB and Kegelman AUX on existing "standardized" flight tracks preclude accomplishing the T-1 tactical approaches at the two airfields without interfering with other aircraft operations. Thus, Vance AFB also has a need for an airfield at which the Base's T-1 aircraft could practice tactical approaches to an airfield.

Based on the information in the preceding paragraph, 71 FTW personnel propose to conduct T-1 tactical maneuvers at PMA during the same time T-6 and T-37 aircraft would operate at the airport. The T-1s would not accomplish landings at PMA because the 5,100- foot long runway does not meet the minimum runway length for the aircraft to land or conduct touch and go operations. The maximum average busy day T-1 airfield operations that could occur at PMA would be 30 (10 arrival and departure operations and 20 closed pattern operations). The cumulative summary of average busy airfield operations at PMA are listed in Table 2.4.

Table 2.4 Summary of Average Busy Day Airfield Operations

Aircraft	Arrival and Departure Operations	Closed Pattern Operations	Total Operations
T-1	10	20	30
T-37	62	150	212
T-6	188	450	638
Total	**260**	**620**	**880**

2.6 COMPARISON OF ENVIRONMENTAL EFFECTS OF ALL ALTERNATIVES

2.6.1 Proposed Action Impacts

Table 2.5 summarizes the impacts of the No Action Alternative and Proposed Action.

2.6.2 Cumulative Impacts

Table 2.6 summarizes the cumulative impacts.

2.7 MITIGATION

No mitigation would be required.

Table 2.5 Summary of Environmental Impacts for the No Action Alternative and Proposed Action

Resource (Applicable Sections)	No Action Alternative	Proposed Action
Airspace and Airfield Operations (Chapter 4.1)	There would be no change from the baseline condition.	The airspace surrounding the airport and the anticipated air traffic control procedures could accommodate the T-6 and T-37 patterns, to include the ELP, without conflict from other aviation activity. The T-6 and T-37 aircraft would avoid overflying residential areas to the maximum extent possible.
Noise (Chapter 4.2)	There would be no change from the baseline condition.	There would be an additional 3,203 acres and 31 persons within the day-night average sound level (DNL) 65 A-weighted sound pressure levels (dBA) and greater noise exposure area. These 31 persons would equate to 13 percent of the estimated 233 persons who live within the approximate 5-mile radius area associated with the airfield airspace environment.
Land Use (Chapter 4.3)	There would be no change from the baseline condition.	Although the noise exposure area would increase, the additionally exposed areas would continue to be farmland and oil production land and no other land use types would be exposed to aircraft noise. There would be no change to land use patterns.
Air Quality (Chapter 4.4)	There would be no change from the baseline condition.	The proposed aircraft activities would occur within an air basin designated as attainment for all criteria pollutants. Therefore, no conformity determination would be required for the Proposed Action. Aircraft operation emissions would be considered recurring emissions. The greatest amount in emissions would be from carbon monoxide at 167 tons per year, which is 0.20 percent of the baseline emissions. The Proposed Action would not be considered regionally significant because the region is in attainment for all criteria pollutants, and all criteria pollutant emissions are less than 10 percent of the emissions inventory.

Table 2.6 Summary of Cumulative Impacts

Resource	Cumulative Impacts
Airspace and Airfield Operations (Chapter 4.1)	The evaluation for the Proposed Action applies.
Noise (Chapter 4.2)	There will be an additional 3,215 acres and 31 persons within the DNL 65 dBA and greater noise exposure area. These 31 persons equate to 13 percent of the estimated 233 persons who live within the approximate 5-mile radius of the airfield.
Land Use (Chapter 4.3)	The evaluation for the Proposed Action applies.
Air Quality (Chapter 4.4)	The greatest amount in emissions would be from carbon monoxide at 177 tons per year, which would be 0.22 percent of baseline emissions. Therefore, a conformity determination would not be required.

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CHAPTER 3
AFFECTED ENVIRONMENT

This chapter describes the existing environmental resources that could be affected by or could affect the No Action Alternative and Proposed Action. Only those specific resources relevant to the potential impacts are described in detail.

3.1 AIRSPACE AND AIRFIELD OPERATIONS

Airspace is a finite resource defined vertically, horizontally, and temporally. As such, it must be managed and used in a manner that best serves the commercial, general, and military aviation needs. The Federal Aviation Administration (FAA) is responsible for overall management of airspace and has established different airspace designations to protect aircraft while operating to or from an airport, transiting enroute between airports, or operating within "special use" areas identified for defense-related purposes. Rules of flight and air traffic control procedures published as Federal Aviation Regulations (FAR) have been established to govern how aircraft must operate within each type of designated airspace. The FARs apply to both civil and military aircraft operations unless the FAA grants the military service an exemption or the FAR specifically excludes military operations. All aircraft operate under either Instrument Flight Rules or Visual Flight Rules.

The airspace ROI includes airspace within an approximate 5-mile radius of PMA and up to about 2,500 feet AGL. The FAA's Kansas City Air Route Traffic Control Center provides radar service to aircraft proceeding to or departing from PMA. Other airports and the distance from the PMA area include: Stillwater Regional Airport, 16 miles southeast of the PMA; Blackwell-Tonkawa Municipal Airport, 22 miles north; Ponca City Regional Airport, 22 miles northeast; Enid Woodring Regional Airport, 25 miles west, and Vance AFB, 31 miles west. There are no military low-level navigation training routes or special use airspaces within the ROI airspace. One federal airway passes through the ROI airspace.

Perry Municipal Airport does not have an air traffic control tower. However, pilots of arriving and departing aircraft are requested to advise other pilots who may be operating at the airport or within the ROI airspace of their intentions via radio calls on a common frequency assigned to the airport. Two nonprecision instrument approach procedures are published for Runway 17 at PMA for use in aircraft approaches during low ceiling and/or visibility conditions. Runway 17/35 is 5,098 feet long and 75 feet wide. There are 34 civil aircraft based at PMA. Table 3.1 lists the baseline average daily airfield operations for PMA.

Table 3.1 Average Daily Airfield Operations, Perry Municipal Airport

Aircraft	Arrival and Departure Operations	Closed Pattern Operations	Total Operations
Cessna 172	16.00	3.00	19.00
Twin Engine Piston	1.40	0.00	1.40
Learjet	0.60	0.00	0.60
Helicopter	2.00	0.00	2.00
Total	20.00	3.00	23.00

Source: AirNav 2006.

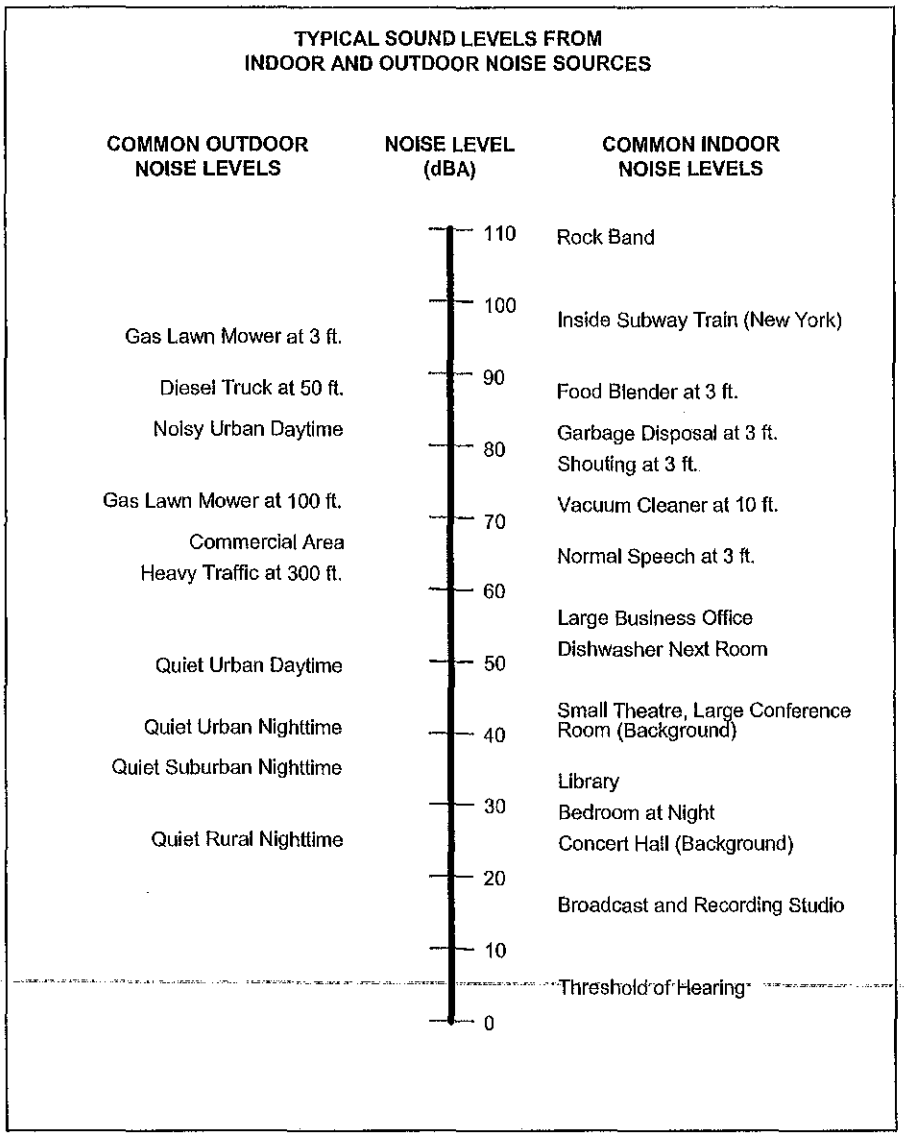
3.2 NOISE

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive. It may be stationary or transient. Stationary noise sources are normally related to specific land uses, *e.g.*, housing tracts or industrial plants. Transient noise sources move through the environment, either along established paths (*e.g.*, highways and railroads) or randomly. There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (*e.g.*, an aircraft) and the receptor (*e.g.*, a person or animal).

The characteristics of sound include parameters such as amplitude (loudness or intensity), frequency (pitch), and duration. Sound varies over an extremely large range of amplitudes. The decibel (dB) is the accepted standard unit for describing levels of sound. Decibels are expressed in logarithmic units to account for the variations in amplitude. On the decibel scale, an increase of 3 dB represents a doubling of sound energy. A difference on the order of 10 dB represents a subjective doubling of loudness.

Different sounds have different frequency contents. Because the human ear is not equally sensitive to sound at all frequencies, a frequency-dependent adjustment, called A-weighting, was developed to measure sound similar to the way the human hearing system responds. The adjustments in amplitude, established by the American National Standards Institute (ANSI 1983), are applied to the frequency content of the sound. Figure 3-1 depicts typical A-weighted sound pressure levels (dBA) for various sources. As indicated in the figure, 65 dBA is equivalent to normal speech at a distance of 3 feet.

Figure 3-1 Typical A-Weighted Noise Levels



3.2.1 Sound Metrics and Analysis Methods

A variety of metrics may be used to assess the impacts of noise. Depending on the specific situation, appropriate analysis may include single event or averaged metrics. Single event metrics are used to assess the potential impacts of noise on structures and animals, and are sometimes used in the assessment of human effects. Sound Exposure Level (SEL), a single event metric, is commonly used to evaluate sleep disturbance. Averaged noise metrics are useful in characterizing the overall noise environment and are primarily used to analyze community (population) exposure to noise. Averaged noise exposure is expressed as the day-night average sound level (DNL) metric. The United States Environmental Protection Agency (USEPA) selected DNL as the uniform

descriptor of averaged noise exposure. Subsequently, federal agencies, including the U.S. Department of Defense, adopted DNL for expressing averaged sound.

Single Event Sound Metrics

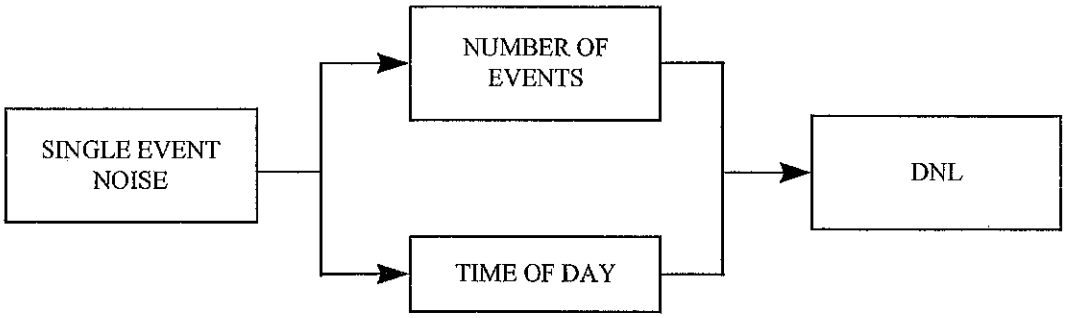
Although the highest dBA level measured during an event (*i.e.*, maximum sound level) is the most easily understood descriptor for a noise event, alone it provides little information. Specifically, it provides no information concerning either the duration of the event or the amount of sound energy. Thus, SEL, which is a measure of the physical energy of the noise event and accounts for both intensity and duration, is used for single event noise analysis. Subjective tests indicate that human response to noise is a function not only of the maximum level, but also of the duration of the event and its variation with respect to time. Evidence indicates that two noise events with equal sound energy will produce the same response. For example, a noise at a constant level of 85 dBA lasting for 10 seconds would be judged to be equally as annoying as a noise event at a constant level of 82 dBA and duration of 20 seconds (*i.e.*, 3 dBA decrease equals one half the sound energy but lasting for twice the time period). This is known as the "equal energy principle." The SEL value represents the A-weighted level of a constant sound with a duration of 1 second, providing an amount of sound energy equal to the event under consideration. By definition, SEL values are referenced to a duration of 1 second and should not be confused with either the average or maximum sound level associated with a specific event. When an event lasts longer than 1 second, the SEL value will be higher than the maximum sound level from the event. The maximum sound level would typically be 5 to 10 dBA below the SEL value for aircraft overflight.

Averaged Noise Metrics

Single event analysis has a major shortcoming -- single event metrics do not describe the overall noise environment. DNL is the measure of the total noise environment. DNL averages the sum of all aircraft noise producing events over a 24-hour period, with a 10 dBA upward adjustment added to the nighttime events (between 10:00 p.m. and 7:00 a.m.). Figure 3-2 depicts the relationship of the single event, the number of events, the time of day, and DNL. This adjustment is an effort to account for increased human sensitivity to nighttime noise events. The summing of sound during a 24-hour period does not ignore the louder single events, it actually tends to emphasize both the sound level and number of those events. The logarithmic nature of the dB unit causes sound levels of the loudest events to control the 24-hour average.

