DRAFT

JUNE 2025

Environmental Assessment
Vance Air Force Base Low Military Operations Area
Special Use Airspace

Prepared for:
The Department of the Air Force

Privacy Advisory

This Draft Environmental Assessment (EA) has been provided for public comment in accordance with the National Environmental Policy Act, which provides an opportunity for public input on United States Department of the Air Force (DAF) decision-making, allows the public to offer input on alternative ways for DAF to accomplish what it is proposing, and solicits comments on DAF's analysis of environmental effects.

Public input allows DAF to make better-informed decisions. Letters or other written or verbal comments provided may be published in this EA. Providing personal information is voluntary. Private addresses will be compiled to develop a stakeholders inventory. However, only the names of the individuals making comments and specific comments will be disclosed. Personal information, home addresses, telephone numbers, and e-mail addresses will not be published in this EA.

Section 508 of the Rehabilitation Act of 1973

The digital version of this EA complies with Section 508 of the Rehabilitation Act of 1973 because assistive technology (e.g., "screen readers") can be used to help the disabled to understand these electronic media. Accessibility may be limited to a descriptive title for each item because of the nature of graphics, figures, tables, and images in the document.

COVER SHEET

ENVIRONMENTAL ASSESSMENT FOR VANCE AIR FORCE BASE LOW MILITARY OPERATIONS AREA SPECIAL USE AIRSPACE

a. **Responsible Agency:** Department of the Air Force (DAF)

b. **Cooperating Agency:** Federal Aviation Administration (FAA)

c. **Proposals and Actions:** The environmental assessment (EA) analyzes the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 71st Flying Training Wing (71 FTW) at Vance Air Force Base (AFB), Oklahoma to support Fighter Bomber Fundamentals (FBF) pilot training syllabus requirements. The proposed airspace would be managed and scheduled by the 71 FTW.

d. **For Additional Information:** 71 FTW Public Affairs at 71ftw.pa@us.af.mil or 580-213-5250

e. **Designation:** Draft EA

f. **Abstract:** This EA has been prepared pursuant to provisions of the National Environmental Policy Act (NEPA), as amended by Public Law 30 118-5, Fiscal Responsibility Act of 2023 (42 United States Code [U.S.C.] 4321 et seq. and FAA Order 1050.1, Environmental Impacts: Policies and Procedures (the current versions of FAA Orders are referenced in the EA as applicable).

The purpose of the DAF Proposed Action is to obtain new airspace that affords the 71 FTW autonomous scheduling and ensures nearby access to airspace necessary to perform low-altitude non-hazardous flight training from 500 feet above ground level (AGL) up to 7,999 feet mean sea level (MSL), and allows for continuous flight training to 24,000 MSL or scheduled independently (500 feet AGL to 7,999 feet MSL), as needed, to support new multidirectional tactical flying training requirements. The Proposed Action is needed because pilots do not have regular, prioritized (scheduling / management of airspace) access to multidirectional, low altitude training down to 500 feet AGL (low altitude/ configuration), with ceilings of 7,999 feet AGL (size), within minimal transit time from Vance AFB. The minimal transit time (approximately 10 minutes) accommodates aircraft fuel requirements and necessary training time in the airspace. The FAA's purpose and need for the Proposed Action is to provide the special use airspace to support DAF undergraduate pilot training requirements while minimizing impacts on the National Airspace System.

The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL. Up to 1,458 aircraft operations would occur in the proposed airspace annually. Most aircraft operations in the proposed airspace (1,170) would be performed by 71 FTW pilots flying the T-38C *Talon*. Up to 288 annual operations would also be performed by Oklahoma Air National Guard pilots flying F-16C aircraft, as 71 FTW scheduling and training requirements allow. Operations in the proposed airspace would be performed between 8:00 a.m. and 9:00 p.m. Monday through Friday and 2:00 p.m. and 6:00 p.m. on Sundays, local time. Operations required outside of those hours would be coordinated between the DAF and FAA. No operations would be performed during nighttime hours or on federal holidays.

The Proposed Action would not involve changes to the lateral boundaries of the existing Vance Airspace Complex. No demolition, construction, or other ground-disturbing activities would occur. None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). No supersonic aircraft operations would occur in the proposed airspace. The Proposed Action would not require changes to the number of personnel or to the number or types of aircraft assigned to Vance AFB, or changes to the existing boundaries of that or any other DoD or DAF installation.

The EA analyzes one alternative for implementing the Proposed Action (Alternative 1). Based on the analysis of the affected environment and potential environmental consequences presented in the Draft EA, Alternative 1 would have no significant adverse impacts on environmental resources in the region of influence.

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
42KS	Farney Field Airport
4KS	Walz Airport
71 FTW	71st Flying Training Wing
ACAM	Air Conformity Applicability Model
ACHP	Advisory Council on Historic Preservation
AETC	Air Education and Training Command
AFB	Air Force Base
AGL	above ground level
ANG	Air National Guard
APE	Area of Potential Effects
AQCR	Air Quality Control Regions
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
AVK	Alva Regional
BASH	bird aircraft strike hazard
BGEPA	Bald and Golden Eagle Protection Act
CAA	Clean Air Act
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent
DAF	Department of the Air Force
DAFMAN	Department of the Air Force Manual
dBA	A-weighted decibel
DEN	Denver International Airport
DFW	Dallas Fort Worth International Airport
DNL	Day-Night Average Sound Level
E.O.	Executive order
EA	Environmental Assessment
EIS	Environmental Impact Statement
END	Vance AFB (airport)
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FBF	Fighter Bomber Fundamentals
FICAN	Federal Interagency Committee on Aviation Noise
FL	flight level

FLIP	Flight Publication
FONSI	Finding of No Significant Impact
GCK	Garden City Regional
GHG	greenhouse gases
GWP	Global Warming Potential
ICT	Wichita Dwight D. Eisenhower National Airport
IFR	Instrument Flight Rules
K51	Medicine Lodge Airport
K77	Freedom Municipal Airport
KDWP	Kansas Department of Wildlife and Parks
L_{dn}	Day-Night Average Sound Level
L_{dnmr}	Onset-Rate Adjusted Monthly Day-Night Average Sound Level
L_{eq}	equivalent sound level
L_{max}	Maximum Sound Level
MBTA	Migratory Bird Treaty Act
MOA	Military Operations Area
MSL	mean sea level
mton/yr	metric tons per year
MTR	Military Training Route
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NM	nautical mile
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxides
NRHP	National Register of Historic Places
ODWC	Oklahoma Department of Wildlife Conservation
OKC	Will Rogers International
Pb	lead
PDARS	Performance Data Analysis and Reporting System
PM_{10}	particulates equal to or less than 10 microns in diameter
$PM_{2.5}$	particulates equal to or less than 2.5 microns in diameter
PSD	Prevention of Significant Deterioration
R	Restricted Area
ROI	region of influence
RVS	Tulsa Riverside Airport
SAA	special activity airspace
SEL	Sound Exposure Level

SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SO_x	sulfur oxides
SUA	special use airspace
SUPT	Specialized Undergraduate Pilot Training
SWIM	System Wide Information Management
tpy	tons per year
TRACON	Terminal Radar Approach Control
TUL	Tulsa International Airport
U.S.C.	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VFR	Visual Flight Rules
VR	Visual Route
WDG	Enid Woodring Regional

1 Purpose and Need

1.1 Introduction

The Department of the Air Force (DAF) has prepared this Environmental Assessment (EA) to evaluate the potential environmental consequences from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 71st Flying Training Wing (71 FTW) at Vance Air Force Base (AFB), Oklahoma to support Fighter Bomber Fundamentals (FBF) pilot training syllabus requirements. The proposed airspace would also be available for use by the Oklahoma Air National Guard (ANG) as scheduling and operational requirements allow. The proposed airspace would be managed and scheduled by the 71 FTW.

The Federal Aviation Administration (FAA) is the primary federal agency responsible for establishing and managing navigable airspace above the United States. Therefore, the FAA is participating as a cooperating agency during the preparation of this EA in accordance with the Memorandum of Understanding between the DoD and the FAA for environmental review of special use airspace (SUA) actions under FAA Order JO 7400.2[1], Procedures for Handling Airspace Matters (FAA, 2025a).

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA), as amended by Public Law 30 118-5, Fiscal Responsibility Act of 2023 (42 United States Code [U.S.C.] 4321 et seq.). The requirements of other federal, state, and local regulations are also addressed in this EA, as applicable.

1.2 Background

1.2.1 Airspace Overview

Four types of airspace are defined by the FAA: controlled, uncontrolled, special use, and other (FAA, 2023a). These types of airspace are defined based on the complexity or density of aircraft movements, nature of the operations conducted within the airspace, the level of safety required, and national and public interest. Airspace is defined with fixed horizontal and vertical boundaries to delineate where aircraft are allowed to operate.

SUA is airspace in which certain activities must be confined, or where limitations may be imposed on the operations of other aircraft that are not involved in those activities. Military Operations Areas (MOAs) are a type of SUA where nonhazardous military flight activities are conducted. Such activities include, but are not limited to, air combat maneuvers, air intercepts, and low-altitude tactics (DAF, 2022). MOAs are SUA established outside of Class A airspace (airspace typically below 18,000 feet mean sea level [MSL]) to separate or segregate certain non-hazardous military flight activities from aircraft operating under Instrument Flight Rules (IFR) and to identify where these activities are conducted for aircraft operating under Visual Flight Rules (VFR).

[1] The current versions of FAA Orders are referenced throughout this EA, as applicable.

Air Traffic Control Assigned Airspace (ATCAA) is airspace of defined vertical and lateral limits, assigned by Air Traffic Control (ATC) operators, for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic. Typically, ATCAA are blocks of airspace which start at flight level (FL)[2]180 or 18,000 feet above MSL and, in some cases, are contoured to the dimensions of the MOAs beneath them.

1.2.2 Vance AFB and 71 FTW

Vance AFB was originally established by the U.S. Army Air Force as the Air Corps Basic Flying School in 1941. The installation covers approximately 2,134 acres in Garfield County, Oklahoma immediately south of the city of Enid and approximately 90 miles north-northwest of Oklahoma City[3] **(Figure 1.2-1)**. Vance AFB currently serves as the headquarters for the 71 FTW and supports several other Guard and Reserve tenants (Vance AFB, 2022).

The 71 FTW/71st Operations Group flies the T-38C *Talon* (T-38C) from Vance AFB. The T-38C is a high-speed, highly maneuverable fighter-like jet trainer with avionics designed to simulate the tactical weapons delivery systems of actual fighter aircraft virtually without dropping live ordnance. The 71 FTW supports Specialized Undergraduate Pilot Training (SUPT) that focuses on training newly winged pilots in high performance aircraft operations. The 71 FTW has been tasked by Air Education and Training Command to implement the FBF program, which incorporates aspects of Introduction to Fighter Fundamentals training into SUPT to prepare students to perform combat-oriented fighter and bomber maneuvers earlier in the pilot production process. Additionally, the 71 FTW trains and qualifies new instructor pilots in the T-38C, then maintains annual Continuation Training sortie requirements for all current instructor pilots.