DNL is the accepted unit for quantifying annoyance to humans from general environmental noise, including aircraft noise. The Federal Interagency Committee on Urban Noise (FICUN) developed land use compatibility guidelines for noise exposure areas (FICUN 1980). Based on these FICUN guidelines, the Federal Aviation Administration (FAA) developed recommended land uses in aircraft noise exposure

Figure 3-2 Day-Night Average A-Weighted Sound Level



areas. The Air Force uses DNL as the method to estimate the amount of exposure to aircraft noise and predict impacts. Land use compatibility and incompatibility are determined by comparing the predicted DNL level at a site with the recommended land uses.

DNL is an accepted unit for quantifying annoyance to humans from general environmental noise, including aircraft noise. The FICUN developed land use compatibility guidelines for noise exposure areas. Based on those FICUN guidelines, the FAA developed recommended land uses in aircraft noise exposure areas. The DoD uses the DNL descriptor as the method to estimate the amount of exposure to aircraft noise and predict impacts. Land use compatibility and incompatibility are determined by comparing the predicted DNL level at a site with the recommended land uses.

Noise Analysis Methods

NOISEMAP noise model, version 7.296, was used to develop the noise contours and DNL and SEL values from airfield operations for this EA. NOISEMAP is a suite of computer programs developed by the Air Force to predict noise exposure in the vicinity of an airfield due to aircraft flight, maintenance, and ground run-up operations. Data describing flight tracks and flight profile use, power settings, ground run-up information by type of aircraft/engine, and meteorological variables are assembled and processed for input into NOISEMAP. The model uses this information to calculate SEL and DNL values at points on a regularly spaced grid surrounding the airfield. A plotting program generates contour lines connecting points of equal DNL values in a manner similar to elevation contours shown on topographic maps. Contours are generated as 5 dB intervals beginning at DNL 65 dBA, the maximum level considered acceptable for unrestricted residential use. The contours produced by NOISEMAP are used in the noise analysis in

this EA. While there is no technical reason why a lower level cannot be measured or calculated for comparison purposes, DNL 65 dBA:

- has been adopted by the DoD, USEPA, FAA, and HUD as the threshold for comparing and assessing community noise effects;
- is often used to determine residential land use compatibility around airports and highways; and
- represents a noise exposure level which is normally dominated by aircraft noise and not other community or nearby highway noise sources.

Ambient background noise is not considered in the aircraft noise calculations for two reasons. First, ambient background noise, even in wilderness areas, varies widely, depending on location and other conditions. For example, studies conducted in an open pine forest in the Sierra National Forest in California have measured up to a 10 dBA variance in sound levels simply due to an increase in wind velocity. Therefore, assigning a value to background noise would be arbitrary. Secondly, it is reasonable to assume that ambient background noise in the project's region of influence would have little or no effect on the calculated DNL levels. Louder sounds dominate the calculations and, overall, aircraft noise would be expected to be the dominant noise source characterizing the acoustic conditions in the region.

3.2.2 Baseline Noise Analysis

The primary source of noise in the vicinity of PMA is from airfield operations. Baseline noise conditions are based on the average daily airfield operations shown on Table 3.1. About 23 average daily airfield operations occur at PMA under the baseline condition. Figure 3-3 shows the aircraft ground tracks and Figure 3-4 depicts the noise exposure area for the baseline condition as well as the DNL noise contours. The noise contours shown in Figure 3-4 do not extend beyond the PMA boundary.

Noise annoyance is defined by the USEPA as any negative subjective reaction to noise by an individual or group. Table 3.2 presents results of over a dozen studies on the relationship between noise and annoyance levels. This relationship was suggested by Schultz (1978) and was reevaluated (Fidell *et al.* 1988) for use in describing people's reactions to environmental noise. These data provide a perspective on the level of annoyance that might be anticipated. For example, 12 to 22 percent of people exposed on a long-term basis to DNL 65 to 70 dBA are expected to be highly annoyed by noise events. The study results summarized in Table 3.2 were based on outdoor noise levels.

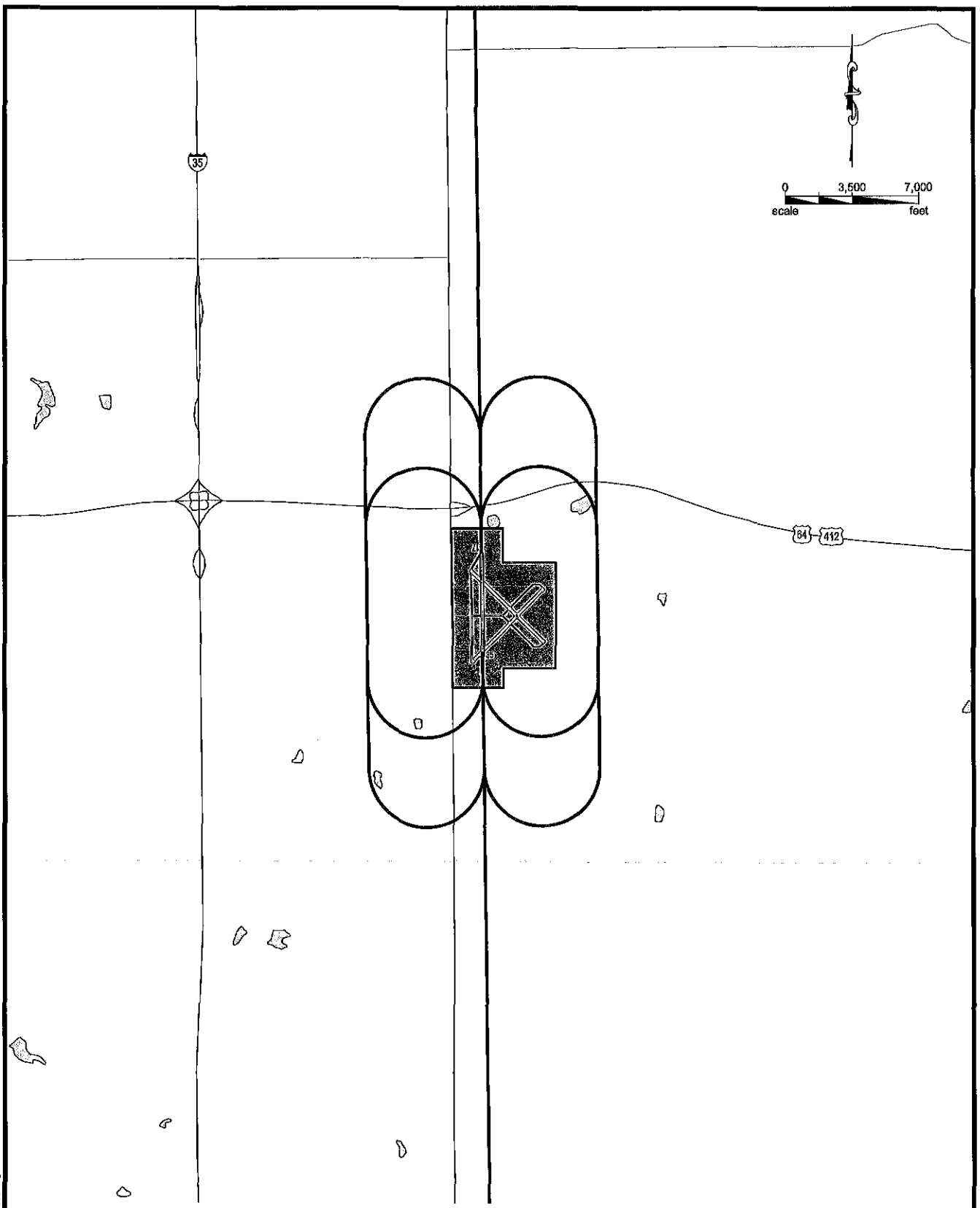


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Figure 3-3

Baseline Aircraft Ground Tracks

Perry Municipal Airport, Oklahoma

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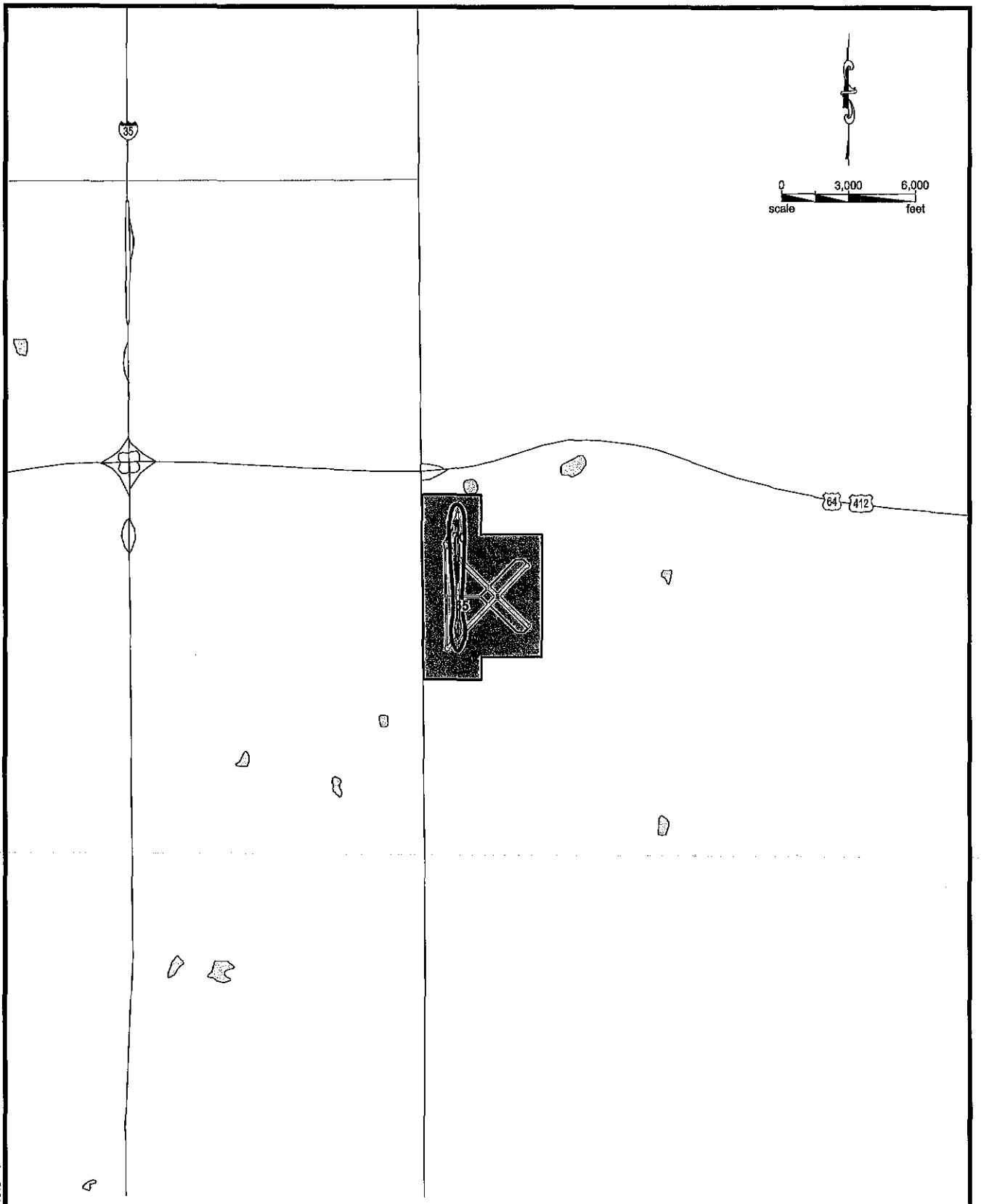

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Figure 3-4

Baseline Noise Contours

Perry Municipal Airport, Oklahoma

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Table 3.2 Theoretical Percentage of Population Highly Annoyed by Noise Exposure

DNL Intervals in dBA	Percentage of Persons Highly Annoyed
<65	<12
65-70	12-22
70-75	22-37
75-80	37-54
>80	>54

Note: Noise impacts on individuals vary as do individual reaction to noise. This is a general prediction of the percent community highly annoyed based on environmental noise surveys conducted around the world.

Source: Adapted from NAS 1977

Table 3.3 lists the number of acres and people within the DNL 65 dBA and greater noise exposure area for the baseline condition, as well as the estimated number of people who might be highly annoyed by noise at those levels.

Table 3.3 Baseline Noise Exposure, Perry Municipal Airport

	DNL Noise Zone (dBA)				
Category	65-70	70-75	75-80	>80+	Total
Acres	70	15	0	0	85
People	0	0	0	0	0
People Highly Annoyed	0	0	0	0	0

Note: It was assumed that population was equally distributed within a census block-group area from the United States Census Bureau 2000 census. Using this assumption, the total acreage and population in each block-group surrounding the PMA was collected and assessed. The number of acres of land in each noise zone was divided by the number of acres of land in each census block-group to determine what portion of the census block-group was contained within each noise zone. The population total in each census block-group was then multiplied by this ratio to estimate affected population. The number of people highly annoyed was determined by multiplying the population for the noise zone by the higher number of the range for the noise zone from Table 3.2. The population determination and people highly annoyed processes were used throughout the EA.

3.3 LAND USE

The PMA is bordered by State Highway 412 to the north and US Highway 77 to the west. Land use to the east and south of PMA consists primarily of rural farmland. The farmland is used for agricultural activities such as cropland and grazing. All of the surrounding properties have some form of oil field production activities, including saltwater injection wells. The only concentration of urban development in the area around the PMA is the City of Perry, which is about 5 miles south of the PMA. The city had a population of 5,230 persons according to the 2000 census (Perry 2006a). The estimated population in July 2004 was 5,125 (Perry 2006b). An asphalt plant is located approximately ¼ to ½ mile north of the northwest corner of the subject property along State Highway 412.

The PMA includes 800 acres of mostly developed land. Land use at the airport is light industrial with large, open grassy areas surrounding the runway. The airport contains approximately 22 structures, mostly metal aircraft hangars leased out to local residents, a main runway, Main Terminal Building, and an air ambulance service operated by Eaglemed. Eaglemed operates a helicopter that is housed in one of the larger hangars just to the north of the Main Terminal Building. Current operations at the airfield are limited to private flights, outgoing medi-vac flights, and crop dusting operations. The aircraft hangars are located along the aircraft parking apron.