The FBF program is expected to start in 2026. The Proposed Action is necessary for the success of the future FBF program and has a direct impact on the quality and quantity of future pilot training. The mission of the 71 FTW is a top priority for the Chief of Staff of the Air Force in streamlining both pilot production programs and the manning needed to support increased production. The 71 FTW will extend beyond its current mission of training basic high-performance aircraft flight to also include training Airmen in the basics they will use in subsequent fighter training and future combat.

[2] Fight level (FL) is an aircraft's altitude at standard air pressure, expressed in increments of 100 feet (e.g., FL180 = 18,000 feet). The air pressure is computed using an international standard atmosphere pressure at sea level and therefore, is not necessarily the same as the aircraft's actual altitude, either above sea level or above ground level.

[3] Vance AFB also owns, operates, and maintains Kegelman Auxiliary Field, located 45 miles northwest of Vance AFB and 10 miles east of Cherokee, Oklahoma, on the Osage Plains. This property is not involved in the Proposed Action evaluated in this EA and is not addressed further.

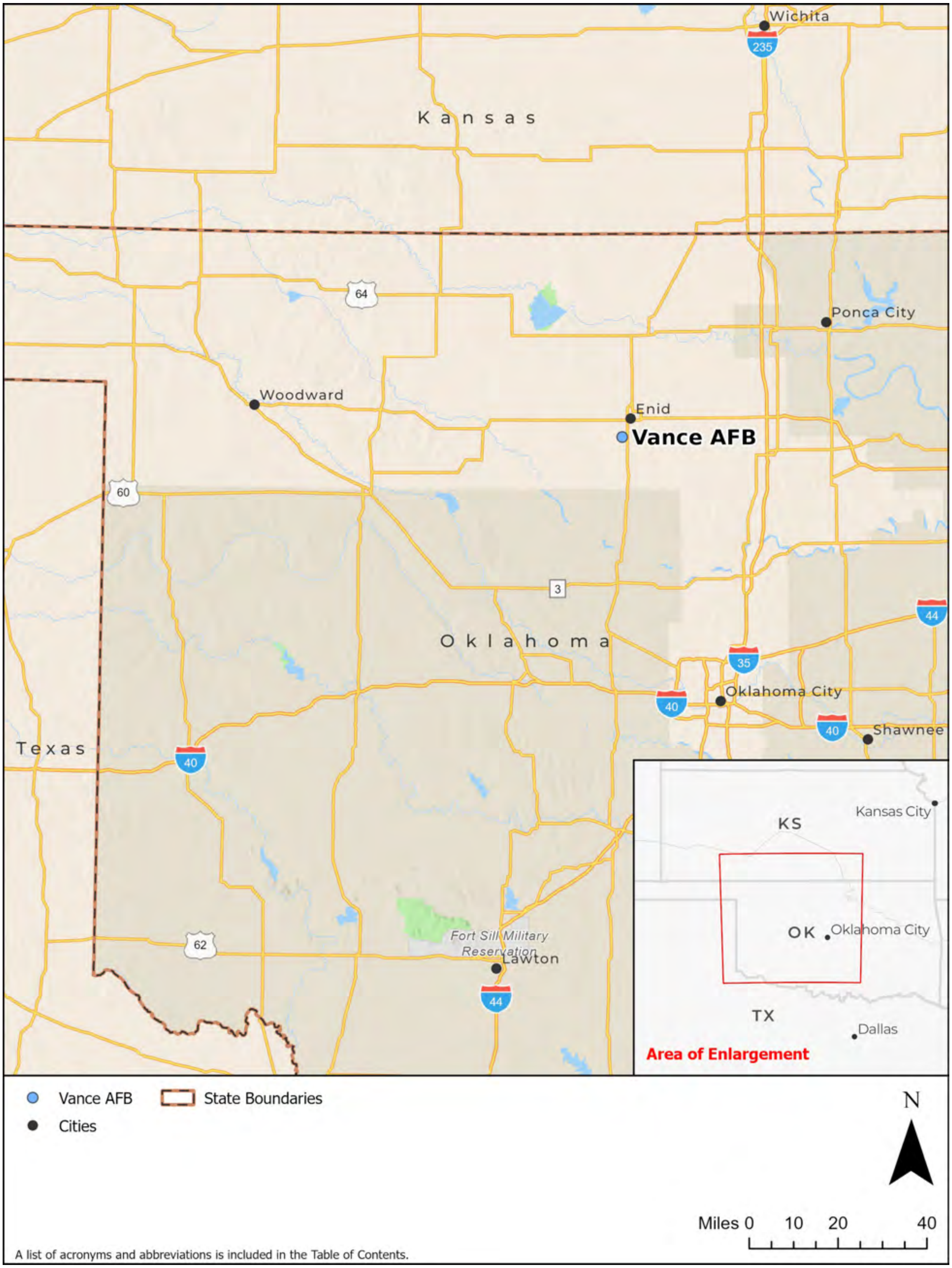


Figure 1.2-1 Regional Location of Vance AFB

The requirement to obtain new low-altitude airspace within proximity to the Vance AFB-delegated Airspace Complex (hereafter referred to as the "Vance Airspace Complex"; see additional discussion in **Section 1.2.3**) would meet all necessary training requirements to support the FBF training syllabus. The Proposed Action evaluated in this EA is not associated with any basing action or requirement to support the DAF's newest flying trainer, the Boeing/Saab T-7A *Red Hawk* (T-7A). Potential effects from the proposed recapitalization (basing and operation) of the T-7A at Vance AFB are currently being evaluated in an Environmental Impact Statement (EIS) that is being prepared separately from this EA (DAF, 2024a)[4]. The 71 FTW would continue to fly the T-38C in the FBF program pending the conclusion of the EIS and the Record of Decision.

Multidirectional tactical flight training requirements at altitudes at or above 500 feet above ground level (AGL) are a key component of the FBF program. Currently, aircraft operations in MOAs scheduled and managed by Vance AFB are not permitted below 7,000 feet MSL **(Section 1.2.3)**. Existing low-altitude MOAs in the vicinity of Vance AFB consist of the Smoky MOA 135 nautical miles (NM) to the north-northwest and Restricted Area (R) 5601, 100 NM to the south. The Smoky MOA is scheduled and managed by the Kansas ANG and R-5601 by the U.S. Army.

Neither the Smoky MOA nor R-5601 are suitable to meet low-altitude training requirements of Vance AFB pilots. Their distance from Vance AFB requires additional commute time and expenditures of fuel that limit training time within the airspace. Additionally, neither airspace is scheduled or managed by Vance AFB, which results in a lack of scheduling priority for Vance AFB pilots.

Vance AFB's 71 FTW serves as the designated scheduling agency for the Vance Airspace Complex **(Section 1.2.3)**. As the scheduling authority the 71 FTW controls scheduling access to the SUA creating essential flexibility to support pilot training needs on a nearly uninterrupted basis. In addition, the FAA has delegated ATC authority to the DAF for the airspace which resides within and under the Vance Airspace Complex. Vance AFB ATC personnel, assigned to the 71 FTW, provide National Airspace System (NAS) ATC services to commercial, general aviation, and military users operating within the confines of the Vance Airspace Complex. The combination of FAA-delegated ATC authority coupled with autonomous SUA scheduling affords 71 FTW ATC personnel real-time situational awareness to all airspace activities enabling the application of highly efficient ATC services in support of all NAS users operating within the Vance Airspace Complex.

The 71 FTW trains Airmen in the basics they will use in subsequent training and potential future combat. The efficient use of available airspace, including location and proximity to Vance AFB and autonomous ATC and scheduling authority by the 71 FTW, has a direct impact on the quality and quantity of training that the 71 FTW provides to future pilots and weapon systems officers.

[4] Proposed T-7A operations at Vance AFB are considered in this EA as part of reasonably foreseeable future actions, as applicable; however, the Proposed Action evaluated in this EA is independent of the proposed T-7A recapitalization evaluated in the Vance AFB T-7A Draft EIS.

1.2.3 Vance Airspace Complex

Vance AFB schedules and manages the existing Vance Airspace Complex. This complex contains approximately 11,121 square miles of airspace and is subdivided into four individual MOAs: Vance 1A, 1B, 1C, and 1D **(Figure 1.2-2)**. Operational altitudes within the MOAs generally vary from 7,000 to 17,999 feet MSL **(Table 1.2-1)**; operations below 7,000 feet MSL are currently not permitted in the Vance Airspace Complex. Each of the Vance MOAs are overlain by ATCAA, which extends from FL180 to FL240. Activation of the Vance MOAs and the overlying ATCAA supports seamless aircraft operations from 7,000 or 8,000 feet MSL to FL240.

Table 1.2-1 Vance MOA Altitudes

MOA	Floor (feet MSL)	Ceiling (feet MSL)
Vance 1A	8,000	17,999
Vance 1B	7,000	17,999
Vance 1C	8,000	17,999
Vance 1D	8,000	17,999

Aircraft currently operating in the Vance Airspace Complex consist of the T-1A *Jayhawk* (T-1A), a medium-range, twin-engine jet trainer used in the advanced phase of SUPT for students selected to fly airlift or tanker aircraft; the T-38C **(Section 1.2.2)**; and the T-6A *Texan* II (T-6A), a single-engine, two-seat turboprop-powered airplane used to train military pilots in basic flying skills (DAF, 2024b; DAF, 2024c). In the 12-month period between August 2023 and July 2024, pilots from Vance AFB performed more than 42,000 operations in the Vance Airspace Complex **(Table 1.2-2)**. Most annual aircraft operations are performed by the T-6A in the Vance 1B MOA. T-38C operations are performed primarily in the Vance 1A, 1C, and 1D MOAs and represent approximately 25 percent of operations within the complex. Most operations within the Vance Airspace Complex occur between 7:00 a.m. and 10:00 p.m. local time (DAF, 2024d).

Table 1.2-2 Annual Aircraft Operations in the Existing Vance Airspace Complex

MOA	Time of Day [1]	Number of Operations [2, 3] by Aircraft Type			
		T-1A	T-38C	T-6A	Total Operations
1A	7:00 a.m. – 10:00 p.m.	619	3,201	0	3,820
	10:00 p.m. – 7:00 a.m.	1	13	0	14
1B	7:00 a.m. – 10:00 p.m.	0	0	28,383	28,383
	10:00 p.m. – 7:00 a.m.	0	0	104	104
1C	7:00 a.m. – 10:00 p.m.	2,509	7,441	0	9,950
	10:00 p.m. – 7:00 a.m.	8	4	0	12
1D	7:00 a.m. – 10:00 p.m.	30	49	0	79
	10:00 p.m. – 7:00 a.m.	2	6	0	8
Total Operations		**3,169**	**10,714**	**28,487**	**42,370**

Notes:
[1] All times are local.
[2] An operation is defined as a single aircraft taking off from Vance AFB, completing its training objective within the MOA, and landing at Vance AFB.
[3] The number of operations listed here also include operations performed in the ATCAA overlying each of the Vance MOAs.
Source: DAF, 2024d

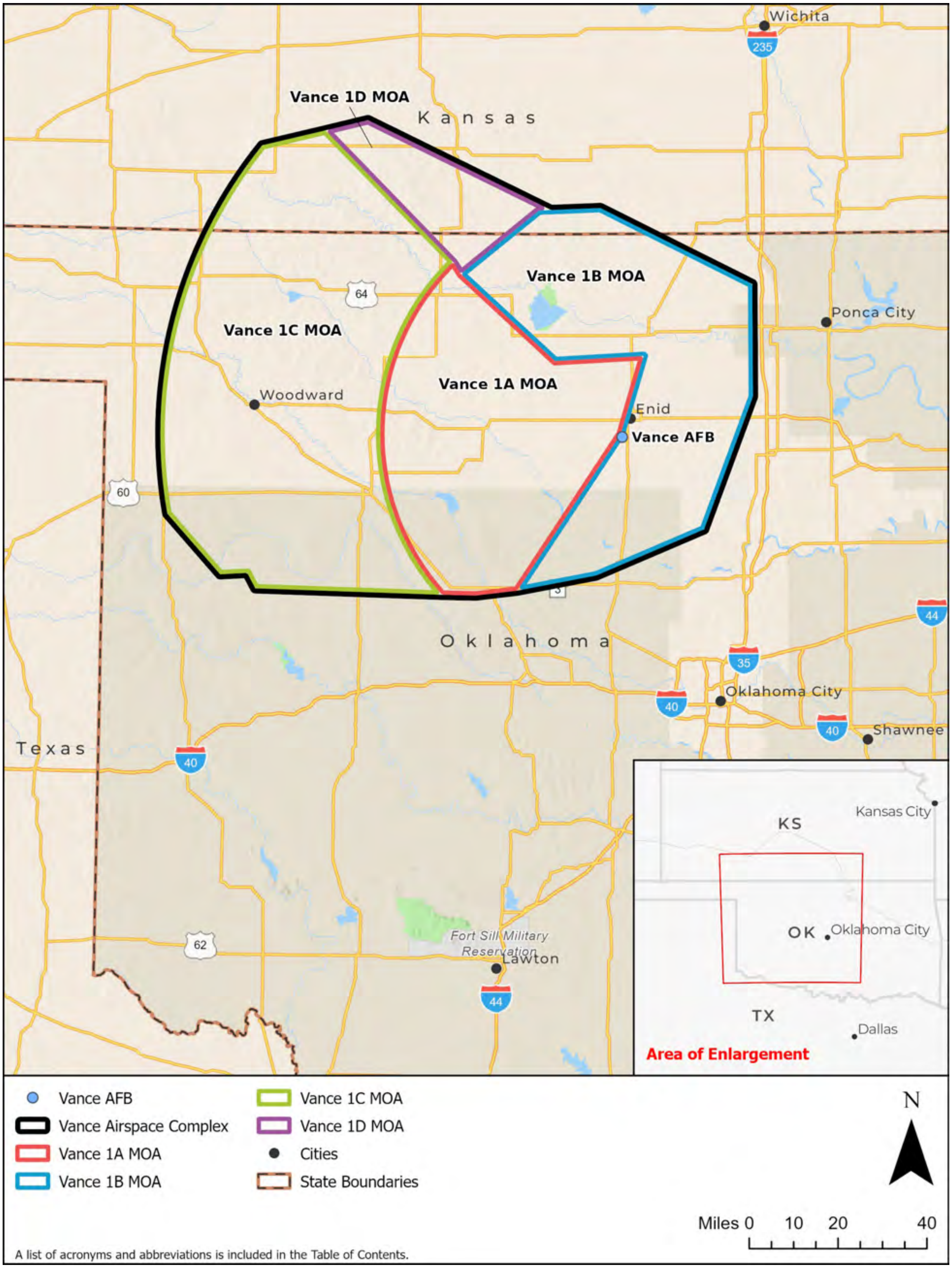


Figure 1.2-2 Vance Airspace Complex

1.3 Purpose of and Need for the Proposed Action

The purpose of the DAF Proposed Action is to obtain new airspace that affords the 71 FTW autonomous scheduling and ensures nearby access to airspace necessary to perform low-altitude non-hazardous flight training from 500 feet AGL up to 7,999 feet MSL, and allows for continuous flight training to 24,000 MSL or scheduled independently (500 feet AGL to 7,999 feet MSL), as needed, to support new multidirectional tactical flying training requirements.

The Proposed Action is needed because pilots do not have regular, prioritized (scheduling / management of airspace) access to multidirectional, low altitude training down to 500 feet AGL (low altitude/ configuration), with ceilings of 7,999 feet AGL (size), within minimal transit time from Vance AFB. The minimal transit time (approximately 10 minutes) accommodates aircraft fuel requirements and necessary training time in the airspace.

The FAA's purpose and need for the Proposed Action is to provide the SUA to support DAF undergraduate pilot training requirements while minimizing the impacts on the NAS.

1.4 Decision to Be Made

This EA evaluates potential environmental consequences associated with obtaining a new permanent low-altitude MOA to support FBF training at Vance AFB. Based on the analysis in this EA, the DAF will make one of three decisions regarding the Proposed Action:

1. Determine the potential environmental consequences associated with the Proposed Action or alternatives are not significant and issue a signed Finding of No Significant Impact (FONSI);
2. Initiate preparation of an EIS if it is determined that significant impacts would occur through implementation of the Proposed Action or alternatives; or
3. Select the No Action Alternative, whereby the Proposed Action would not be implemented at this time.

As required by NEPA, preparation of an environmental document must precede final decisions regarding the proposed project and be available to inform decision-makers of the potential environmental impacts.

1.5 Interagency and Intergovernmental Coordination and Consultation

Scoping is an early and open process for developing the range of issues to be addressed in an EA and for identifying significant concerns related to an action. Per the requirements of NEPA, the Intergovernmental Cooperation Act of 1968 (42 U.S.C. § 4231[a]) and Executive Order (E.O.) 12372, Intergovernmental Review of Federal Programs (as amended by E.O. 12416), federal, state, and local agencies with jurisdiction over resources that could potentially be affected by the Proposed Action or alternatives were notified during the development of this EA.

The Intergovernmental Coordination Act and E.O. 12372 require federal agencies to cooperate with and consider state and local views in implementing a federal proposal. Through the coordination process, potentially interested and affected government agencies, government representatives, elected officials, and interested parties that could be affected by the Proposed

Action and alternatives were notified during the development of this EA. The stakeholder list and agency and intergovernmental coordination letters and responses are included in **Appendix A**.

1.5.1 Cooperating Agencies

A cooperating agency is defined by NEPA as any federal agency other than a lead agency having jurisdiction by law or special expertise with respect to any environmental issue involved in a proposed action. In accordance with the FAA's jurisdiction by law and the Memorandum of Understanding between the DoD and the FAA for environmental review of SUA actions under FAA Order JO 7400.2, Procedures for Handling Airspace Matters (FAA, 2025a), the DAF invited the FAA to participate as a cooperating agency during the preparation of this EA. The FAA accepted the DAF's invitation via letter dated November 27, 2024. The FAA's involvement and responsibilities as a cooperating agency during the preparation of this EA are further described in **Section 1.5.2.**

1.5.2 FAA Guidelines

The FAA is responsible for managing navigable airspace in the United States for public safety and ensuring its efficient use for commercial air traffic, general aviation, and national defense, including SUA utilized by the DoD. The FAA processes requests for the establishment or modification of airspace in accordance with procedures defined in FAA Order JO 7400.2. The process for establishing (or modifying) airspace is two-fold, consisting of both aeronautical and environmental analyses. The DAF will submit a formal airspace proposal to the FAA defining the proposed airspace. The FAA ensures the proposed airspace is compliant with airspace regulations and circulates the airspace proposal for public review.

In addition to the aeronautical analysis, the FAA is participating in this EA as a cooperating agency. The FAA may or may not adopt this EA, in whole or in part, to comply with its NEPA procedures defined in FAA Order 1050.1, Environmental Impacts: Policies and Procedures and Chapter 32 of FAA Order JO 7400.2, prior to making a decision to chart any proposed airspace addressed in this EA. As part of this process, the FAA will publicly circularize the airspace proposal for a 45-day public review period. The FAA's public review process will be conducted separately from the NEPA public involvement process that the DAF is conducting for this EA. Comments received during the FAA circularization process will be considered in the Final EA and FONSI, as applicable.

If approved, the proposed airspace would be published in the current issue of FAA Order JO 7400.10, Special Use Airspace and illustrated on sectional aeronautical charts, at which time it would be available for use as defined in this EA. The airspace associated with the Proposed Action would lie within the jurisdiction of the FAA Kansas City Air Route Traffic Control Center (ARTCC).

1.5.3 Agency Consultations

Compliance with NEPA requires coordination and consultation with federal, state, and local agencies and Native American tribes to address regulatory requirements established under the National Historic Preservation Act (NHPA) (36 CFR Part 800), DoD Instruction 4710.02, DoD

Interactions with Federally Recognized Tribes, DAF Instruction 90-2002, Interactions with Federally Recognized Tribes, Section 7 of the Endangered Species Act (ESA) (16 U.S.C. § 1531 et seq.), and other laws and regulations. These requirements are summarized below. Other regulatory requirements are addressed throughout this EA, as applicable.

1.5.4 Government-to-Government Consultation

The NHPA directs federal agencies to consult with federally recognized Native American tribes when a Proposed Action has the potential to affect tribal lands or properties of religious and cultural significance. Air Force Instruction 90-2002, Interactions with Federally Recognized Tribes (March 2025) and DAF Manual (DAFMAN) 32-7003, Environmental Conservation (June 2024) establish policy on Wing or Installation Commander involvement in government-to-government relations with federally recognized tribes and for NHPA Section 106 "good faith" consultations with federally recognized tribes. Consistent with the NHPA, DoD Instruction 4710.02, and DAF Instruction 90-2002, the DAF has initiated government-to-government consultation with Native American tribes having cultural, historical, or religious ties to the lands underlying areas where the Proposed Action would occur. The tribal consultation process is distinct from NEPA consultation and the interagency coordination process and requires separate notification to all relevant tribes. The timelines for tribal consultation are also distinct from those of other consultations.

The Vance point of contact for tribal consultation is the Base Commander. Correspondence regarding government-to-government consultation conducted for the Proposed Action is included in **Appendix A**.

1.5.5 Cultural Resources Guidance

Section 106 of the NHPA requires federal agencies to consider the effects of their proposed actions (or "undertakings") on historic properties and to integrate historic preservation values into their decision-making process. Federal agencies must seek to avoid, minimize, or mitigate potential adverse effects on historic properties under Section 106 (36 CFR § 800.1[a]). Section 106 also requires agencies to consult with federally recognized Native American tribes with a vested interest in the undertaking. Other federal laws protecting cultural resources include the Archaeological and Historic Preservation Act of 1960 as amended, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990.

The Section 106 consultation process is integrated into the NEPA process for the Proposed Action evaluated in this EA. The DAF is consulting with Oklahoma and Kansas State Historic Preservation Officers (SHPOs) regarding potential effects on historic properties from the Proposed Action. The Vance Cultural Resources Manager is the point of contact for consultation with the SHPO and Advisory Council on Historic Preservation (ACHP), as applicable.