The city of Perry owns 100 acres to the north and 60 acres to the south of the airfield which is designated as clear-zone space. There are two property owners each to east and west of the airport property and only one property owner each to the north and south. As discussed previously, these properties are used for agricultural and oil production purposes. The closest residences are about 0.8 mile and 1 mile east of the south end of the main runway.

Development in the PMA area of influence is expected to remain consistent with current patterns. Future development surrounding the airfield is expected to be minimal and not change from the current use patterns.

3.4 AIR QUALITY

Air quality in any given region is measured by the concentration of various pollutants in the atmosphere, typically expressed in units of parts per million (ppm) or in units of micrograms per cubic meter (μg/m3). Air quality is not only determined by the types and quantities of atmospheric pollutants, but also by surface topography, size of the air basin, and by prevailing meteorological conditions. The six criteria pollutants are ozone (O_3), particulate matter (PM_{10}), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and lead (Pb).

Ozone (ground-level ozone), which is a major component of "smog," is a secondary pollutant formed in the atmosphere by photochemical reactions involving previously emitted pollutants or precursors. Ozone precursors are mainly nitrogen oxides (NOx) and volatile organic compounds (VOC). NOx is the designation given to the group of all oxygenated nitrogen species, including nitric oxide (NO), NO_2, nitrous oxide (N_2O), and others. However, only NO, NO_2, and N_2O are found in appreciable quantities in the atmosphere. VOCs are organic compounds (containing at least carbon and hydrogen) that participate in photochemical reactions and include carbonaceous compounds except metallic carbonates, metallic carbides, ammonium carbonate, carbon dioxide, and carbonic acid. Some VOCs are considered non-reactive under atmospheric conditions and include methane, ethane, and several other organic compounds. The level of O_3 in the air depends on the outdoor levels of these organic gases, the radiant energy of the sun, and other weather conditions. The biggest concern with high O_3 concentrations is the damage it causes to human health, vegetation, and many common materials used

everyday. High O_3 concentrations can cause shortness of breath, coughing, wheezing, headaches, nausea, eye and throat irritations, and lung damage.

There are two categories of particulate matter: particles with diameters less than 10 microns (PM_{10}) and particles with diameters less than 2.5 microns ($PM_{2.5}$) in diameter. Currently, there are area designations only for PM_{10}. The sources of PM_{10} emissions include industrial and agricultural operations, automobile exhaust, and construction. Since PM_{10} is so small, it is not easily filtered and can penetrate to the deeper portions of the lungs. Chronic and acute respiratory illnesses may be caused from inhalation of PM_{10}.

Nitrogen dioxide is a reddish-brown to dark brown poisonous gas that produces an irritating odor. It is a byproduct of high combustion sources. Health effects include damage to lungs, bronchial and respiratory system irritation, headaches, nausea, coughing, choking and chest pains.

Carbon monoxide is a colorless, odorless and tasteless toxic gas found naturally in trace quantities in the atmosphere and emitted from any form of combustion. At low concentrations, the central nervous system is affected. At higher concentrations, irritability, headaches, rapid breathing, blurred vision, lack of coordination, nausea and dizziness can all occur. It is especially dangerous indoors when ventilation is inadequate; unconsciousness or death can occur.

Sulfur dioxide is a colorless gas with a strong suffocating odor. It is a gas resulting from the burning of sulfur-containing fuels. Exposure to SO_2 can irritate the respiratory system including lung and throat irritations and nasal bleeding. In the presence of moisture, SO_2 can form sulfuric acid that can cause damage to vegetation.

Lead is a bluish-white to silvery gray solid. Lead particles can originate from motor vehicle exhaust, industrial smelters and battery plants. Health effects include decreased motor function, reflexes and learning; as well as, damage to the central nervous system, kidneys and brain. At high levels of exposure to lead, seizures, coma, or death may occur.

3.4.1 Regulatory Requirements

The Clean Air Act (CAA) of 1970 directed the USEPA to develop, implement, and enforce strong environmental regulations that would ensure cleaner air for all Americans. To protect public health and welfare, the USEPA developed concentration-based standards called National Ambient Air Quality Standards (NAAQS). Enactment of the CAA was driven by the failure of nearly 100 U.S. cities to meet the NAAQSs for O_3 and CO, and by the inherent limitations in previous regulations to effectively deal with those and other air quality problems. The USEPA established both primary and secondary NAAQSs under provisions of the CAA. Primary standards define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary

standards define levels of air quality necessary to protect public welfare (e.g., soil, vegetation, property, and wildlife) from any known adverse impacts.

The CAA does not make the NAAQSs directly enforceable. However, it does require each state to promulgate a state implementation plan (SIP) to provide for "implementation, maintenance, and enforcement" of the NAAQSs in nonattainment areas. The General Conformity Rule, published in 58 Federal Register 63214 (November 30, 1993) and codified at 40 CFR part 93, subpart B, requires federal agencies to prepare written conformity determinations for federal actions in or affecting nonattainment areas, except when the action is covered under the Transportation Conformity Rule or when the action is exempted because the total increase in emissions is below the threshold emissions limits. The General Conformity Rule applies to federal actions occurring in air basins designated as nonattainment for criteria pollutants or areas designated as maintenance areas. Federal actions occurring in air basins in attainment of the NAAQSs are not subject to the General Conformity Rule.

3.4.2 Regional Air Quality

The fundamental method by which the USEPA tracks compliance with the NAAQS is the designation of a particular region as "attainment" or "nonattainment". Based on the NAAQS, each state is divided into three types of areas for each of the criteria pollutants. The areas are:

- Those areas that are in compliance with the NAAQS (attainment);
- Those areas that do not meet the ambient air quality standards (nonattainment); and
- Those areas where a determination of attainment/nonattainment cannot be made due to a lack of monitoring data (unclassifiable – treated as attainment until proven otherwise).

The USEPA classifies the air quality within an AQCR according to whether the concentration of criteria air pollutants in the atmosphere exceeds primary or secondary NAAQSs. All areas within each AQCR are assigned a designation of attainment, nonattainment, unclassifiable attainment, or not designated attainment for each criteria air pollutant. An attainment designation indicates that the air quality within an area is as good as or better than the NAAQS. Nonattainment indicates that air quality within a specific geographical area exceeds applicable NAAQS. Unclassifiable and not designated indicates that the air quality cannot be or has not been classified on the basis of available information as meeting or not meeting the NAAQS, and is therefore treated as attainment. Before a nonattainment area is eligible for reclassification to attainment status, the state must demonstrate compliance with NAAQSs in the nonattainment area for three consecutive years and demonstrate, through extensive dispersion modeling, that attainment status can be maintained in the future even with community growth.

Generally, areas in violation of one or more of the NAAQSs are designated nonattainment and must comply with stringent restrictions until all of the standards are met. In the case of O_3, CO, and PM_{10}, USEPA divides nonattainment areas into different categories, depending on the severity of the problem in each area. Each nonattainment category has a separate deadline for attainment and a different set of control requirements under the SIP.

Perry Municipal Airport is located in Noble County within the North Central Oklahoma Intrastate AQCR 185. This AQCR includes the Oklahoma counties of Garfield, Grant, Kay, Noble, and Payne. The USEPA has designated the air quality within Noble County as better than the NAAQS for SO_2 and NO_2, unclassifiable for CO, 1-hour O_3, 8-hour O_3 and $PM_{2.5}$. Oklahoma does not have a classification for Pb or PM_{10}. AQCR 185 is considered to be in attainment for all criteria pollutants.

3.4.3 Baseline Air Emissions

An air emissions inventory is an estimate of total actual mass emissions of pollutants generated from a source or sources over a period of time, typically a year. The quantity of air pollutants is generally measured in pounds (lb) per year or tons per year (tpy). Accurate air emissions inventories are needed for estimating the relationship between emissions sources and air quality. Emission sources may be categorized as either mobile or stationary emission sources. Typical mobile emission sources at a Municipal airport include aircraft and vehicles, among others. Stationary emission sources may include fuel storage and fueling operations, and generators, among others. Table 3-4 lists the baseline emissions inventory for the counties within AQCR 185.

Table 3-4 Baseline Emissions Inventory, AQCR 185

Criteria Air Pollutant	CO[a] (tpy)	VOC[a] (tpy)	SO_x[a] (tpy)	NO_x[a] (tpy)	PM_{10}[a] (tpy)	$PM_{2.5}$[a] (tpy)
Totals	82,142	17,868	33,677	30,812	67,305	14,541

a USEPA AirData for the year 2001.
tpy tons per year

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter provides the scientific and analytic basis for the environmental consequences of the No Action Alternative and Proposed Action.

4.1 AIRSPACE AND AIRFIELD OPERATIONS

Impacts associated with the Proposed Action are assessed by comparing projected military flight operations and proposed airspace utilization with baseline conditions, to include civil aviation activities. This EA analyzes the capability of the affected airspace elements to accommodate the projected level of military and civil flight activities, and determining whether such changes would have an adverse impact on overall use of the airspace. This includes consideration of such factors as the interaction of the proposed use of specific airspace with adjacent controlled, uncontrolled, or other military training airspace; possible impacts on other nonparticipating civil and military aircraft operations; and possible impacts on civil airports underlying or near the airspace projected for use in the Proposed Action.

4.1.1 No Action Alternative

No T-1, T-6, or T-37 airfield operations would occur at the airport. All Air Force activity would occur at Vance AFB or other outlying municipal airfields on a limited basis, which would impose severe limitations to conducting JSUPT and affect the mission of the 71 FTW. Airfield and airspace operations at the PMA would continue at the baseline levels.

4.1.2 Proposed Action

T-6 and T-37 aircraft would be radar vectored by the Vance AFB Radar Approach Control (RAPCON) to a point about 10 miles west of the airport and at 2,500 feet AGL. From this point, the aircraft would proceed to points north or south of the airport or overhead the runway for an ELP (T-6 only). Pilots from the two aircraft types would contact the RSU controller to announce intentions and receive landing instructions when departing the 10-mile point or the low-level route.

The ELP would be initiated from about 3,000 feet above either Runway 17/35 and would be accomplished east and west of the runway. The ELP would terminate in a touch and go landing after which the aircraft would transition to other traffic patterns.

The other patterns for the T-6 and T-37 aircraft include overhead patterns and straight-in approaches. T-6 and T-37 straight-in approaches would be made from points on an extended runway centerline to the north and south of the airfield at altitudes of 500 feet AGL. Overhead patterns would be initiated from approximately the same points north or south of the and would fly inbound on the extended runway centerline at

1,000 feet AGL. Other T-6 and T-37 overhead patterns and closed patterns would be flown both east and west of the airfield and at an altitude of 1,000 feet AGL.

Full stop landings may occur during RSU controller changeover when the RSU personnel would fly to the PMA instead of using ground transportation or when supervisors make required RSU observations. Other routine full stop landings would not be planned for the airport. Upon completion of the traffic pattern work, the aircraft would turn to the west to depart the airport for the return to Vance AFB. Vance AFB RAPCON would provide radar service when the aircraft enters RAPCON's area of coverage. A total of approximately 873 average busy day operations would occur at PMA as a result of the Proposed Action and the baseline condition (see Tables 2.3 and 3.1).

Instructor pilots housed in the RSU at the airfield would control the T-6 and T-37 airfield operations that occur within ROI airspace. RSU personnel would control only T-6 and T-37 aircraft and would not provide air traffic control service to other aircraft that transit the ROI airspace or land at the airport. Pilots of arriving and departing civil aircraft would contact the RSU controller on the assigned radio frequency for advisories that would be used for Air Force operations. In these instances, the RSU controller would instruct T-6 and T-37 aircrews to clear the pattern to allow civil aircraft to approach or depart the airfield. The airspace within the airport ROI and the anticipated air traffic control procedures could accommodate the T-6 and T-37 patterns, to include the ELP, without conflict from other aviation activity.

Other than the closed patterns that extend further east and west of the airport on which aircraft maneuver for re-entry into the traffic pattern from the north or south points, the altitudes and dimensions of T-6 and T-37 traffic patterns would be very similar to those flown by the civil aircraft under the baseline condition. The T-6 and T-37 aircraft would avoid overflying residential areas to the maximum extent possible.

4.1.3 Mitigation

Mitigation would not be necessary.

4.1.4 Cumulative Impacts

T-1 aircraft would typically depart a low-level navigation training route north of PMA and accomplish tactical arrivals to PMA at 1,000 feet AGL from random directions from the airport. The T-6 and T-37 operations discussion for the Proposed Action apply to the cumulative impacts analysis. Pilots from all three aircraft types would contact the RSU controller to announce intentions and receive landing instructions when departing the 10-mile point or the low-level route.

T-1 closed patterns would be flown at 1,500 feet AGL and T-1 aircraft would not accomplish touch and go landings because the runway length does not meet the requirement for the maneuver. The T-6 ELP and other airfield operations, RSU

operation, and Vance AFB RAPCON discussion for the Proposed Action apply. A total of approximately 903 average busy day operations would occur at PMA as a result of the Proposed Action, the other action, and the baseline condition (see Tables 2.3 and 3.1). The airspace within the airport ROI and the anticipated air traffic control procedures could accommodate the T-1, T-6, and T-37 patterns, to include the ELP, without conflict from other aviation activity.

4.2 NOISE

The following evaluation criteria were used to determine the impacts of noise:

- The extent, if any, that the action would generate noise levels from aircraft operations that would be greater than ambient noise levels;
- The extent, if any, that the action would cause annoyance, and speech interference; and
- The extent, if any, that the proximity of noise-sensitive receptors, such as housing, to the noise source would be affected.

4.2.1 No Action Alternative

No T-1, T-6, or T-37 airfield operations would occur at the PMA. All Air Force activity would occur at Vance AFB, Kegelman AUX, and other outlying civil airfields. Noise exposure at the PMA would continue at the baseline levels.

4.2.2 Proposed Action

Figure 4-1 depicts the flight tracks for T-6 and T-37 operations at the PMA as well as the baseline civil aircraft operations and Figure 4-2 depicts the noise exposure area for the aircraft operations identified in Table 2.3 plus the baseline operations in Table 3.1. About 10 percent of airfield operations would be conducted during the nighttime (10:00 p.m. and 7:00 a.m.). Figure 4-3 compares the Proposed Action noise contours with the baseline contours. Appendix C contains a general discussion of noise effects.