1.5.6 Endangered Species Act

The ESA establishes protections for species listed as threatened and endangered and the ecosystems upon which those species depend. Endangered species are those in danger of extinction throughout all, or a large portion, of their range (16 U.S.C. § 1536). Threatened species are those likely to be listed as endangered in the foreseeable future. Section 7 of the ESA prohibits federal agencies from engaging in any action that is likely to jeopardize the continued existence of listed endangered or threatened species or that destroys or adversely affects the critical habitat of such species. Section 9 of the ESA prohibits the take of federally listed species. “Take” as defined by the ESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

The DAF is consulting with the U.S. Fish and Wildlife Service (USFWS) in accordance with Section 7 of the ESA to determine potential effects on federally listed species and federally designated critical habitat that could result from the Proposed Action.

1.6 Applicable Laws and Environmental Regulations

1.6.1 National Environmental Policy Act

NEPA requires federal agencies to consider the potential environmental consequences of their proposed actions. The law’s intent is to protect, restore, or enhance the environment through well-informed federal decisions. An EA is prepared to:

- briefly provide sufficient analysis and evidence for determining whether to prepare an EIS or a FONSI;
- aid in an agency’s compliance with NEPA when no EIS is necessary; and
- facilitate preparation of an EIS when one is necessary.

Although the Secretary of the Air Force or their designated representative will decide whether to implement the Proposed Action, the FAA has final authority for approving or denying any proposal to modify, expand, or establish SUA.

1.7 Public and Agency Review of the Environmental Assessment

A Notice of Availability for the Draft EA and proposed FONSI was published in the Enid Daily News and Eagle, Alva Review Courier, and Kiowa Tri-County Tribune. Publication of the Notice of Availability initiated the 30-day public review period and invited the public to review and comment on the Draft EA and proposed FONSI.

Printed copies of the Draft EA and proposed FONSI were available for review at the following public libraries:

- Enid Public Library, 120 West Maine, Enid, Oklahoma 73701
- Alva Public Library, 504 7th Street, Alva, Oklahoma 73717

The Draft EA and proposed FONSI could also be accessed online on Vance AFB’s website at: www.vance.af.mil. Comments received during the 30-day public review period will be considered in the Final EA and FONSI, as applicable.

The list of stakeholders who were notified and consulted with regarding the Proposed Action is provided in **Appendix A**.

1.8 Scope of the Environmental Analysis

This EA analyzes the potential environmental consequences from the DAF's Proposed Action to obtain low-altitude airspace to support FBF training requirements at Vance AFB. The EA focuses on resources that would be measurably or meaningfully affected by the Proposed Action and Alternatives. Detailed discussions of these resources and the potential impacts are provided in **Chapter 3**. Cumulative impacts are also described for each resource, as applicable. Resources that were dismissed from detailed analysis in this EA because the Proposed Action would have no potential to affect them are briefly described in **Section 3.2**.

This page intentionally left blank.

2 Description of the Proposed Action and Alternatives

2.1 Proposed Action

Under the Proposed Action, the DAF would obtain new low-altitude airspace to support low-altitude pilot training requirements of the FBF syllabus. The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL

Up to 1,458 aircraft operations would occur in the proposed airspace annually. Most aircraft operations (1,170) would be performed by pilots from the 71 FTW at Vance AFB flying T-38Cs **(Section 1.2.2)**. Up to 288 annual operations would also be performed by Oklahoma ANG pilots flying F-16C aircraft as 71 FTW scheduling and operational requirements allow. Generally, low-altitude training operations would be performed in the proposed airspace between 8:00 a.m. and 9:00 p.m. Monday through Friday and 2:00 p.m. and 6:00 p.m. on Sundays (all times local), adjusted seasonally as needed. Operations that would be required outside of those hours would be coordinated between the DAF and FAA and publicized via Notices to Airmen. No operations would be performed in the proposed airspace during nighttime hours (local sunset to sunrise, adjusted seasonally as needed) or on federal holidays.

2.2 Alternatives Development

2.2.1 Selection Standards

Selection standards were developed to establish a means for evaluating the reasonableness of an alternative and whether an alternative should be carried forward for further analysis in the EA. The following selection standards meet the purpose of and need for the Proposed Action and were used to identify reasonable alternatives for analysis in the EA:

1. **Provide airspace with sufficient volume and availability.** The alternative must be of adequate size and configuration to provide optimized pilot training that supports achievement of the necessary FBF training syllabi requirements. Specifically, the alternative must afford sufficient lateral and vertical maneuverability to a minimum floor of 500 feet AGL. The alternative must provide sufficient operational space within the existing Vance Airspace Complex that minimizes the need to perform unnecessary and inefficient maneuvers to avoid existing encroachments.
2. **Pilot production.** Provide suitable multidirectional airspace that is adequately sized to expose new pilots to training needs and prepares them for 4th-generation aircraft and beyond.
3. **Scheduling. P**rovide 71 FTW-scheduled airspace to allow for autonomous scheduling. Airspace scheduled by the 71 FTW would prioritize training time for 71 FTW pilots, avoid or minimize competition with other DoD or DAF units for airspace training time, and provide scheduling flexibility to accommodate inclement weather or other operational requirements in adjacent or nearby airspace. In airspace not scheduled by the 71 FTW, pilots from the 71 FTW

receive lower priority for training time, resulting in less time in the airspace and corresponding increases in the amounts of sorties and fuel needed to achieve required training objectives.

4. **Maximize training time and minimize transit time.** Provide a low-altitude MOA adjoining an existing MOA structure closer to Vance AFB to reduce aircraft transit time and maximize training efficiencies. Maximum transit time to and from the training airspace should be 10 minutes.
5. **Limit impacts on other NAS users.** The proposed airspace should limit or reduce the potential for conflicts with the structure and use of the existing NAS by civil aviation. Avoid or minimize potential conflicts with airports, Air Traffic Service routes, and other airspace users.

2.2.2 Alternatives Considered

The DAF considered multiple alternatives to implement the Proposed Action. Some alternatives that were initially considered, such as modifying other portions of the Vance Airspace Complex to either lower the existing airspace floor or creating a new low-altitude airspace directly underneath other Vance MOAs (such as the Vance 1A or 1B MOA, either separately or in combination), were dismissed by Vance airspace managers based on their knowledge of the airspace because they would result in irreconcilable conflicts with other existing Vance AFB aircraft operations or be constrained by underlying topography, development, or other encroachments. Alternatives initially considered and determined by the DAF to potentially meet the purpose and need are summarized in **Section 2.2.2.1** through **Section 2.2.2.6**. These alternatives were compared against the selection standards listed in **Section 2.2.1**.

Of the alternatives described below, Alternative 1 met all selection standards and is retained for detailed analysis in the EA. The remaining alternatives failed to meet one or more of the selection standards and were dismissed from detailed analysis because they would not meet the purpose and need. A summary of the alternatives screening is presented in **Table 2.2-1.** Although it does not meet the purpose and need, the No Action Alternative is carried forward for detailed analysis in the EA. The No Action Alternative is described in **Section 2.2.2.7**.

Alternatives consisting of partial or complete training using flight simulators were not considered for detailed analysis in the EA. Simulators are used to the extent practicable during pilot training, but ultimately do not provide a fully realistic training experience and cannot replace real-world, in-flight training. Low-altitude flying training provides this realism and is considered one of the DAF's highest training priorities (DAF, 2025). Therefore, alternatives involving the partial or complete use of flight simulators to meet the purpose of and need for the Proposed Action are not addressed further in this EA.

Table 2.2-1 Comparison of Alternatives

Selection Standards	Alternatives Considered					
	ALT 1 New Low MOA Under Vance 1A, 1C, and 1D MOAs	ALT 2 Lower Floor of Existing Vance 1D MOA	ALT 3 New Low MOA Under Vance 1C MOA	ALT 4 Use Other Low-Altitude MOAs	ALT 5 Use Other Existing Airspace Types	ALT 6 Forward Deployment
1. Airspace Volume and Availability	Yes	No	No	Yes	No	Yes
2. Pilot Production	Yes	Yes	Yes	Yes	No	Yes
3. Scheduling	Yes	Yes	Yes	No	Partially	No
4. Maximize Training Time and Minimize Transit Time	Yes	Yes	No	No	Yes	Yes
5. Limit Impacts on Other NAS Users	Yes	Yes	No	Yes	Yes	Yes
Meets Selection Standards	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**

Notes:
ALT = Alternative

2.2.2.1 Alternative 1 – Establish Low-Altitude MOA Under Portions of Existing Vance 1A, 1C, and 1D MOAs

Alternative 1 would implement the Proposed Action described in **Section 2.1**. Under this alternative, the DAF would request FAA to establish a new low-altitude MOA under portions of the existing Vance 1A, 1C, and 1D MOAs. Vance airspace managers determined that this configuration would best align with existing and ongoing aircraft operations in the Vance Airspace Complex and would result in no or minimal conflicts or constraints with underlying topography, development, or other potential encroachments. The new airspace would be designated as the Vance 1E Low MOA. The proposed MOA would have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL (directly beneath the floor of the existing Vance Airspace Complex). The proposed MOA would encompass approximately 1,051 square miles of airspace with the exception of avoidance areas around existing airports. The lateral boundaries of the proposed Vance 1E Low MOA relative to the existing Vance Airspace Complex is shown on **Figure 2.2-1**. A conceptual view of this alternative is shown on **Figure 2.2-2.**

The proposed MOA would be established immediately below and within the smaller footprint of the established contoured dimensions of the SUA (MOAs/ATCAA) assigned to the 71 FTW to support flying training requirements. The proposed MOA would be managed and operated separately from the existing Vance 1D MOA and could be combined with that airspace, as needed, to support seamless flight operations from 500 feet AGL to FL240. Training activities would occur in the new low MOA as described in **Section 2.1**.

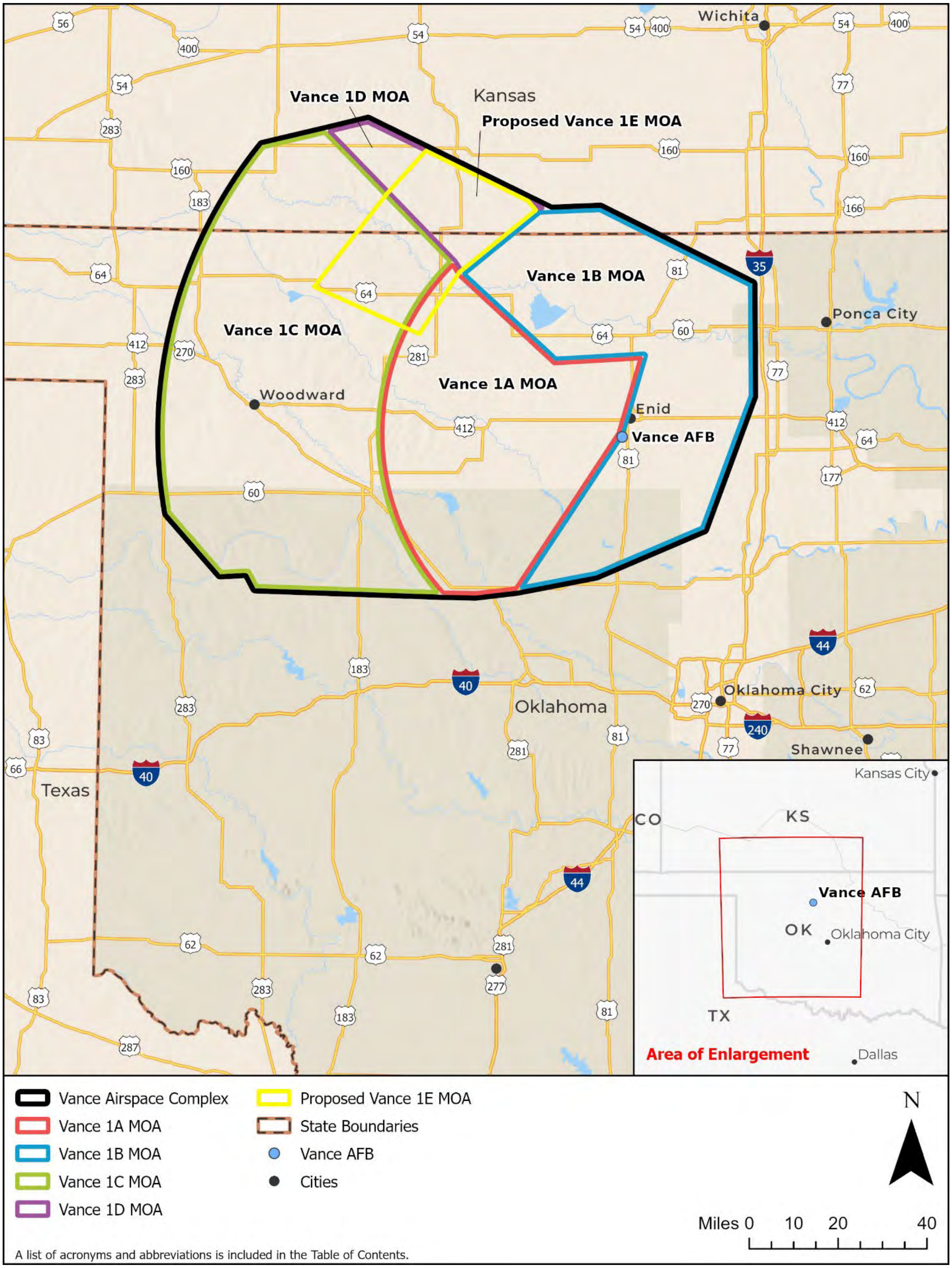


Figure 2.2-1 Lateral Boundaries of Alternative 1 – Proposed Vance 1E Low MOA

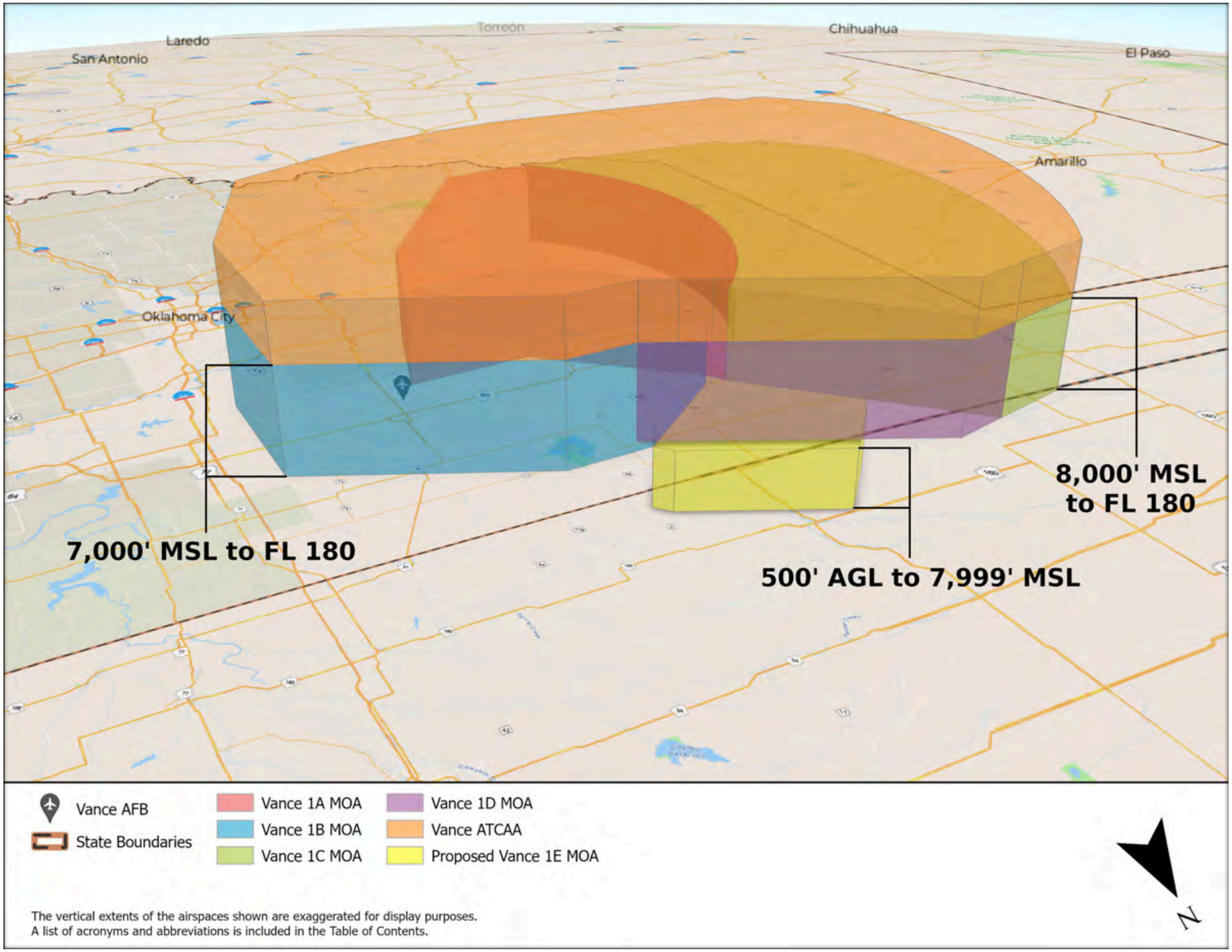


Figure 2.2-2 Conceptual View of Alternative 1 – Proposed Vance 1E Low MOA

Alternative 1 would not involve changes to the lateral boundaries of the existing Vance Airspace Complex **(Figure 1.2-2).** No demolition, construction, or other ground-disturbing activities would occur under Alternative 1. None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). No supersonic aircraft operations would occur in the proposed airspace. Alternative 1 would not require changes to the number of personnel or to the number or types of aircraft assigned to Vance AFB, or changes to the existing boundaries of that or any other DoD or DAF installation.

2.2.2.2 Alternative 2 – Lower Floor of Existing Vance 1D MOA to 500 feet AGL

Under this alternative, the DAF would request FAA to modify the existing Vance 1D MOA by lowering the floor from 8,000 feet to 500 feet AGL. The modified airspace would encompass approximately 662 square miles with the exception of avoidance areas around existing airports. This alternative would support seamless aircraft operations from 500 feet AGL to FL240 when overlying portions of the Vance Airspace Complex are not active. Existing terrain up to 2,400 feet MSL in the northwestern portion of the Vance 1D MOA would limit usable airspace for low-level aircraft operations.

Although Alternative 2 meets selection standards 2 through 5, it does not meet selection standard 1 because it would not provide sufficient airspace volume to support multidirectional tactical flight training requirements of the FBF training syllabus due to its smaller size relative to Alternative 1. Therefore, this alternative was dismissed from detailed analysis in the EA.

2.2.2.3 Alternative 3 – Establish Low-Altitude MOA Under Portions of the Existing Vance 1C MOA

Under Alternative 3, the DAF would request FAA to establish a new low-altitude MOA under portions of the existing Vance 1C MOA. This low-altitude MOA would contain approximately 1,112 square miles of airspace, with the exception of avoidance areas around existing airports, and would avoid sensitive areas including the town of Alva, Alva Regional Airport, and the Great Salt Plains Reservoir. However, this alternative would be over 70 NM away from Vance AFB, which would require larger amounts of fuel and longer transit times to access from the base. This alternative would also underlie portions of the Vance 1C MOA currently used by T-1A aircraft, which would create conflicts with T-1A training operations if the proposed airspace is activated concurrently with the overlying airspace for seamless training operations. Higher terrain underlying the western portion of the Vance 1C MOA, the presence of existing wind turbines up to 500 feet, and proximity to the city of Woodward, Oklahoma would impose constraints on aircraft operations as low as 500 feet AGL. This alternative would also intersect Visual Route (VR) 280 and VR-190, potentially disrupting aircraft operations in those VRs.

Alternative 3 meets selection standards 2 and 3. However, it fails to meet selection standards 1, 4, and 5 because it would lack sufficient airspace volume and availability, would not offer optimal training and transit time, and would not limit impacts on NAS users. Therefore, this alternative was dismissed from further consideration in the EA.

2.2.2.4 Alternative 4 – Use Other Existing Low-Altitude MOAs

Under this alternative, 71 FTW pilots would commute from Vance AFB to either the Smoky MOA 135 NM north of Vance AFB or R-5601 100 NM south of the base. The Smoky MOA is scheduled and managed by the Kansas ANG and R-5601 by the U.S. Army.

Alternative 4 meets selection standards 1, 2, and 5. However, it fails to meet selection standards 3 and 4 because the airspace would not be managed and scheduled by the 71 FTW and would not provide optimal training and transit time. Therefore, Alternative 4 was dismissed from detailed analysis in the EA.

2.2.2.5 Alternative 5 – Use of Other Airspace Types

Under this alternative, 71 FTW pilots would utilize other airspace types including Military Training Routes and Restricted Areas in proximity to Vance AFB to meet low-altitude training requirements of the FBF syllabus.

Alternative 5 meets selection standards 4 and 5. However, it fails to meet selection standards 1, 2, and 3 because it would not provide sufficient airspace volume and availability, would not support pilot production goals, and would not be scheduled by the 71 FTW. Therefore, this alternative was dismissed from further analysis in the EA.

2.2.2.6 Alternative 6 – Forward Deployment

This alternative would consist of forward deployment to Salina Regional Airport in Kansas, approximately 171 miles north of Vance AFB, to reduce aircraft commute time to the Smoky MOA. This alternative would substantially increase the fuel available for tactical low altitude training. Under this alternative, forward deployment would include temporarily relocating pilots, operations, maintainers, and aircraft for one or more rotations of 6 months.

Alternative 6 would meet selection standards 1, 2, 4, and 5. However, it would fail to meet selection standard 3 because the airspace would not be scheduled by the 71 FTW. Additionally, the anticipated frequency of low-altitude training operations required by the FBF syllabus would make this alternative prohibitively costly from both temporary duty funding and logistics/maintenance perspectives. Therefore, Alternative 6 was dismissed from detailed analysis in the EA.

2.2.2.7 No Action Alternative

Under the No Action Alternative, the proposed low-altitude MOA would not be obtained. The FBF program is expected to start in 2026; therefore, pilots from Vance AFB would be required to seek Smoky MOA or R-5601 availability to conduct low-altitude training, resulting in operational inefficiencies and continuing to limit time spent in actual training. Finally, pilots from Vance AFB would not receive priority for training time in the Smoky MOA. Pilot production timelines using the Smoky MOA and R-5601 would be severely hampered.