The Proposed Action DNL 65 dBA contour extends about 2.5 miles beyond the north and south boundaries of the airport along the runway centerline and is about 1 mile wide at points north and south of the airport. Figure 4-3 shows that noise exposure continues to be influenced primarily by the straight-in arrivals and departures. The influence of the closed pattern operations is indicated by the widening of the contours at distances about 0.5 and 1.0 miles off both ends of the runway. Table 4.1 compares the land area and population exposed to noise of DNL 65 dBA and greater for the Proposed Action with the baseline condition, as well as the population potentially highly annoyed for both conditions.

People would be exposed to aircraft noise in three of the four noise zones (see Table 4.1), with the DNL 65-70 dBA noise zone containing 21 of the 31 persons exposed to DNL 65 dBA and greater. These 31 persons would equate to 13 percent of the estimated

233 persons (based on 2000 census data) who live within the approximate 5-mile radius area associated with airfield airspace environment. This approximate 5-mile radius area includes the airspace typically allocated to the air traffic control tower at those airports with a tower and is the area in which closed patterns and maneuvering for takeoffs and landings is accomplished. The overall number of persons who could be potentially highly annoyed by noise exposure would be 9 people.

Table 4.1 Summary of Proposed Action Land Area and Population Exposed to, and Population Potentially Highly Annoyed by, DNL 65 dBA and Greater

	DNL Interval (dBA)				
Category	65-70	70-75	75-80	80+	Total
Land Area					
Baseline Acres	70	15	0	0	85
Proposed Action	1,835	803	360	205	3,203
Change	+1,765	+788	+	+	+3,118
Percent Change	+2,521 %	+5,253 %	--	--	+3,668%
Population					
Baseline Population	0	0	0	0	0
Proposed Action	21	8	2		31
Change	+21	+8	+2	0	+31
Percent Change	--	--	--	--	--
Highly Annoyed					
Baseline Population	0	0	0	0	0
Proposed Action	5	3	1	0	9
Change	+5	+3	+1	0	+9
Percent Change	--	--	--	--	--

Note: The methods explained in the Table 3.2 footnote was used to determine population and population highly annoyed for the Proposed Action.

4.2.3 Mitigation

No mitigation would be necessary.

4.2.4 Cumulative Impacts

Figure 4-4 depicts the flight tracks for T-1, T-6, and T-37 operations at the PMA as well as the baseline civil aircraft operations and Figure 4-5 depicts the noise exposure area for the aircraft operations identified in Table 2.4 plus the baseline operations in Table 3.1. About 10 percent of airfield operations would be conducted during the nighttime (10:00 p.m. and 7:00 a.m.). Figure 4-6 compares the Proposed Action noise contours with the baseline contours.

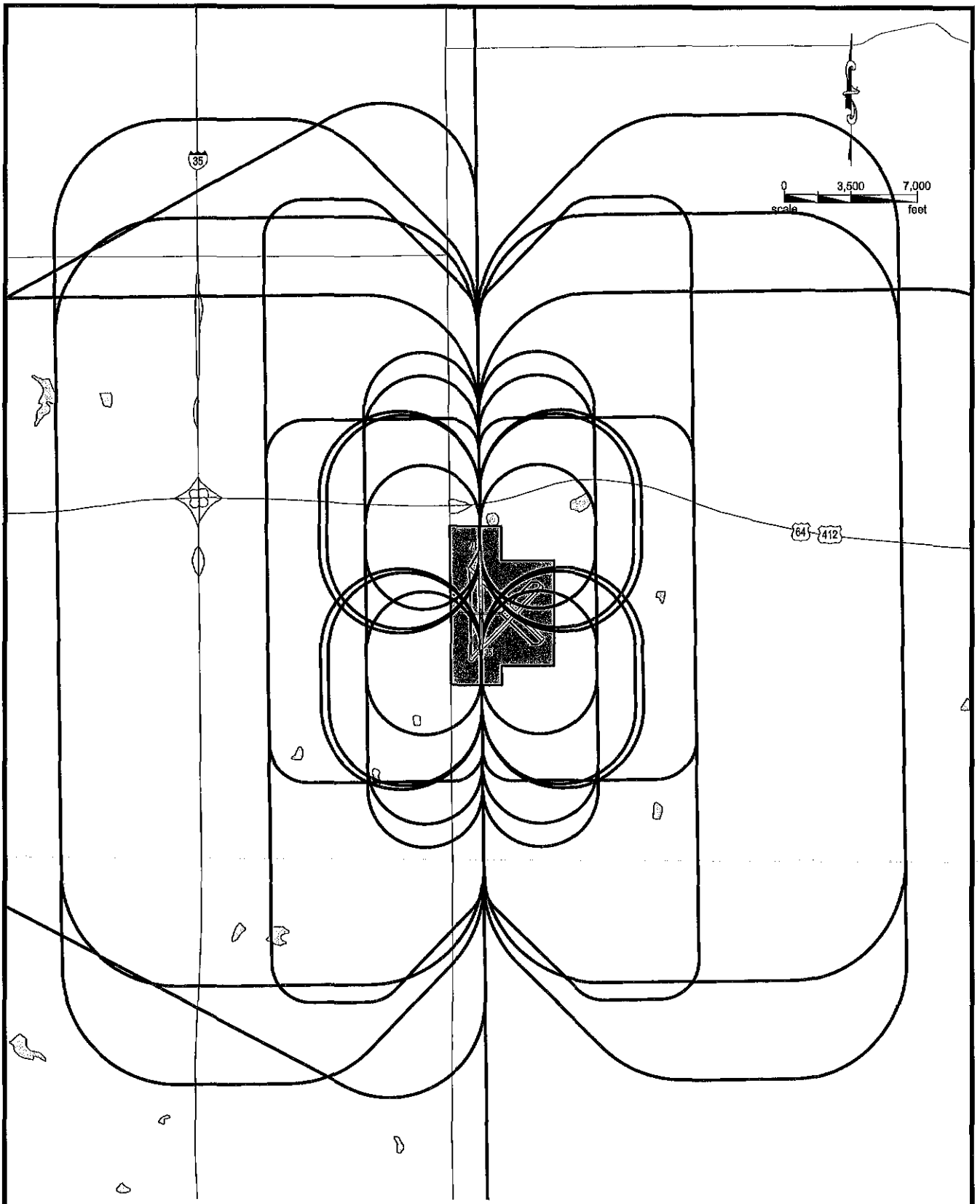

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Figure 4-1

Proposed Action Aircraft Ground Tracks

Perry Municipal Airport, Oklahoma

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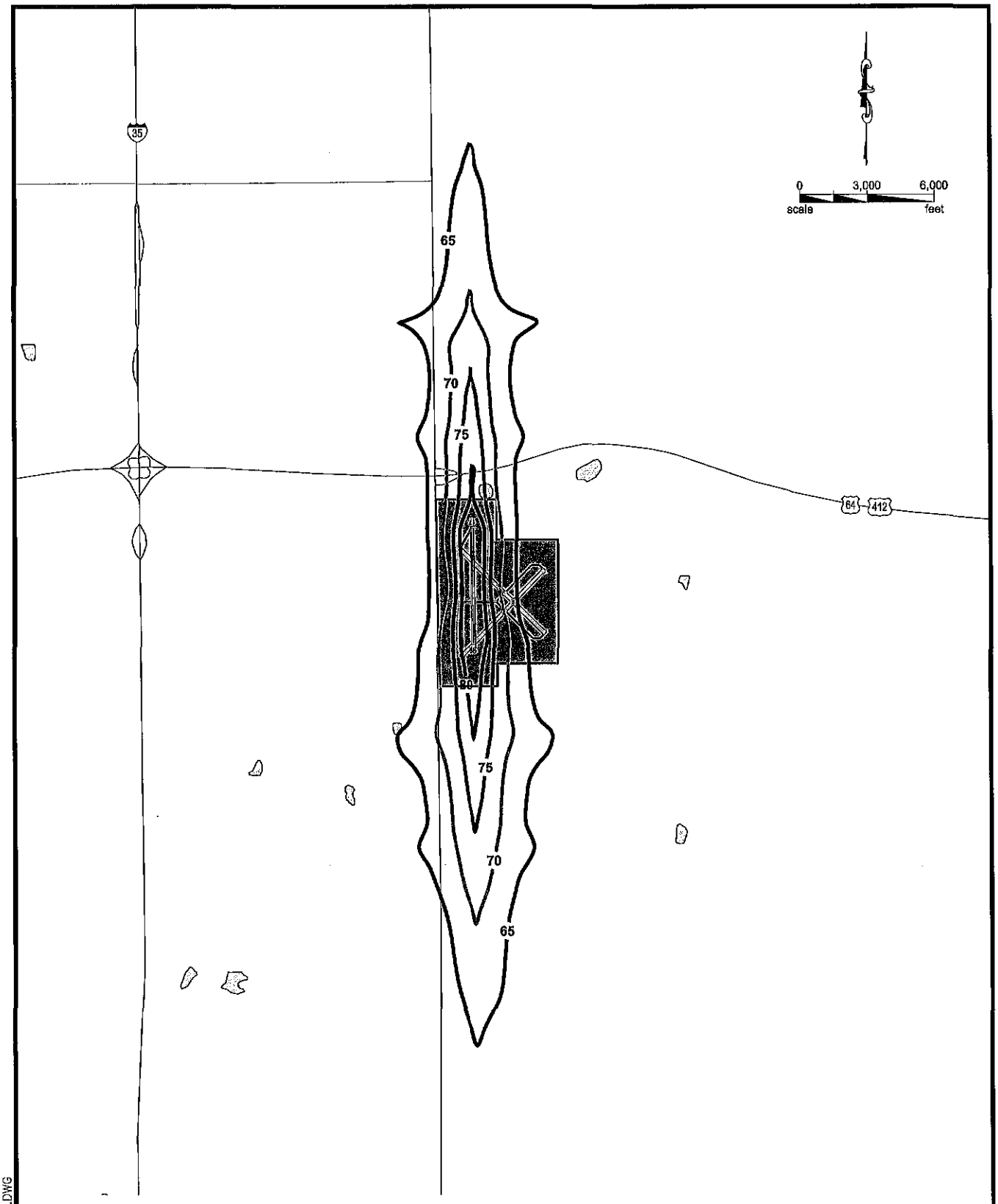

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Figure 4-2

Proposed Action Noise Contours

Perry Municipal Airport, Oklahoma

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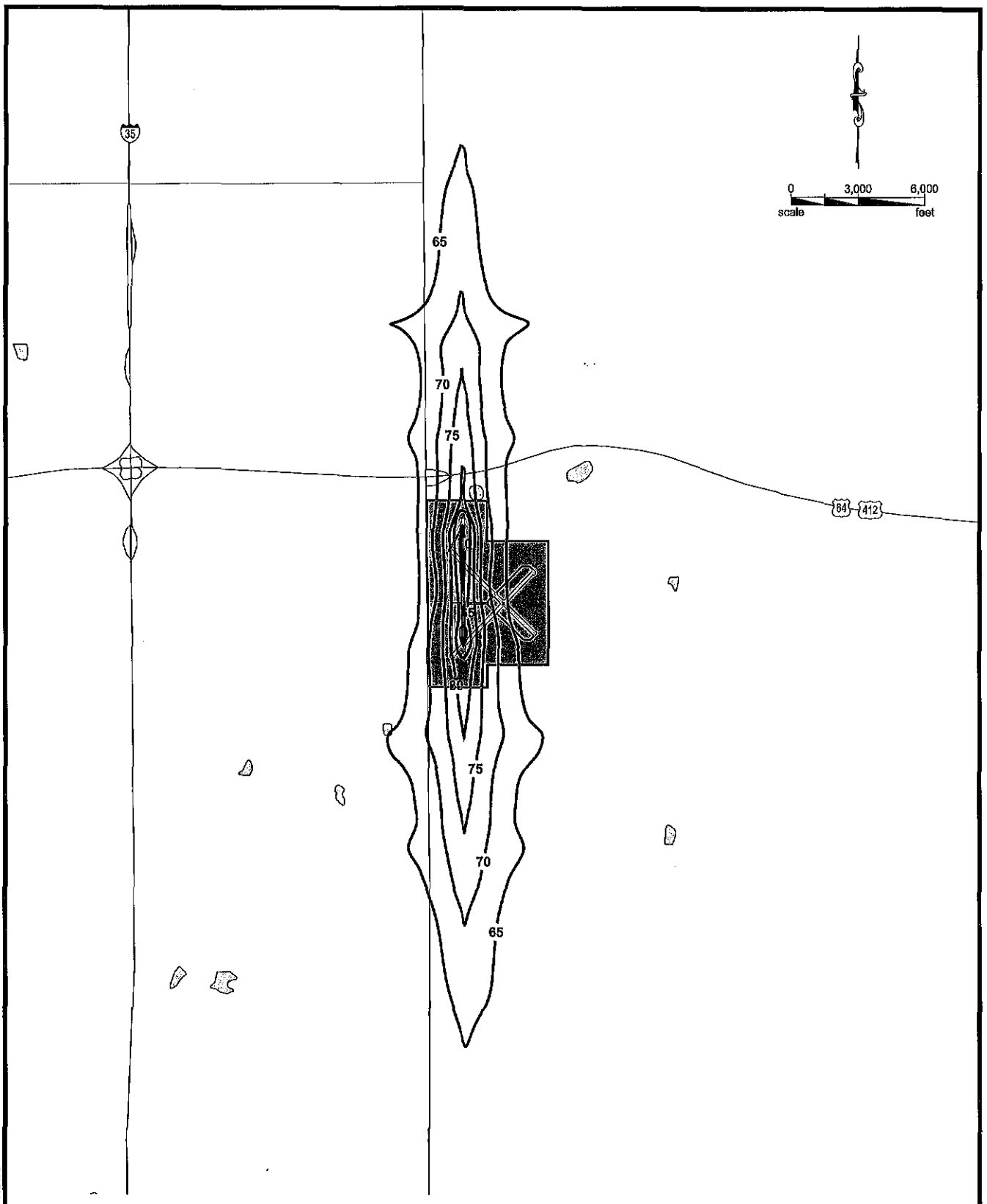