The No Action Alternative does not meet the purpose and need but is carried forward for detailed analysis in the EA. The No Action Alternative provides a baseline for the evaluation of potential impacts from the Proposed Action and also represents a potential and viable decision to not implement the Proposed Action.

2.3 Summary of Potential Environmental Consequences

The potential impacts associated with the Proposed Action are summarized in **Table 2.3-1.** This summary is based on the detailed analysis of each resource presented in **Chapter 3**.

Table 2.3-1 Summary of Impacts from the Proposed Action (Alternative 1) and No Action Alternative

Resource	Proposed Action (Alternative 1)	No Action Alternative
Airspace Management and Use	No significant adverse impacts on airspace, including any adjacent military training airspace or other local civil or military operations.	No significant adverse effects.
Noise	No significant adverse impacts from noise associated with proposed aircraft operations.	No significant adverse effects.
Land Use	No significant adverse impacts on land use.	No significant adverse effects.
Air Quality	No significant adverse impacts on air quality or greenhouse gases (GHG) from increases in criteria pollutant emissions associated with proposed aircraft operations. Net changes in criteria pollutant emissions would be less than the indicator of significance and would not result in changes to the attainment status of the Air Quality Control Regions that would contain the proposed airspace. No impacts on Class 1 areas because no such areas are within 62 miles of the proposed airspace. The annual net change in GHG emissions would be below the GHG insignificance indicator; therefore, there would be no substantive change in GHG at a regional or global scale.	No significant adverse effects.
Biological Resources	No significant adverse impacts on biological resources. The DAF determined that the Proposed Action may affect but is not likely to adversely affect federally listed threatened and endangered species and would not jeopardize the continued existence of federal proposed or candidate species. USFWS concurrence with this determination is pending.	No significant adverse effects.
Cultural Resources	No significant adverse impacts on archaeological or architectural resources because the Proposed Action does not involve construction, demolition, or other ground-disturbing activities. Increased noise levels associated with the Proposed Action would be low and would have no potential to affect the character, setting, or historic integrity of historic properties in the Area of Potential Effects (APE). No impacts on traditional cultural properties or Indian sacred sites because no such properties or sites have been identified in the APE. In March 2025, the Oklahoma SHPO stated that there are no historic properties affected by the Proposed Action. The Kansas SHPO's concurrence with DAF's determination of "no adverse effects on historic properties" is pending.	No significant adverse effects.

Table 2.3-1 Summary of Impacts from the Proposed Action (Alternative 1) and No Action Alternative

Resource	Proposed Action (Alternative 1)	No Action Alternative
Safety	No significant adverse impacts on safety, including potential aircraft mishaps, aircraft collisions with birds and wildlife, and obstructions to flight, through adherence to all applicable safety procedures.	No significant adverse effects.
Socioeconomics	No significant adverse impacts on socioeconomic conditions.	No significant adverse effects.
Visual Resources	No significant adverse impacts on visual resources.	No significant adverse effects.

This page intentionally left blank.

3 Affected Environment and Environmental Consequences

This chapter describes the affected environment and environmental consequences for resources that would potentially be affected by the Proposed Action. Resources that were dismissed from detailed analysis because the Proposed Action would have no potential to affect them are also briefly summarized. Throughout this PEA, the terms “environmental consequences,” “effects,” and “impacts” are used interchangeably and have the same meaning.

3.1 Resources Analyzed in the Environmental Assessment

Environmental resources analyzed in the EA, and the region of influence (ROI) for each resource, are listed in **Table 3.1-1**. The ROI is the geographic area where potential impacts on a particular resource could occur or be experienced as a result of the Proposed Action or No Action Alternative. The area and extent of the ROI varies for each resource based on the characteristics of the particular resource being evaluated. Reasonably foreseeable future actions that could contribute to cumulatively significant effects in the ROI when considered with the Proposed Action are summarized in **Appendix B**.

Table 3.1-1 Resources Analyzed in the EA and ROI

Resource	Region of Influence
Airspace Management and Use	Airspace within the proposed Vance 1E Low MOA; the existing Vance 1A/1C/1D MOA and overlying ATCAA; local airports under the proposed MOA; and civilian and military air traffic and Military Training Route (MTRs) that cross the proposed MOA.
Noise	Airspace within and lands below the proposed Vance 1E Low MOA and parts of the existing Vance 1A, 1C, and 1D MOAs and ATCAA.
Land Use	Lands below the proposed Vance 1E Low MOA within portions of Alfalfa and Woods Counties, Oklahoma and Barber and Harper Counties, Kansas.
Air Quality	Alfalfa and Woods Counties, Oklahoma; Barber and Harper Counties, Kansas; and the Air Quality Control Regions that contain these counties.
Biological Resources	Lands under and airspace within the proposed Vance 1E Low MOA.
Cultural Resources	Contiguous with the APE which consists of lands below or intersected by the boundaries of the proposed Vance 1E Low MOA.
Safety	Airspace in and under portions of the existing Vance 1A, 1C, and 1D MOAs and ATCAA, including airspace above 500 feet AGL where the proposed low-altitude MOA would be established.
Socioeconomics	Alfalfa and Woods Counties, Oklahoma and Barber and Harper Counties, Kansas under the proposed Vance 1E Low MOA.
Visual Resources	Airspace within, above, and below the proposed Vance 1E Low MOA; lands in Oklahoma and Kansas directly below the proposed MOA; and adjacent lands where viewers may observe aircraft activity within the proposed MOA.

3.2 Resources Dismissed from Analysis

Resources that were dismissed from detailed analysis in the EA are summarized in **Table 3.2-1.** These resources were dismissed in accordance with NEPA because the Proposed Action would have no potential to affect them.

Table 3.2-1 Resources Dismissed from Analysis in the EA

Resource Dismissed from Analysis	Rationale for Dismissal
Water Resources	The Proposed Action would occur entirely within airspace above the Earth's surface and would have no potential to affect surface water bodies, wetlands, floodplains, groundwater, or other water resources. The Proposed Action would not increase or otherwise change the use of water resources at Vance AFB or under the existing Vance Airspace Complex. Therefore, this resource was dismissed from detailed analysis in the EA.
Earth Resources	The Proposed Action would occur entirely within airspace above the Earth's surface and would not involve the disturbance of soils or geological strata, or the alteration of topography. Therefore, this resource is not analyzed further in the EA.
Hazardous Materials and Waste	Under the Proposed Action, hazardous materials and hazardous waste would continue to be used, handled, stored, and disposed of in accordance with all applicable DoD and DAF regulations and other federal and state regulatory requirements. The quantities and types of these materials and wastes used and generated by the DAF would not change under the Proposed Action. No hazardous materials or hazardous waste would be used, stored, generated, disposed of, or released in areas underlying the existing Vance Airspace Complex. Therefore, this resource is not analyzed further in the EA.
Infrastructure / Utilities	The Proposed Action would not exceed the capacity of existing utility and infrastructure systems and does not involve the installation of new, or the alteration of, existing infrastructure and utilities. Therefore, this resource was dismissed from detailed analysis in the EA.
Coastal Zone Management	Oklahoma and Kansas are not adjacent to coastal waters and have not established coastal zone management programs. The Proposed Action would occur in airspace above the states of Oklahoma and Kansas and would have no potential to affect coastal zone resources of any other state. Therefore, requirements of the Coastal Zone Management Act of 1972 are not applicable to the Proposed Action and are not addressed further in this EA.
Section 4(f) of the U.S. Department of Transportation Act (49 USC § 303(c))	The U.S. Department of Transportation Act (49 U.S.C. § 303(c)) requires projects funded or authorized by the U.S. Department of Transportation to avoid or minimize the use of or adverse effects on public parks, recreation areas, or wildlife and waterfowl refuges of national, state, or local significance, or land of an historic site of national, state, or local significance. (In this context, such lands or sites are typically referred to as "Section 4(f) resources.") Section 1079 of the National Defense Authorization Act for FY98 (Public Law 105-85, November 18, 1997) states that "No military flight operation (including a military training flight), or designation of airspace for such an operation, may be treated as a transportation program or project for purposes of" 49 U.S.C. § 303(c). Therefore, Section 4(f) resources are not addressed further in this EA.

Table 3.2-1 Resources Dismissed from Analysis in the EA

Resource Dismissed from Analysis	Rationale for Dismissal
Prime and Unique Farmland, and Land of Statewide or Local Importance	The Proposed Action would occur entirely in airspace above the Earth's surface and would not involve the nonagricultural development or use of prime and unique farmland as defined by the U.S. Department of Agriculture, or land of statewide or local importance as defined by applicable state and local agencies. Aircraft noise associated with the Proposed Action would have no potential to impede or prevent agricultural activities currently occurring on or planned for such lands. Therefore, this resource was dismissed from analysis in the EA.

3.3 Airspace Management and Use

3.3.1 Definition of the Resource

3.3.1.1 Airspace Regulations

Airspace management involves the direction, control, and handling of flight operations in the airspace that overlies the borders of the United States and its territories. Under Title 49, U.S.C. § 40103, Sovereignty and use of airspace, and Public Law No. 103-272, the U.S. government has exclusive sovereignty over the nation's airspace. The FAA is solely responsible for developing plans and policy for airspace use and management to ensure the safety of flight and that all users of the NAS can operate in a safe, secure, and efficient manner. The NAS is made up of a network of air navigation facilities, ATC facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system and establish how and where aircraft may fly.

Airspace for military use is established by the FAA in coordination with the DoD to meet operational needs for military readiness; the DoD requests airspace from the FAA and schedules and uses airspace as described in DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation*. In this process, the FAA is routinely a cooperating agency in developing airspace actions. SUA identified for military activities is charted and published by the National Aeronautical Navigation Services in accordance with FAA Order JO 7400.2, *Procedures for Handling Airspace Matters* (FAA, 2025a). Procedures governing the use of airspace operated and controlled by the DAF are included in Air Force Policy Directive 13-2, *Air Traffic Control, Airfield, Airspace, and Range Management*. The DAF manages airspace in accordance with processes and procedures detailed in DAFMAN 13-201, *Airspace Management*, which also provides the guidance and procedures for developing and processing SUA actions including aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support DAF and United States Space Force operations.

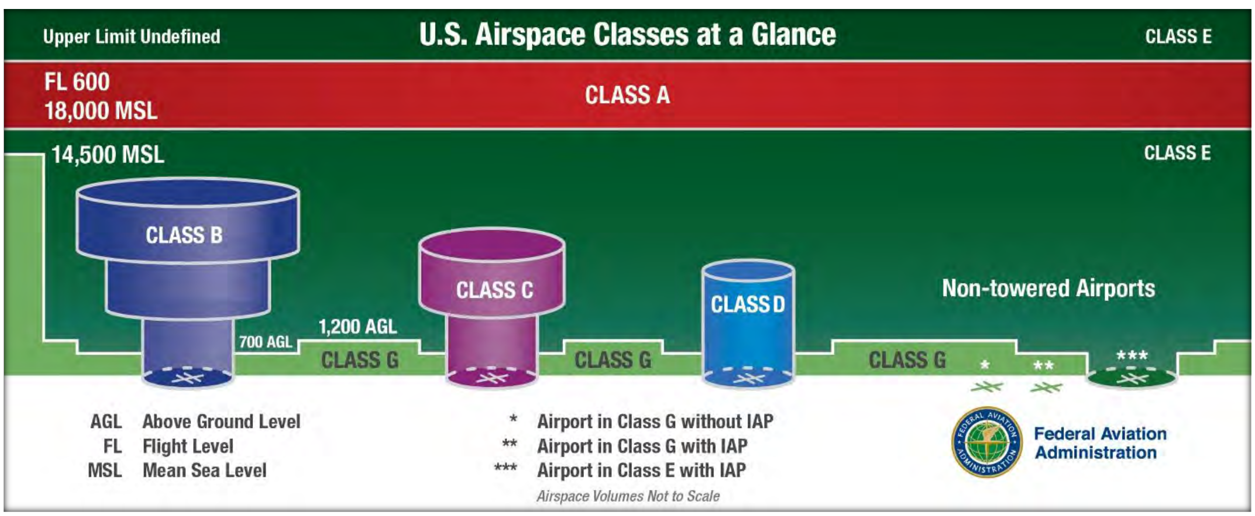
3.3.1.2 Airspace Classification

The FAA categorizes airspace as either regulatory or nonregulatory. Regulatory airspace includes Class A, B, C, D, and E airspace, restricted areas, and prohibited areas. Nonregulatory airspace includes MOAs, warning areas, alert areas, controlled firing areas, and national security areas. These two categories are divided into four airspace types: Controlled, Uncontrolled, SUA, and special activity airspace (SAA). These airspace categories and types are determined by the complexity or density of aircraft movements, the nature of the operations conducted within the airspace, the level of safety required, and national and public interest in the airspace.

Controlled airspace includes different classifications of airspace (Class A, Class B, Class C, Class D, and Class E airspace) and defined dimensions where ATC service is provided to IFR flights and VFR flights according to airspace classification. IFR operations in any class of controlled airspace requires that a pilot must file an IFR flight plan and receive an appropriate ATC clearance. VFR operations require the pilot to ensure that ATC clearance or radio communication requirements are met prior to entry into Class B, Class C, or Class D airspace. Class A is the most restrictive airspace. Altitudes associated with controlled airspace classes vary. FAA Order JO 7400.11, *Airspace Designations and Reporting Points* (September 2024) specifies the airspace altitude ranges for airspaces designated for public and military airports.

Uncontrolled (Class G) airspace is the portion of airspace that has not been designated as Class A, Class B, Class C, Class D, or Class E airspace and is therefore not provided ATC service. Generally, Class G airspace extends from the surface up to but does not include the Class E airspace floor.

Figure 3.3-1 shows the altitude ranges and airspace relationship of the controlled and uncontrolled airspace classes. Additional information regarding airspace classes is provided in **Appendix C, Section C.1.1.**



Source: FAA, 2023b

Figure 3.3-1 U.S. Airspace Classes

SUA is the designation for airspace in which certain activities must be confined, or where limitations may be imposed on aircraft operations that are not part of those activities. SUA generally consists of prohibited areas, restricted areas, warning areas, MOAs, alert areas, controlled firing areas, and national security areas. MOAs are considered joint use airspace consisting of defined vertical and lateral limits established outside of Class A airspace to separate or segregate certain nonhazardous military flight activities from IFR aircraft and to identify for VFR aircraft where these activities are conducted.

Whenever a MOA is being used, nonparticipating IFR traffic may be cleared through the MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic. Nonparticipating pilots are permitted to operate by VFR in active MOAs using see-and-avoid flying to prevent conflicts. Restricted Areas are regulated under 14 CFR Part 73 as designated airspace supporting ground or flight activities that can be hazardous to nonparticipating aircraft, such as artillery firing, aerial gunnery, guided missiles, or other air-to-ground or ground-to-ground ordnance training activities. All general aviation and nonparticipating military aircraft are prohibited from active Restricted Areas, but they can be authorized for Restricted Area transit when the area is not being activated by the using agency.

SAA refers to most of the remaining airspace including, but not limited to MTRs, temporary flight restrictions, published VFR routes, national security areas, and flight restricted zones (FAA, 2023b). MTRs are established by joint venture between the FAA and the DoD for use by the military for the purpose of conducting low-altitude, high-speed (exceeding 250 knots) training. Routes above 1,500 feet AGL are developed to be flown, to the maximum extent possible, under IFR. Most routes at 1,500 feet AGL and below are developed to be flown under VFR using see-and-avoid flying.

As stated in 14 CFR § 91.119, Minimum Safe Altitudes, aircraft operating in the NAS must abide by the following standard altitude restrictions to avoid hazards to persons or property damage. Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes: an altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface; over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft; over uncongested areas, aircraft must maintain an altitude of 500 feet above the surface, except over open water or sparsely populated areas, and no closer than 500 feet to any person, vessel, vehicle, or structure.

The ROI for airspace management and use is primarily the airspace within the proposed Vance 1E Low MOA, but also includes the existing, adjacent Vance 1A/1C/1D MOA and Vance 1A/1C/1D ATCAA, as well as the local airports located under the proposed MOA, and civilian and military air traffic and MTRs that cross the proposed MOA. This area is located about 50 miles west of Enid, Oklahoma, as shown on **Figure 1.2-2**. Times of use for the SUA and ATCAA are from Monday to Friday, sunrise to sunset, and other times by Notice to Airmen. The controlling agency is FAA Mike Monroney Aeronautical Center and the using agency is DAF, 71 FTW, Vance AFB (DoD, 2024). These are the airspace that would potentially be impacted by the Proposed Action and which require assessment of the effects on airspace resources.

Additional information regarding the definition of the resource is provided in **Appendix C, Section C.1**.

3.3.1.3 Airspace Traffic Analysis

The *Final Report for Airspace Analysis in Support of the Environmental Impact Analysis Process for Vance 1E Low MOA, Oklahoma* (ATAC, 2025) was prepared concurrently with this EA to identify and characterize all existing flight activity in and around the proposed Vance 1E Low

MOA (ATAC, 2025). This report analyzes existing air traffic operations based on recorded flight data from August 1, 2023, to July 31, 2024, from available radar tracking data and associated aircraft type and flight plan information. Archived information from the Performance Data Analysis and Reporting System (PDARS) collected from the Kansas City and Fort Worth ARTCCs and System Wide Information Management (SWIM) data from Dallas-Fort Worth Terminal Radar Approach Control (TRACON) (D10) and Kansas City TRACON (MCI) were used in the airspace analysis. Airspace elements included in this analysis and some of the data processing assumptions are briefly described in this section as a basis for understanding the air traffic results obtained for the proposed Vance 1E Low MOA.

The airspace analysis focused on evaluating August 2023 through July 2024 PDARS and SWIM traffic flows within the proposed Vance 1E Low MOA, SUA, and SAA that are adjacent to or near the proposed MOA. Flight track data for individual flights were associated with aircraft type and flight plan information and these data were subsequently filtered to identify the specific flights that occurred in each airspace analyzed; these data were also entered into the SkyViewer visualization tool to develop data analytics and create graphics for illustrating flight information.

Airspace analyzed in the final report are summarized in **Table 3.3-1**. Of note are the flight altitudes; the proposed Vance 1E Low MOA altitude range is from 500 feet AGL to 8,000 feet MSL, whereas all the other airspace flight altitudes are 7,000 feet MSL or above. The Vance 1A/1C/1D MOA made up of the component 1A, 1C, and 1D MOAs is considered as one airspace for the purposes of this analysis, since the proposed Vance 1E Low MOA directly underlies portions of these three MOAs.

Table 3.3-1 Definitions of Airspace Evaluated in the Final Airspace Analysis Report

Airspace	Altitudes Used for Analysis	Lateral Boundaries
Proposed Vance 1E Low MOA	500 feet AGL to 8,000 feet MSL	**Figures 2.2-1** and **2.2-2**
Vance 1A/1C/1D MOA	8,000 feet MSL to FL180	**Figures 1.2-2** and **2.2-1**
Vance 1A/1C/1D ATCAA	FL180 to FL240	Same lateral boundaries as Vance 1A/1C/1D MOA **(Figures 1.2-2** and **2.2-1)**
Vance 1A/1B/1C/1D MOA	7,000 feet MSL to FL180	**Figures 1.2-2** and **2.2-1**
Vance 1A/1B/1C/1D ATCAA	FL180 to FL240	Same lateral boundaries as Vance 1A/1B/1C/1D MOA **(Figures 1.2-2** and **2.2-1)**
Vance 1B MOA	7,000 feet MSL to FL180	**Figures 1.2-2** and **2.2-1**

The proposed Vance 1E Low MOA is anticipated to be scheduled with the Vance 1A/1C/1D MOA and the Vance 1A/1C/1D ATCAA such that training flights would be able to transition seamlessly between these vertically adjacent airspace. Therefore, in defining the affected environment, results for air traffic operations within these three airspace components are presented in **Section 3.3.2** with the affected environment primarily consisting of airspace within the proposed Vance 1E Low MOA **(Figure 2.1-1)**. Flight operations in airspace within the proposed MOA include civilian and military traffic that transit the airspace, flight operations at local civilian airports located under the airspace, and military flights on five active MTRs that cross the airspace. Results from analyzing the other existing, higher-altitude flight operations in Vance 1B MOA are summarized separately in **Section 3.3.2.4**

3.3.2 Affected Environment

Vance AFB was established in Oklahoma in 1941 and training in military airspace has occurred over northwest Oklahoma and southern Kansas, including the areas containing the Vance 1A/1C/1D MOA, for more than 75 years. MOAs may overlap or be crossed by other types of military and nonmilitary airspace, and have been historically compatible with nonmilitary aviation operations including commercial passenger aviation and local or regional operations such as medical transport, crop dusting, pest control, aerial assessments for farming and wildlife management purposes, and similar activities. Military and nonmilitary pilots flying VFR and transiting through MOAs as part of their routine flight operations and patterns must use "see and avoid" techniques to prevent conflicts with military aircraft actively using the MOAs. Pilots flying under IFR also rely on their instruments and communications with ATC when cleared to transit nonactive parts of MOAs.

Existing flight operations in the affected environment, as identified in the *Final Report for Airspace Analysis in Support of the Environmental Impact Analysis Process for Vance 1E Low MOA, Oklahoma* (ATAC, 2025) are summarized by category in the following sections:

- Proposed Vance 1E Low MOA **(Section 3.3.2.1)**
- Vance 1A/1C/1D MOA **(Section 3.3.2.2)**
- Vance 1A/1C/1D ATCAA **(Section 3.3.2.3)**
- Local civilian airports with flight operations in the proposed Vance 1E Low MOA **(Section 3.3.2.5)**
- Military airfields with flight operations in the proposed Vance 1E Low MOA **(Section 3.3.2.6)**
- MTRs that cross the proposed Vance 1E Low MOA **(Section 3.3.2.7)**

Note that the flight operations are summarized in the categories above to help differentiate the primary sources of air traffic in the study area that characterize the affected environment. All flight operations reported in the proposed Vance 1E Low MOA, Vance 1A/1B/1C MOA, and Vance 1A/1B/1C ATCAA are the totals for each airspace; those totals include all flights from local and regional civilian airports and military airfields that transit each airspace. In addition, MTR operations were provided by Vance AFB, separate from the data used in the air traffic analysis. Potential impacts on existing flight operations in the airspace listed above are discussed in **Section 3.3.3**.