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Figure 4-3

Comparison of Baseline and Proposed Action Noise Contours

Perry Municipal Airport, Oklahoma

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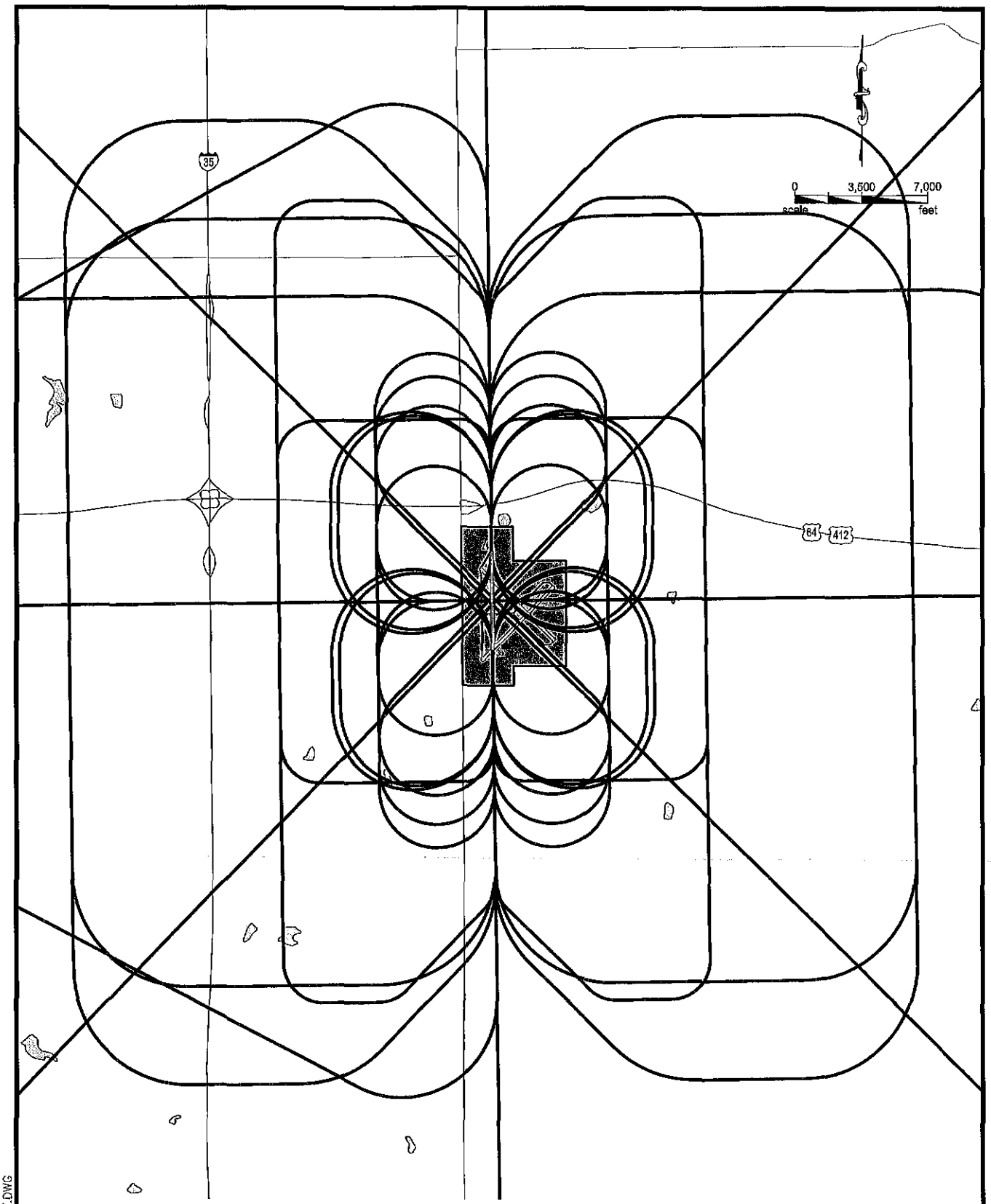

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Figure 4-4

Cumulative Aircraft Ground Tracks

Perry Municipal Airport, Oklahoma

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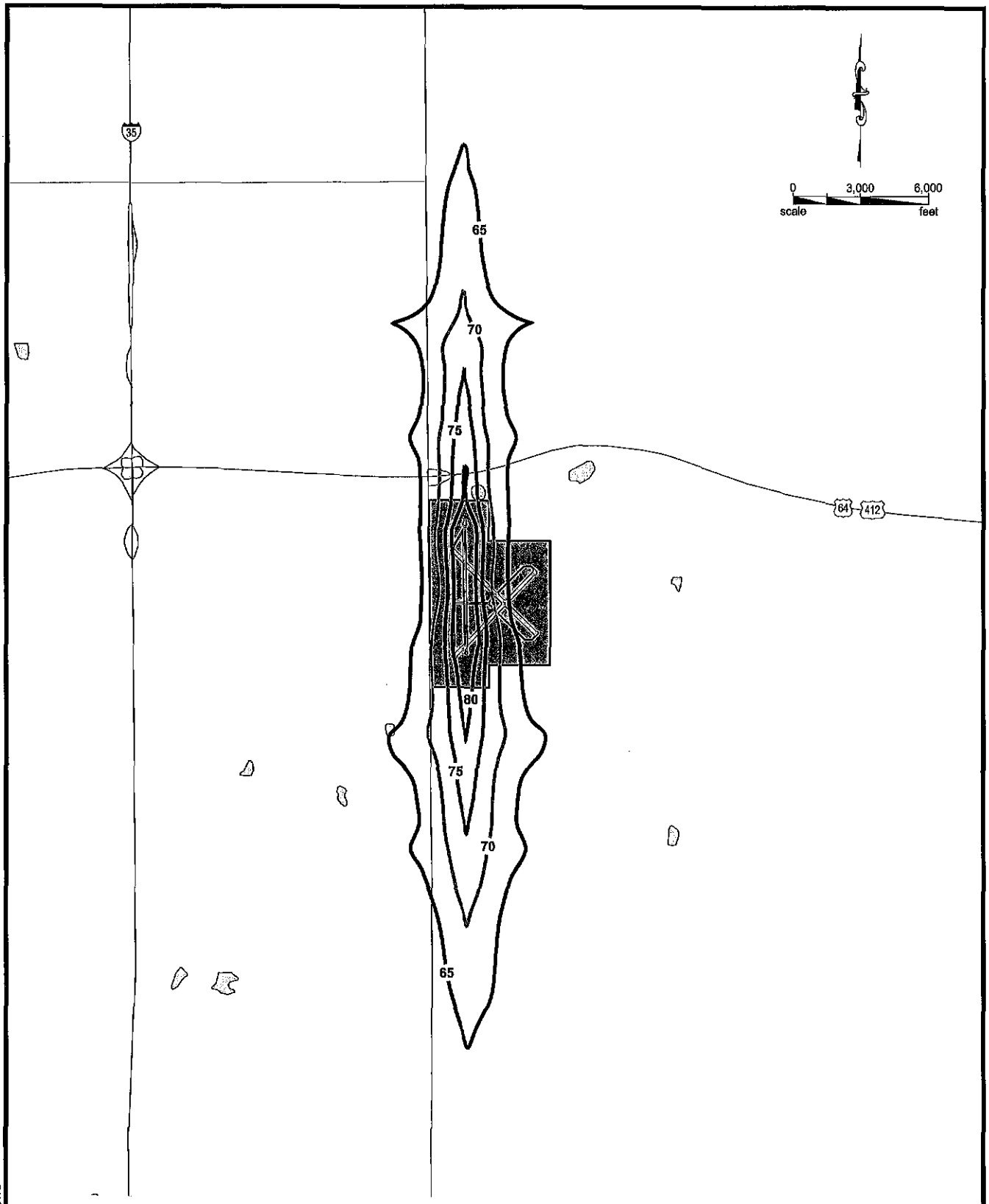

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Figure 4-5

Cumulative Noise Contours

Perry Municipal Airport, Oklahoma

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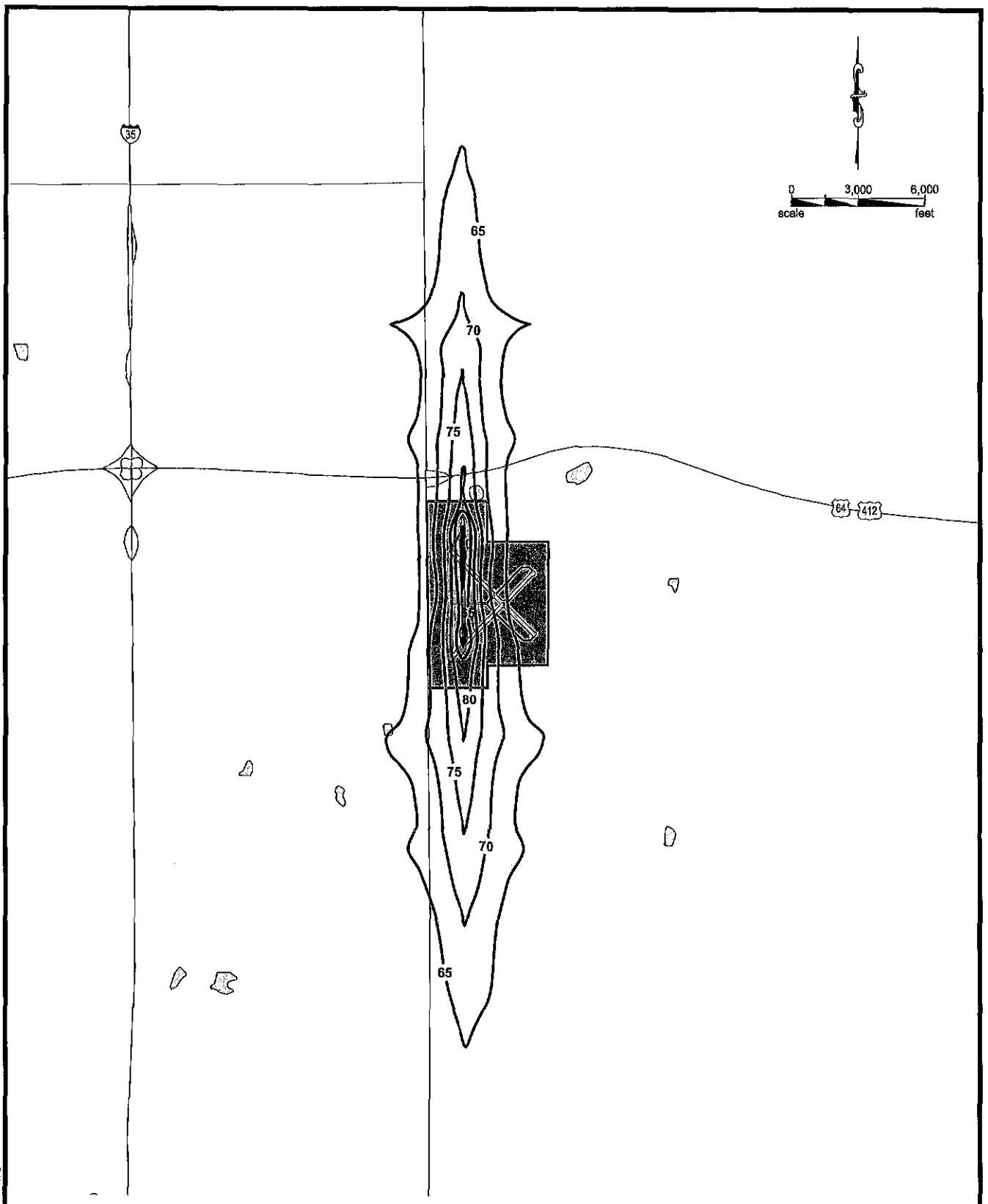

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Figure 4-6

Comparison of Baseline and Cumulative Noise Contours

Perry Municipal Airport, Oklahoma

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The cumulative DNL 65 dBA contour extends about 2.5 miles beyond the north and south boundaries of the airport along the runway centerline and is about 1 mile wide at points north and south of the airport. Figure 4-5 shows that noise exposure continues to be influenced primarily by the straight-in arrivals and departures. The influence of the closed pattern operations is indicated by the widening of the contours at distances about 0.5 and 1.0 miles off both ends of the runway. Table 4.2 compares the land area and population exposed to noise of DNL 65 dBA and greater for the Proposed Action and the other action with the baseline condition, as well as the population potentially highly annoyed for both conditions.

Table 4.2 Summary of Cumulative Land Area and Population Exposed to, and Population Potentially Highly Annoyed by, DNL 65 dBA and Greater

	DNL Interval (dBA)				
Category	65-70	70-75	75-80	80+	Total
Land Area					
Baseline Acres	70	15	0	0	85
Proposed Action	1,839	806	361	209	3,215
Change	+1,769	+791	+361	+209	+3,130
Percent Change	+2,527 %	+5,273 %	--	--	+3,682%
Population					
Baseline Population	0	0	0	0	0
Proposed Action	22	7	2	0	31
Change	+22	+7	+2	0	+31
Percent Change	--	--	--	--	--
Highly Annoyed					
Baseline Population	0	0	0	0	0
Proposed Action	5	3	1	0	9
Change	+5	+3	+1	0	+9
Percent Change	--	--	--	--	--

Note: The methods explained in the Table 3.2 footnote was used to determine population and population highly annoyed for the Proposed Action.

People would be exposed to aircraft noise in three of the four noise zones (see Table 4.2), with the DNL 65-70 dBA noise zone containing 22 of the 31 persons exposed to DNL 65 dBA and greater. These 31 persons would equate to 13 percent of the estimated 233 persons (based on 2000 census data) who live within the approximate 5-mile radius area associated with airfield airspace environment. The overall number of persons who could be potentially highly annoyed by noise exposure would be 9 people.

4.3 LAND USE

In considering the basis for evaluating impacts on land use, two items were examined, including:

- The degree to which the airfield operations would impact existing sensitive land use; and

- The degree to which airfield operations would interfere with the activities or functions of adjacent existing or proposed land uses.

4.3.1 No Action Alternative

Noise exposure from airfield operations would remain the same as the baseline condition, which do not affect land use.

4.3.2 Proposed Action

Noise modeling indicates the DNL 65 dBA extends about 2.5 miles beyond the north and south boundaries of the airport along the runway centerline and is about 1 mile wide at points north and south of the airport. The areas that would be exposed to DNL 65 dBA and greater are used for agriculture and oil production purposes with residences scattered throughout. The noise exposure from the Proposed Action would not change the land use patterns in the area surrounding the airport.

4.3.3 Mitigation

Mitigation would not be necessary.

4.3.4 Cumulative Impacts

Noise modeling indicates the DNL 65 dBA extends about 2.5 miles beyond the north and south boundaries of the airport along the runway centerline and is about 1 mile wide at points north and south of the airport. The areas that would be exposed to DNL 65 dBA and greater are used for agriculture and oil production purposes with residences scattered throughout. The noise exposure from the Proposed Action and other actions would not change the land use patterns in the area surrounding the airport.

4.4 AIR QUALITY

Evaluation criteria considered in air quality analysis include:

- Would emissions from the action cause or contribute to a violation of any national or Oklahoma ambient air quality standard; and
- Would emissions from the action represent 10 percent or more in affected AQCR or county emissions inventory to be considered regionally significant?

4.4.1 No Action Alternative

Under the No Action Alternative the 71 FTW would not conduct T-1, T-6, and T-37 training at the PMA. Emissions from aircraft operations, vehicles, generators, and fueling operations would continue to be generated by PMA.

4.4.2 Proposed Action

Under the Proposed Action, there would be changes in aircraft operations only. Aircraft operation emissions would be considered recurring emissions.

Emissions from aircraft operations were calculated using the emission factors from the United States Air Force Institute for Environmental, Safety, & Occupational Health Risk Analysis (AFIERA) document Air Emissions Inventory Guidance for Mobile Sources at Air Force Installations, (AFIERA 2003) and from the aircraft operations listed on Table 2.3 in Subchapter 2.4. The Proposed Action aircraft emissions are found on Table 4.3.

Table 4.3 Proposed Action Emissions

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NOx (tpy)	SOx (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Baseline Emission Inventory	82,142	17,868	33,677	30,812	67,305	14,541
Proposed Action Recurring Emissions						
Aircraft Emissions	167	32	18	7	1	1
Total Recurring Proposed Action Emissions	167	32	18	7	1	1
Emissions as Percent of the AQCR Emissions	0.20%	0.18%	0.06%	0.00%	0.00%	0.00%

Note: VOC is not a criteria air pollutant. However, VOC is reported because, as an ozone precursor, it is a controlled pollutant

Based on the requirements outlined in the USEPA's General Conformity Rule published in 58 Federal Register 63214 (November 30, 1993) and codified in 40 CFR Part 93, Subpart B (for federal agencies), a conformity analysis is required to analyze whether the applicable criteria air pollutant emissions associated with the project equal or exceed the threshold emission limits (i.e., *de minimis*) that trigger the need to conduct a formal conformity determination. The intent of the conformity rule is to encourage long range planning by evaluating the air quality impacts from federal actions before the projects are undertaken. This rule establishes a process for analyzing and determining whether a proposed project in a nonattainment area conforms to the SIP and federal standards. A federal action would be considered regionally significant when the net change in emissions from the Proposed Action (the delta between the baseline and the Proposed Action emissions) equal or exceed 10 percent of the nonattainment or maintenance area's emissions inventory for any criteria air pollutant. A full conformity determination is not required if a federal action meets de minimis requirements and is not considered a regionally significant action. Ongoing activities currently being conducted are exempt from the rule so long as there is no increase in emissions equal to or greater than the *de minimis* thresholds as the result of the federal action.

As indicated in the previous paragraph, emissions that exceed 10 percent of the emissions inventory would be considered regionally significant by the USEPA if the region were nonattainment for any of the criteria pollutants as stated in 40 CFR 51,

Subpart W, Section 852. However, all criteria pollutant emissions are less than 10 percent of the emissions inventory (see Table 4.4).

Table 4.4 Regional Significance for AQCR 185 for the Proposed Action

Category	Pollutants Emitted (tons/year)					
	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Emissions Inventory	1,311,000	255,000	12,000	165,000	71,000	29,000
Baseline Aircraft Emissions	9	7	1	0	0	0
Project Emissions	167	32	18	7	1	1
Change in Emissions	+158	+25	+17	+7	+1	+1
Region Percent Change	**0.19%**	**0.14%**	**0.05%**	**0.02%**	**0.00%**	**0.00%**
Regionally Significant? (>10%)	No	No	No	No	No	No

Since the Proposed Action is located in an area in attainment for all criteria pollutants and the percent increase in criteria pollutant emissions is less than 10 percent, the Proposed Action has been demonstrated by USEPA standards not to cause or contribute to new violations of any national ambient air quality standard in the affected area, nor increase the frequency or severity of an existing violation. Implementation of the Proposed Action would not delay timely attainment of any of the standards in the air basin, and the Proposed Action is in compliance or consistent with all relevant requirements and milestones contained in the applicable SIP. This conclusion of positive General Conformity Determination for the federal action planned for PMA fulfilled the Air Force's obligation and responsibility under 40 CFR Part 93, Subpart B.

4.4.3 Mitigation

There are no air quality impacts from the Proposed Action that require mitigation.

4.4.4 Cumulative Impacts

Under the Proposed Action and other actions, there would be changes in aircraft operations only. Aircraft operation emissions would be considered recurring emissions. Emissions from aircraft operations were calculated using the methodology for the Proposed Action and from the aircraft operations listed on Table 2.4 in Subchapter 2.5. The cumulative aircraft emissions are found on Table 4.5.

Table 4.5 Cumulative Emissions

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NOx (tpy)	SOx (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Baseline Emission Inventory	82,142	17,868	33,677	30,812	67,305	14,541
Cumulative Recurring Emissions						
Aircraft Emissions	177	37	20	8	3	3
Total Recurring Cumulative Emissions	177	37	20	8	3	3
Emissions as Percent of the AQCR Emissions	0.22%	0.21%	0.06%	0.06%	0.00%	0.09%

Note: VOC is not a criteria air pollutant. However, VOC is reported because, as an ozone precursor, it is a controlled pollutant

As mentioned in the background information presented for the Proposed Action, emissions that exceed 10 percent of the emissions inventory would be considered regionally significant by the USEPA if the region were nonattainment for any of the criteria pollutants as stated in 40 CFR 51, Subpart W, Section 852. However, all criteria pollutant emissions are less than 10 percent of the emissions inventory (see Table 4.6)

Table 4.6 Regional Significance for AQCR 185 for Cumulative Emissions

Category	Pollutants Emitted (tons/year)					
	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Emissions Inventory	1,311,000	255,000	12,000	165,000	71,000	29,000
Baseline Aircraft Emissions	9	7	1	0	0	0
Cumulative Emissions	177	37	20	8	3	3
Change in Emissions	+168	+30	+19	+8	+3	+3
Region Percent Change	0.20%	0.17%	0.06%	0.02%	0.00%	0.02%
Regionally Significant? (>10%)	No	No	No	No	No	No

Since the Proposed Action and other action are located in an area in attainment for all criteria pollutants and the percent increase in criteria pollutant emissions is less than 10 percent, the Proposed Action and other action has been demonstrated by USEPA standards not to cause or contribute to new violations of any national ambient air quality standard in the affected area, nor increase the frequency or severity of an existing violation. Implementation of the Proposed Action and other action would not delay timely attainment of any of the standards in the air basin, and the Proposed Action and other action is in compliance or consistent with all relevant requirements and milestones contained in the applicable SIP. This conclusion of positive General Conformity Determination for the federal action planned for PMA fulfilled the Air Force's obligation and responsibility under 40 CFR Part 93, Subpart B.

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CHAPTER 5
LIST OF PREPARERS

Name	Degree	Resource	Years of Experience
Davis, Anthony	B.S., Civil Engineering	Project Manager	28
Miller, Dorothy	B.S., Mathematics	Aircraft Noise Modeling	26
Schnapp, Angela	B.S., Nuclear Engineering M.S., Environmental Engineering	Air Quality	10
Wallin, John	B.A., Biology M.A., Management	Airspace and Airfield Operations; Noise Analysis, Land Use	33
Montroy, Leo	Ph.D., Ecology and Biology	Technical Management	36
Sherrie Keenan	B.A., Journalism	Technical Editor	28

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CHAPTER 6
PERSONS AND AGENCIES CONSULTED

The following persons and agencies were consulted during preparation of this EA.

Brooks City-Base, Texas, Air Force Center For Environmental Excellence

Smith, Buddy (AFCEE/ICE)
Cantrell, Julia (AFCEE/ISM)

Vance Air Force Base, Oklahoma, 71st Flying Training Wing

Buthman, Mark (CSC/CE)
Farrell, Robert (71st FTW/PA)
Lyman, Robert Capt (71 OSS/OSOP)

Perry Municipal Airport, Perry, Oklahoma

Engel, Ty (Airfield Operations Manager)
Henry, David (President City of Perry Airport Board)

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CHAPTER 7
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APPENDIX A
Air Force Form 813

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REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS

Report Control Symbol RCS:

INSTRUCTIONS: *Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on separate sheets as necessary. Reference appropriate item number(s).*

SECTION I - PROPONENT INFORMATION

1. TO *(Environmental Planning Function)*	2. FROM *(Proponent organization and functional address symbol)*	2a. TELEPHONE NO.
CSC/CEV	71 OSS/OSOP	448-7854

3. TITLE OF PROPOSED ACTION

Movement of Kegelman AUX Field operations to Perry Municipal Airport

4. PURPOSE AND NEED FOR ACTION *(Identify decision to be made and need date)*

During runway renovation, Kegelman AUX Field operations will be temporarily moved to Perry Municipal Airport.

5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES *(DOPAA) (Provide sufficient details for evaluation of the total action.)*

ACTION: Vance AFB would move its auxilary field operations from Kegelman Field to Perry Municipal Airport for an extended length of time. The field would be used for practice VFR pattern operations by the T-37 and T-6. There is also the possibility of

6. PROPONENT APPROVAL *(Name and Grade)*	6a. SIGNATURE	6b. DATE
ROBERT E. LYMAN, Capt, USAF		20051130

SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. *(Check appropriate box and describe potential environmental affects including cumulative effects.) (+ = positive effect; 0 = no effect; - = adverse effect; U= unknown effect)*	+	0	-	U
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE *(Noise, accident potential, encroachment, etc.)*	☐	☐	X	☐
8. AIR QUALITY *(Emissions, attainment status, state implementation plan, etc.)*	☐	☐	☐	X
9. WATER RESOURCES *(Quality, quantity, source, etc.)*	☐	X	☐	☐
10. SAFETY AND OCCUPATIONAL HEALTH *(Asbestos/radiation/chemical exposure, explosives safety quantity-distance, bird/wildlife aircraft hazard, etc.)*	☐	☐	X	☐
11. HAZARDOUS MATERIALS/WASTE *(Use/storage/generation, solid waste, etc.)*	☐	X	☐	☐
12. BIOLOGICAL RESOURCES *(Wetlands/floodplains, threatened or endangered species, etc.)*	☐	☐	☐	X
13. CULTURAL RESOURCES *(Native American burial sites, archaeological, historical, etc.)*	☐	☐	☐	X
14. GEOLOGY AND SOILS *(Topography, minerals, geothermal, Installation Restoration Program, seismicity, etc.)*	☐	X	☐	☐
15. SOCIOECONOMIC *(Employment/population projections, school and local fiscal impacts, etc.)*	☐	☐	☐	X
16. OTHER *(Potential impacts not addressed above.)*	☐	☐	☐	X

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

17. ☐ PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # _____ ; OR

☒ PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

18. REMARKS

The proposed action requires further environmental assessment.

19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION *(Name and Grade)*	19a. SIGNATURE	19b. DATE
Natalie Stennis, Civ		11/30/05

limited nighttime pattern operations as required by the T-6 syllabus. Finally, the possibility exists for future use of Perry Airfield by T-1 aircraft for VFR tactical patterns to low approaches. Due to runway length, touch-and-go operations for T-1s are not possible at this time.

The proposed pattern to be flown is in Atch 1. It will be flown by T-37 and T-6 aircraft at 1,000 ft AGL (2,000 ft MSL) at a standard speed of 200 KIAS. Straight-in approach operations will be flown no lower than 500 ft AGL (1,500 ft MSL). The hours of operation for the airfield will be approximately from sunrise to sunset, with the possibility of limited nighttime pattern training for the T-6. The maximum number of aircraft at any time in the pattern will be 12 with a limit of 8 in the night pattern. If pattern operations need to be restricted due to deteriorating weather conditions, the maximum number will be 8. For average daily operations, there will be approximately 125 arrivals, 125 departures, and 300 closed pattern operations for a total of 850 daily operations by T-37 and T-6 aircraft. Closed pattern operations will include Emergency Landing Pattern training for T-6 aircraft up to an altitude of 3,000 ft AGL (4,000 ft MSL).

T-1 tactical patterns will be flown at 1,500 ft AGL (2,500 ft MSL) approximately 1 mi east of the field using a standard FAA VFR pattern.

For the purposes of controlling Vance operations at the airfield, an RSU will need to be positioned 360 ft west of the extended runway at approximately midfield. The single RSU will control operations for both north and south patterns. The RSU will be provided by Vance AFB with the appropriate wind measuring equipment included. No excavation will be required for RSU power requirements due to recent modernization of Perry runway lighting, which included running power cables to anticipated RSU location.

Crash response will be provided by rescue crews and equipment redeployed from Kegelman. In addition, LifeFlight has a 24-hour medevac helicopter stationed at Perry. Facilities for housing crews and equipment at Perry will be in existing structures with only minor interior upgrades required.

ALTERNATIVES: No alternatives will be possible within the timeframe of the Kegelman runway closure. Vance AFB will have to conduct all Phase II pattern training at home station. This will impose severe limitations to the conduct of Phase II JSUPT training and could result in a cutback in the number of sorties flown due to mitigation of pattern saturation.

APPENDIX B
Public Involvement

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PUBLIC INVOLVEMENT

The *Air Force Environmental Impact Analysis Process* (32 CFR 989), 15 Jul 99, and amended 28 Mar 01, states that the environmental assessment and Finding of No Significant Impact should be made available to government agencies and the public for comment. The following Privacy Advisory was a preface in the draft EA that was made available to the public, agencies, and organizations during the public comment period.

PRIVACY ADVISORY NOTICE

The Air Force requests comments on this draft environmental assessment (EA). Letters or other written or verbal comments provided to the Air Force may be published in the Final EA. As required by law, comments addressing adequacy of the Draft EA or the merits of the alternatives discussed, or both, will be addressed in the Final EA and made available to the public. Private addresses will be compiled to develop a mailing list for those requesting copies of the Final EA; however, only the names of commenters and specific comments will be disclosed. Personal home addresses and phone numbers of individuals will not be published in the Final EA

A notice announcing the 30-day public comment period and the availability of the draft EA was published in *The Perry Daily Journal* on March 24, 2006. The following page contains a copy of the notice of availability. Copies of the letters to the agencies requesting review and comment, along with their responses, are also included in this appendix.

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DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

17 FEB 2006

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Ms. Margaret Graham
Oklahoma Department of Environmental Quality
707 N. Robinson
P.O. Box 1677
Oklahoma City OK 73101-1677

Dear Ms. Graham

The United States Air Force is preparing an Environmental Assessment (EA) to evaluate the movement of airfield operations to Perry Municipal Airport, Perry, Oklahoma, from Kegelman Auxiliary (AUX) Field at Vance Air Force Base, Oklahoma (Vance AFB OK). The overall purpose of the project is to conduct military flying training operations using T-1, T-6, and T-37 aircraft to practice instrument and visual approach and traffic pattern training at Perry Municipal Airport. This will take place as repairs to Kegelman AUX Field runway are under way. This document describes and analyzes alternative plans for auxiliary field operations at Perry Municipal Airport. It includes the No Action Alternative under which the movement of auxiliary field operations would not occur.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, please identify specific issues or topics of environmental concern. The environmental concerns may include potential permits or other requirements addressed in the EA. Below is a short description of the purpose and need, as well as a description of the proposed activities associated with the Proposed Action. Attached are figures for your reference.

The mission of the 71st Flying Training Wing (71 FTW) at Vance AFB is to conduct Joint Specialized Undergraduate Pilot Training (JSUPT) for Air Force personnel. The 71 FTW conducts JSUPT for qualified United States and foreign military officers. It also provides flying training for members of the Air National Guard, Air Force Reserve, and the air forces of several allied countries. Vance AFB T-1, T-6, and T-37 aircrews use Kegelman AUX Field, a sub-installation of the base, for traffic pattern training in order to reduce traffic pattern congestion at Vance AFB caused by four aircraft types operating at a single airfield. The condition of the runways at Kegelman AUX Field has deteriorated; and extensive repairs are necessary, requiring closure of the runways. While temporarily closing Kegelman AUX Field for repairs, Vance AFB has a need for another airfield at which T-1, T-6, and T-37 aircraft could conduct traffic pattern training. The current use of Kegelman AUX Field ensures accomplishment of JSUPT for

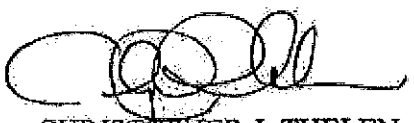
Air Force personnel. The Proposed Action would move auxiliary field operations from Kegelman AUX Field to Perry Municipal Airport. This project has urgency because runway repairs may take as long as 6 to 8 months, and work completion should occur before the frost season in the fall of 2006.

Under the No Action Alternative, Vance AFB would not conduct T-1, T-6, and T-37 training at Perry Municipal Airport. Kegelman AUX Field would not be available while closed for repairs. Vance AFB would have to conduct T-1, T-6, and T-37 traffic pattern training at the base, which would impose severe limitations to JSUPT training and could result in a reduction in the number of sorties flown due to traffic pattern saturation.

In addition to identifying resources within your agency's purview that may be potentially impacted, we also request any point-of-contact information or relevant documentation available that would assist in preparing the EA. To facilitate the cumulative impact analysis, we appreciate identification of major projects in the vicinity that may contribute to cumulative effects.

Please provide any comments or information by 19 March 2006. Address any questions to Mr. Mark Buthman at (580) 213-7344.

Sincerely



CHRISTOPHER J. THELEN, Colonel, USAF

2 Attachments:
1. Location of Proposed Action
2. Location of Vance AFB, Kegelman AUX Field, and Perry Municipal Airport

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

17 FEB 2006

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

U.S. Fish and Wildlife Service
222 S. Houston, Suite A
Tulsa OK 74127

To Whom It May Concern

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In addition to identifying resources within your agency's purview that may be potentially impacted, we also request any point-of-contact information or relevant documentation available that would assist in preparing the EA. To facilitate the cumulative impact analysis, we appreciate identification of major projects in the vicinity that may contribute to cumulative effects.

Please provide any comments or information by 19 March 2006. Address any questions to Mr. Mark Buthman at (580) 213-7344.

Sincerely

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DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

17 FEB 2006

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Southwest Region Administrator
FAA – Southwest Region
2601 Meacham Boulevard
Fort Worth TX 76137-4298

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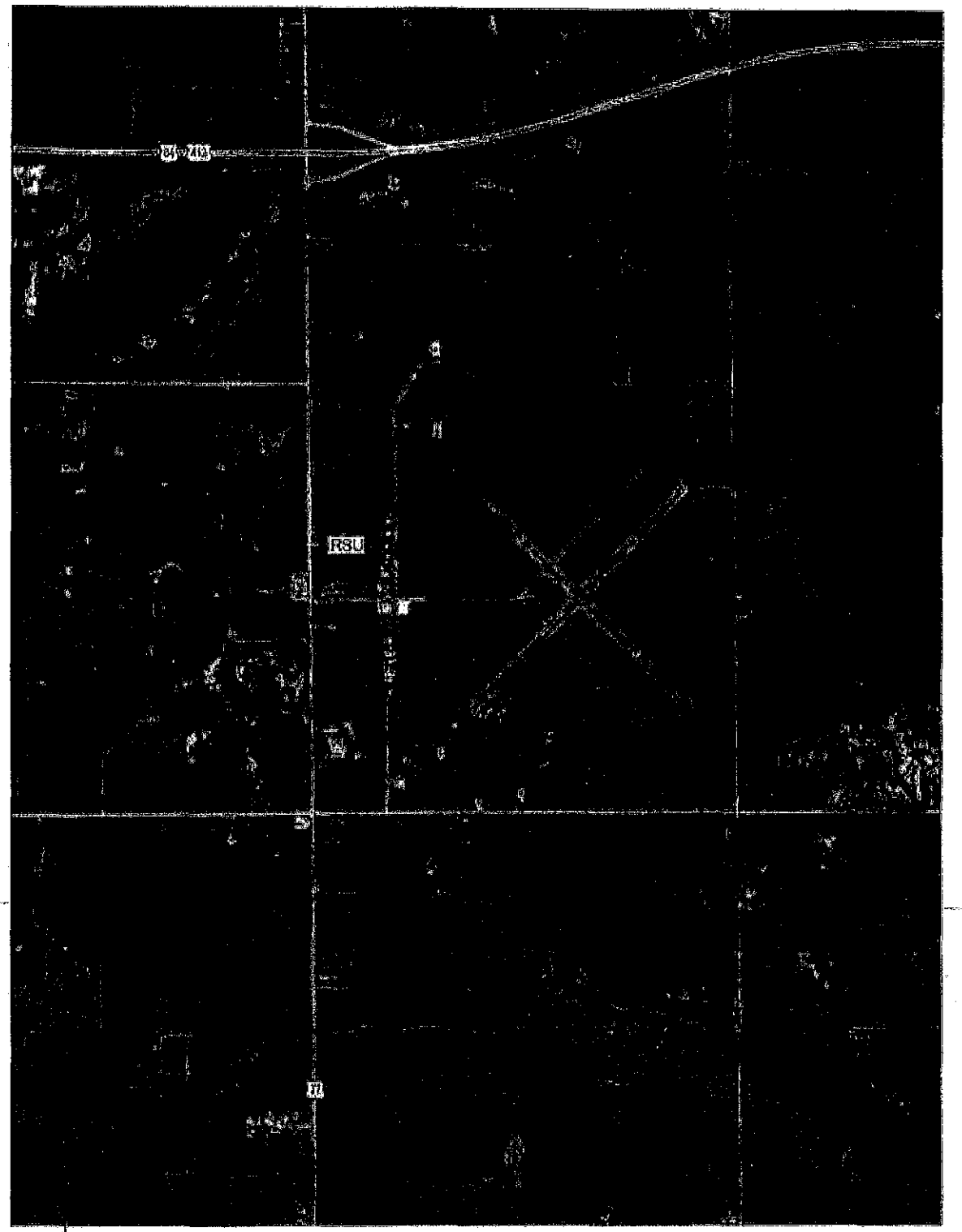


0 900 1,800
scale feet

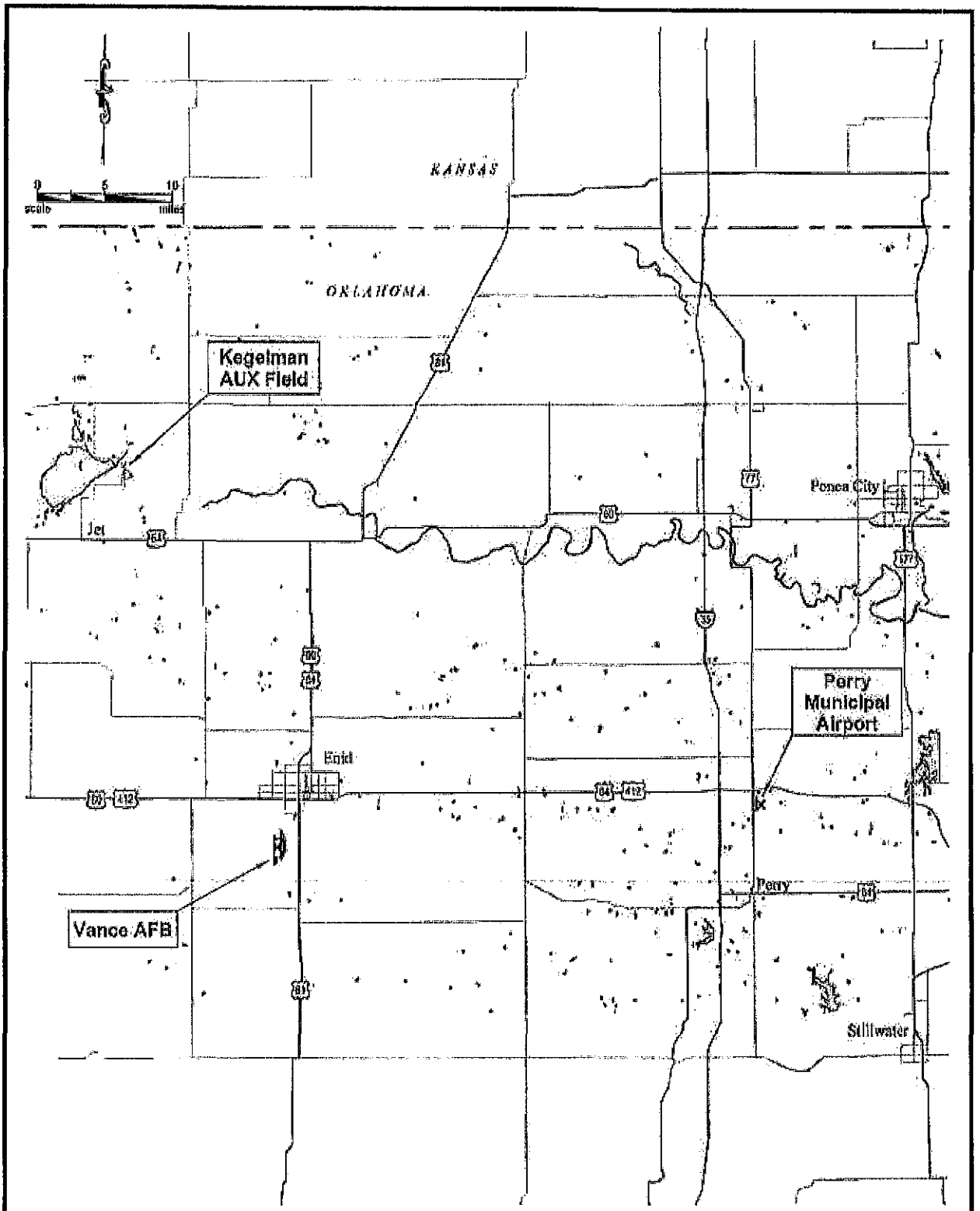
Aerial: USGS, February 20, 1995

Figure 2-1

Location of Proposed Action

Perry Municipal Airport, Oklahoma

744387 PERRY-AERIAL.DWG



Key Map

Figure 1-1

Location of Vance AFB, Kegelman AUX Field, and Perry Municipal Airport

Perry Municipal Airport, Oklahoma

U.S. Department
of Transportation
**Federal Aviation
Administration**

Federal Aviation Administration
Airports Division, Southwest Region
Arkansas/Oklahoma Airports Development Office

Fort Worth, Texas 76193-0600

March 27, 2006

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB, OK 73705-5036

This is in response to your letter dated February 17, 2006, in which you solicit Federal Aviation Administration (FAA) input regarding a U.S. Air Force Environmental Assessment (EA) on the temporary transfer of military training operations from Kegelman Auxiliary Field to Perry Municipal Airport. We understand that this would accommodate repairs at Kegelman Auxiliary Field, which are expected to require approximately six to eight months.

FAA environmental policies do not require the assessment of temporary actions such as your proposed transfer of training operations; therefore, we offer no comments regarding the EA. We encourage you to continue coordinating your activities with the sponsor and users of Perry Municipal Airport.

Please feel free to call me at 817-222-5635 or e-mail me at tim.tandy@faa.gov if you have any questions.

Sincerely

Tim Tandy, Environmental Specialist
Arkansas/Oklahoma Airports Development Office

cc:
The Honorable Etsell Emde
Mayor of Perry
P.O. Drawer 798
Perry, OK 73077-0798

PUBLIC NOTICE
NOTICE OF AVAILABILITY
DRAFT ENVIRONMENTAL ASSESSMENT
AND PROPOSED FINDING OF NO SIGNIFICANT IMPACT
T-1, t-6, and t-37 Aircraft operations at Perry Municipal Airport

An Environmental Assessment (EA) has been prepared that assesses accomplishment of the T-6 and T-37 airfield operations currently being conducted at Kegelman Auxiliary Field, a subinstallation of Vance AFB, OK at Perry Municipal Airport (PMA), Perry, OK. The EA, prepared in accordance with the *National Environmental Policy Act* (NEPA), Council on Environmental Quality regulations, and Air Force instructions implementing NEPA, evaluates potential impacts of the proposed action and the No Action Alternative, on the environment. Additionally, the EA analyzed the cumulative condition of T-1 aircraft operations at PMA in combination with the T-6 and T-37 aircraft. Based on the EA, the Air Force has prepared a proposed Finding of No Significant Impact (FONSI). Copies of the EA and FONSI are available for public review at the Perry Carnegie Library, 302 North 7th Street, Perry, Oklahoma, or may be obtained by contacting Vance AFB. EA inquiries should be directed to Mr. Bob Farrell, Chief, Community Relations, 71 FTW/PA, 246 Brown Parkway, Suite 120, Vance AFB, OK, 73705-5028, (580) 213-7136. Comments regarding the EA should be submitted in writing by April 23, 2006.

PRIVACY ADVISORY NOTICE

Your comments on this Draft EA are requested. Letters or other written comments provided may be published in the Final EA. As required by law, comments will be addressed in the Final EA and made available to the public. Any personal information provided will be kept confidential. Private addresses will be compiled to develop a mailing list for those requesting copies of the Final EA. However, only the names of the individuals making comments and their specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the Final EA.

We, The Perry Daily Journal, certify that we published said ad (document) on March 24, 2006; March 28, 2006; and March 29, 2006.

Perry Daily Journal
P. O. Box 311
714 Delaware
Perry, Oklahoma 73077

Maria Lemons
Advertising Rep.
580-336-2222

Maria Lemons

APPENDIX C
Supplemental Noise Information

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C.1 General

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Of course, aircraft are not the only sources of noise in an urban or suburban surrounding, where noise from interstate and local roadway traffic, rail, industrial, and neighborhood sources also intrude on the everyday quality of life. Nevertheless, aircraft are readily identifiable to those affected by their noise and are typically singled out for special attention and criticism. Consequently, aircraft noise problems often dominate analyses of environmental impacts.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (*e.g.*, music) or unpleasant (*e.g.*, aircraft noise) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound. It is often true that one person's music is another person's noise.

The measurement and human perception of sound involves two basic physical characteristics - intensity and frequency. Intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic is sound frequency, that is, the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.

The loudest sounds, which can be detected comfortably by the human ear, have intensities that are a trillion times larger than those of sounds that can be detected at the lower end of the spectrum. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the decibel (dB) is used to represent the intensity of a sound. Such a representation is called a sound level.

A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

$$60 \text{ dB} + 60 \text{ dB} = 63 \text{ dB, and}$$

$$80 \text{ dB} + 80 \text{ dB} = 83 \text{ dB.}$$

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such an addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that what is really happening when decibel values are added is each decibel value is first converted to its corresponding acoustic energy, then the energies are added using the normal rules of addition, and finally the total energy is converted to its decibel equivalent.

An important facet of decibel addition arises later when the concept of time-average sound levels is introduced to explain Day-Night Average A-Weighted Sound Level (DNL). Because of the logarithmic units, the louder levels that occur during the averaging period dominate the time-average sound levels. As a simple example, consider a sound level that is 100 dB and lasts for 30 seconds, followed by a sound level of 50 dB which also lasts for 30 seconds. The time-average sound level over the total 60-second period is 97 dB, not 75 dB.

Sound frequency is measured in terms of cycles per second (cps), or hertz (Hz), which is the preferred scientific unit for cps. The normal human ear can detect sounds that range in frequency from about 20 Hz to about 15,000 Hz. All sounds in this wide range of frequencies, however, are not heard equally well by the human ear, which is most sensitive to frequencies in the 1000 to 4000 Hz range. In measuring community noise, this frequency dependence is taken into account by adjusting the sound levels of the very high and low frequencies to approximate the human ear's lower sensitivity to those frequencies. This is called "A-weighting" and is commonly used in measurements of community environmental noise.

Sound levels measured using A-weighting are most properly called A-weighted sound levels while sound levels measured without any frequency weighting are most properly called sound levels. However, since most environmental impact analysis documents deal only with A-weighted sound levels, the adjective "A-weighted" is often omitted, and A-weighted sound levels are referred to simply as sound levels. In some instances it will be indicated that the sound levels have been A-weighted by using the abbreviation dBA or dB(A), rather than the abbreviation dB, for decibel. As long as the use of A-weighting is understood to be used, there is no difference implied by the terms "sound level" and "A-weighted sound level" or by the units dB, dBA, and dB(A).

In this document and most Air Installation Compatible Use Zone documents, all sound levels are A-weighted sound levels and the adjective "A-weighted" has been omitted and dB is used for the decibel units.

Sound levels do not represent instantaneous measurements but rather averages over short periods of time. Two measurement time periods are most commonly used - one

second and one-eighth of a second. Most environmental noise studies use slow response measurements, and the adjective "slow response" is usually omitted. It is easy to understand why the proper descriptor "slow response A-weighted sound level" is usually shortened to "sound level" in environmental impact analysis documents.

C.2 Noise Metrics

A "metric" is defined as something "of, involving, or used in measurement." In environmental noise analyses, a metric refers to the unit or quantity that quantitatively measures the effect of noise on the environment. Noise studies have typically involved a confusing proliferation of noise metrics as individual researchers have attempted to understand and represent the effects of noise. As a result, past literature describing environmental noise abatement has included many different metrics.

Various federal agencies involved in environmental noise mitigation agree on common metrics for environmental impact analysis documents, and both the Department of Defense (DoD) and the FAA specified those which should be used for federal aviation noise assessments. These metrics are as follows.

C.2.1 Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (*e.g.*, an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by ALM, $L_{max,}$ or L_{Amax}.

C.2.2 Sound Exposure Level

Individual time-varying noise events have two main characteristics - a sound level which changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE}) combines both of these characteristics into a single metric.

Sound Exposure Level is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of the constant sound that would, in one second, generate the same acoustic energy as did the actual time-varying noise event. Since aircraft overflights usually last longer than 1 second, the SEL of an overflight is usually greater than the ALM of the overflight.

Note that sound exposure level is a composite metric that represents both the intensity of a sound level of the constant sound and its duration. It does not directly represent the sound level heard at any given time, but rather provides a measure of the

net impact of the entire acoustic event. It has been well established in the scientific community that SEL measures this impact much more reliably than just the ALM.

Because the SEL and the ALM are both A-weighted sound levels expressed in decibels, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

C.2.3 Day-Night Average Sound Level

Time-average sound levels are measurements of sound levels that are averaged over a specified length of time. These levels provide a measure of the average sound energy during the measurement period.

For the evaluation of community noise effects, and particularly aircraft noise effects, the DNL (mathematically represented as L_{dn}) is used. DNL averages aircraft sound levels at a location over a complete 24-hour period, with a 10-dB adjustment added to those noise events that take place between 10:00 p.m. and 7:00 a.m. (local time). This 10-dB "penalty" represents the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

As noted earlier for SEL, DNL does not represent the sound level heard at any particular time. DNL provides a single measure of overall noise impact, but does not provide specific information on the number of noise events or the individual sound levels which occur during the day. For example, a DNL of 65 dB could result from a very few noisy events, or a large number of quieter events.

Scientific studies and social surveys which have been conducted to evaluate community annoyance to all types of environmental noise have found the DNL to be the best measure to predict annoyance. Its use is endorsed by the scientific community (See References C.1 through C-5 at the end of this section).

There is, in fact, a remarkable consistency in the results of attitudinal surveys about aircraft noise conducted in different countries to find the percentages of groups of people who express various degrees of annoyance when exposed to different levels of DNL.

Reference C.6 was published in 1978. A more recent study has reaffirmed this relationship (Reference C.7). In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors that influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise can be predicted quite reliably using DNL.

This relation between community annoyance and DNL has been confirmed, even for infrequent aircraft noise events. Reference C.8 reported the reactions of individuals in a community to daily helicopter overflights correlated quite well with the daily time-average sound levels over this range of numbers of daily noise events.

The use of DNL has been criticized as not accurately representing community annoyance and land-use compatibility with aircraft noise. Much of that criticism stems from a lack of understanding of the basis for the measurement or calculation of L_{dn}. One frequent criticism is based on the principle that people inherently react more to single noise events and not as much to "meaningless" time-average sound levels.

In fact, a time-average noise metric, such as DNL, takes into account both the noise levels of all individual events which occur during a 24-hour period and the number of times those events occur. As described briefly above, the logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average.

As a simple example of this characteristic, consider a case in which only one aircraft overflight occurs in daytime during a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.5 dB. Assume, as a second example, that ten such 30-second overflights occur in daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.4 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events. This is the basic concept of a time-average sound metric, and specifically the DNL.

C.3 Noise Effects

C.3.1 Hearing Loss

Noise-induced hearing loss is probably the best-defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. An outdoor DNL of 75 dBA is considered the threshold above which the risk of hearing loss should be evaluated. Following guidelines recommended by the Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council, the average change in the threshold of hearing for people exposed to DNL equal to or greater than 75 dBA was evaluated. Results indicated that an average of 1 dBA hearing loss could be expected for people exposed to DNL equal to or greater than 75 dBA. For the most sensitive 10 percent of the exposed population, the maximum anticipated hearing loss would be 4 dBA. These hearing loss projections must be considered conservative as the calculations are based on an average daily outdoor exposure of 16 hours (7:00 a.m. to 10:00 p.m.) over a 40-year period. Since it is unlikely that airport neighbors will remain outside their homes 16 hours per day for extended

periods of time, there is little possibility of hearing loss below a DNL of 75 dB, and this level is extremely conservative.

C.3.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have never been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institute of Health Conference on Noise and Hearing Loss, held on 22-24 January 1990 in Washington, D.C.

> "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day). At the recent (1988) International Congress on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous. Consequently, one comes to the conclusion that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place." (Reference C.9; parenthetical wording added for clarification.)

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two University of California at Los Angeles (UCLA) researchers apparently found a relationship between aircraft noise levels under the approach path to Los Angeles International Airport and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Reference C.10). Nevertheless, three other UCLA professors analyzed those same data and found no relationship between noise exposure and mortality rates (Reference C.11).

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft DNL below 75 dB.

C.3.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the U.S. Environmental Protection Agency as any negative subjective reaction on the part of an individual or group (Reference C.3). As noted in the discussion of DNL above, community annoyance is best predicted by that metric.

It is often suggested that a lower DNL, such as 60 or 55 dB, be adopted as the threshold of community noise annoyance for airport environmental analysis documents. While there is no technical reason why a lower level cannot be measured or calculated for comparison purposes, a DNL of 65 dB:

- provides a valid basis for comparing and assessing community noise effects;
- represents a noise exposure level which is normally dominated by aircraft noise and not other community or nearby highway noise sources; and
- reflects the FAA's threshold for grant-in-aid funding of airport noise mitigation projects.
- United States Department of Housing and Urban Development also establishes a DNL standard of 65 dB for eligibility for federally guaranteed home loans.

C.3.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that "whenever intrusive noise exceeds approximately 60 dB indoors, there will be interference with speech communication" (Reference C.5). A steady A-weighted background sound level of 60 dB will produce 93 percent intelligibility; that of 70 dB will produce 66 percent intelligibility; and that of 75 dB will produce 2 percent intelligibility (Figure D-1 in Reference C.3).

C.3.5 Sleep Interference

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat louder noise level than does a change in sleep stage.

A recent analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Reference C.14). The analysis concluded that a lack of reliable studies in homes, combined with large differences among the results from the various laboratory studies and the limited in-home studies, did not permit

development of an acceptable accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced in the home. None of the laboratory studies was of sufficiently long duration to determine any effects of habituation, such as those which would occur under normal community conditions.

Nevertheless, some guidance is available in judging sleep interference. The U.S. Environmental Protection Agency (USEPA) identified an indoor DNL of 45 dB as necessary to protect against sleep interference (Reference C.3). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

The Federal Interagency Committee on Noise (Reference C.5) reviewed the sleep disturbance issue and presented an Air Force-developed sleep disturbance dose-response prediction curve, which is based on data from Reference C.14, as an interim tool for analysis of potential sleep disturbance. This interim curve shows that for an indoor SEL of 65 dB, approximately 15 percent or less of those exposed should be awakened.

C.3.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans - stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

Many scientific studies are available regarding the effects of noise on wildlife and some anecdotal reports of wildlife "flight due to noise." Few of these studies or reports include any reliable measures of the actual noise levels involved.

In the absence of definitive data on the effect of noise on animals, the Committee on Hearing, Bioacoustics, and Biomechanics proposed that protective noise criteria for animals be taken to be the same as for humans (Reference C.16).

C.3.7 Effects of Noise-Induced Vibration on Structures and Humans

The sound from an aircraft overflight travels from the exterior to the interior of the house in one of two ways: through the solid structural elements and directly through the air. The sound transmission starts with noise impinging on the wall exterior. Some of this sound energy will be reflected away and some will make the wall vibrate. The vibrating wall radiates sound into the airspace, which in turn sets the interior finish surface vibrating, with some of the energy lost in the airspace. This surface then radiates

sound into the dwelling interior. Vibrational energy also bypasses the air cavity by traveling through the studs and edge connections.

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressure impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of structural damage. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than 1 second above a sound level of 130 dB are potentially damaging to structural components (Reference C.17).

In terms of average acceleration of wall or ceiling vibration, the thresholds for structural damage (C.18) are:

- 0.5 meters/sec/sec—threshold of risk of damage to sensitive structures (e.g., ancient monuments); and
- meters/sec/sec—threshold of risk of damage to normal dwellings (e.g., houses with plaster ceilings and walls).

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects within the dwelling - hanging pictures, dishes, plaques, and bric-a-brac. Loose window panes may also vibrate noticeably when exposed to high levels of aircraft noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally compatible with residential land use. Thus, assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

In the assessment of vibrations on humans, the following factors determine if a person will perceive and possibly react to building vibrations:

- Type of excitation: steady state, intermittent, or impulsive vibration;
- Frequency of the excitation. ISO 2631-2 (Reference C.18) recommends a frequency range of 1 to 80 Hz for the assessment of vibration on humans;
- Orientation of the body with respect to the vibration;
- The use of the occupied space; and
- Time of day.

C.3.8 Noise Effects on Terrain

It has been suggested that noise levels associated with low-flying aircraft may affect the terrain under the flight path by disturbing fragile soil or snow structures, especially in mountainous areas, causing landslides or avalanches. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

C.3.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Reference C.19). There was a special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning.

As noted above for the noise effects of noise-induced vibrations of normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

C.4 Noise Level Reduction Guidelines

A study that provides in-depth, state-of-the-art noise level reduction guidelines was prepared for the Naval Facilities Engineering Command (NAVFAC) in April 2005. The title of the document is *Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations* (C.20). A copy of this document can be obtained from NAVFAC Southern Division, Charleston, SC.

C.5 References

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C.3. "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare With an Adequate Margin of Safety," U.S. Environmental Protection Agency Report 550/9-74-004, March 1972.

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