3.3.2.1 Proposed Vance 1E Low MOA

Existing flight operations in the proposed Vance 1E Low MOA are summarized below. Data presented in this section is drawn from the final airspace report (ATAC, 2025). Three graphic plots are presented below to illustrate various elements of the PDARS radar data analysis, performed to filter the data into different categories (the same types of analysis were performed for the Vance 1A/1C/1D MOA and Vance 1A/1C/1D ATCAA). **Figure 3.3-2** shows a sample of radar tracks crossing the proposed Vance 1E Low MOA, color coded by operator type to identify civilian (blue), military (green), and unknown (red) operators. Likewise, **Figures 3.3-3** and **3.3-4** show civilian traffic flows and military traffic flows, respectively, in the proposed Vance 1E Low MOA, color coded by altitude band. The primary information available from these analyses for each airspace include (for each flight track data point) aircraft location, altitude, and airspeed, merged with aircraft type and flight plan information; from which additional study metrics can be derived, such as flight category (VFR or IFR) and time in airspace.

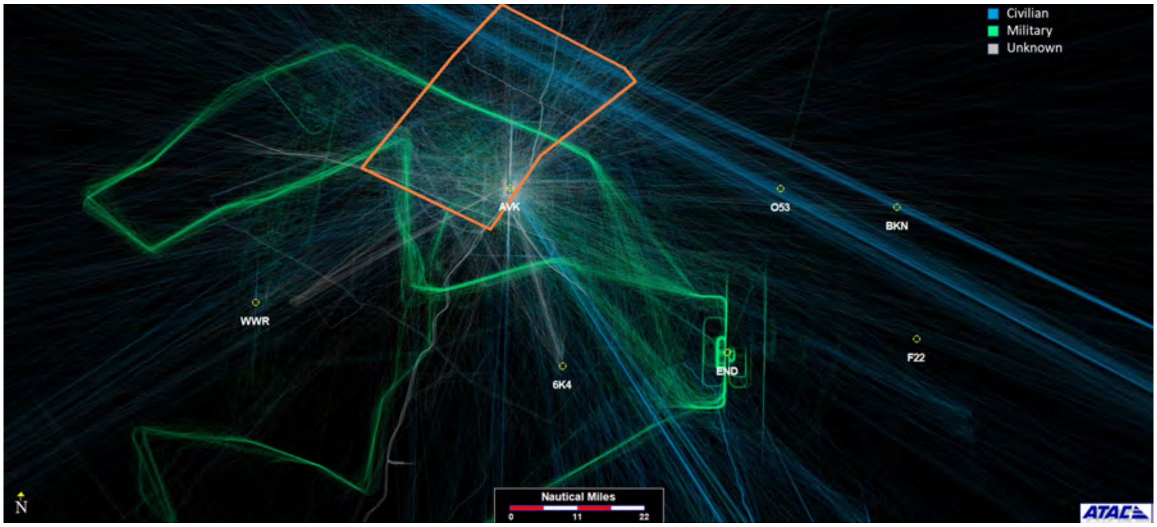


Figure 3.3-2 Radar Flight Tracks by Operator Type – Proposed Vance 1E Low MOA (July 2023 – August 2024)

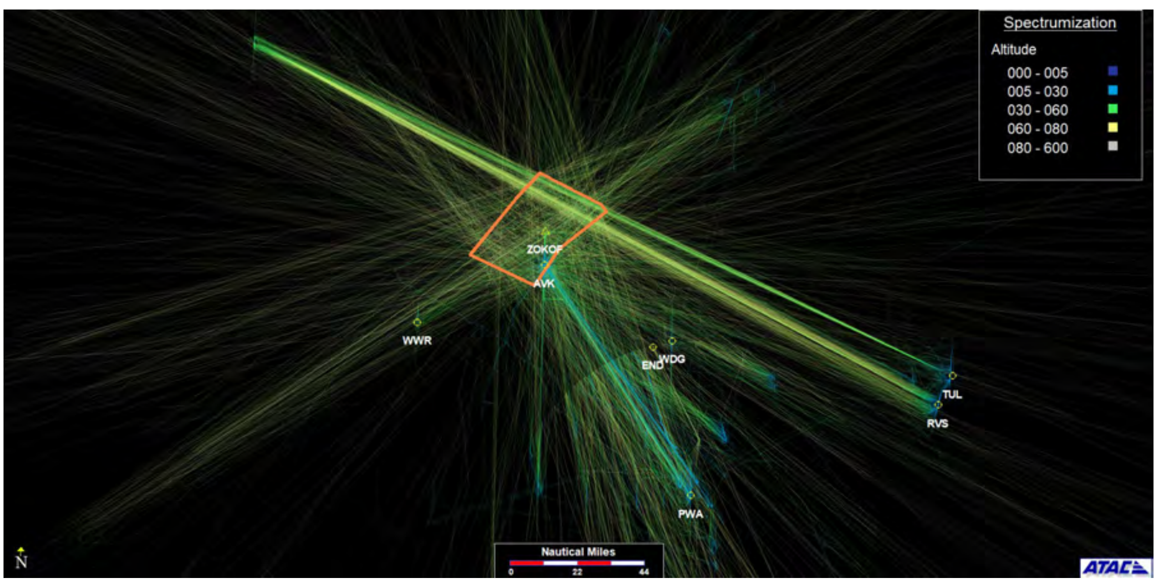


Figure 3.3-3 Civilian Traffic Flows – Proposed Vance 1E Low MOA (July 2023 – August 2024)

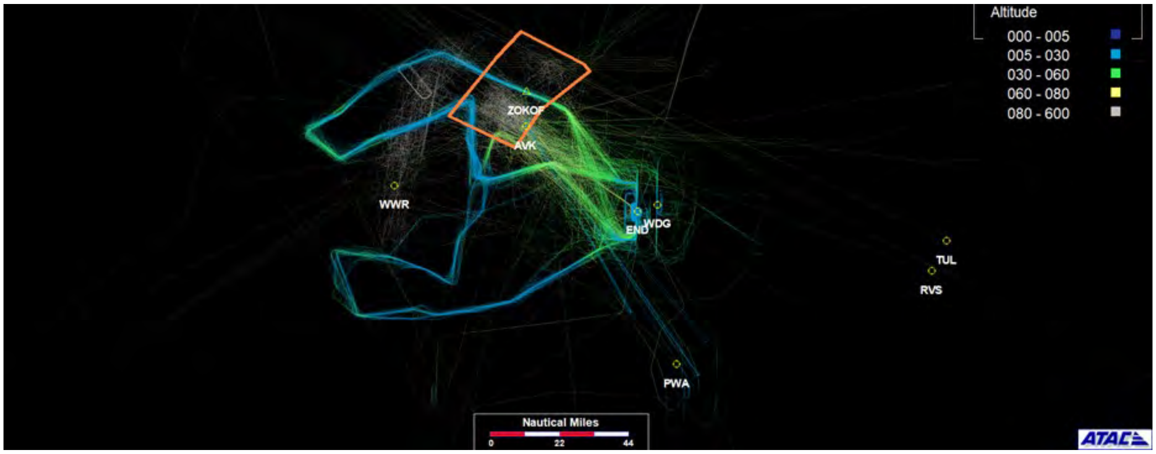


Figure 3.3-4 Military Traffic Flows – Proposed Vance 1E Low MOA (July 2023 – August 2024)

Filtering and analysis of the air traffic data associated with the proposed Vance 1E Low MOA yielded the operations listed in **Tables 3.3-2** through **3.3-9**. More than 5,700 aircraft crossed or operated within the proposed Vance 1E Low MOA between July 2023 and August 2024 **(Table 3.3-2)**. Of the air traffic crossings by operator type listed in **Table 3.3-2**, 37 percent of the total crossings were civilian, general aviation operators, 14 percent were military operators, less than 1 percent were civilian air carrier and air taxi operators, and 48 percent were unknown aircraft operators (for which aircraft type and flight plan could not be associated with tracking data).

Table 3.3-2 Crossings of the Proposed Vance 1E Low MOA by Operator Type and Category (July 2023 – August 2024)

Operator Type/Category		Count	Percent
Civilian	Air Carrier	3	<0.1
	Air Taxi	40	<1
	General Aviation	2,098	37
Military		829	14
Unknown		2,749	48
Total		**5,719**	**100**

The most common civilian aircraft observed in the proposed Vance 1E Low MOA include the Piper PA-28 Cherokee Series (19 percent), Cessna 172 Skyhawk (8 percent), Cessna 182 (7 percent), Beechcraft Bonanza 35 (5 percent) various helicopters (4 percent), other single and twin engine aircraft (54 percent), and unknown (3 percent). The most common military aircraft observed in the proposed Vance 1E Low MOA include the T-38C (28 percent), T-1A (8 percent), T-6A (2 percent), other (2 percent), and unknown (60 percent).

Table 3.3-3 summarizes crossings in the proposed Vance 1E Low MOA by operator type and flight category (IFR or VFR).

Table 3.3-3 IFR and VFR Crossings of the Proposed 1E Low MOA (July 2023 – August 2024)

Flight Category	Civilian			Military	Unknown	Total	Percent
	Air Carrier	Air Taxi	General Aviation				
IFR	3	34	1,736	328	0	2,101	37

Flight Category	Civilian			Military	Unknown	Total	Percent
	Air Carrier	Air Taxi	General Aviation				
VFR	0	6	362	501	2,749	3,618	63
Total	**3**	**40**	**2,098**	**829**	**2,749**	**5,719**	**100**

Monthly, daily, and hourly crossings in the proposed Vance 1E Low MOA are listed in **Tables 3.3-4** through **3.3-6**, respectively, for different operator categories. The combined information in these tables indicates the number of crossings for different periods throughout the year. Based on these data, the busiest months were May and July **(Table 3.3-4)**, the busiest weekdays were Wednesday through Friday **(Table 3.3-5)**, and the busiest times of day were from 10:00 a.m. to 4:00 p.m., with peak hours from 11:00 a.m. to 1:00 p.m. **(Table 3.3-6)**. In **Section 3.3.3**, this existing airspace usage information, estimated for IFR operations, is compared with the anticipated activity schedule for the proposed Vance 1E Low MOA to estimate potential impacts on existing operations.

Table 3.3-4 Monthly Crossings of the Proposed 1E Low MOA (July 2023 – August 2024)

Month	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Daily Average
Aug	0	0	189	89	223	**501**	16
Sep	0	4	165	73	164	**406**	14
Oct	0	0	164	90	172	**426**	14
Nov	0	6	159	64	188	**417**	14
Dec	0	6	149	55	185	**395**	13
Jan	0	3	132	50	144	**329**	11
Feb	1	5	187	62	270	**525**	19
Mar	1	4	169	55	236	**465**	15
Apr	0	5	209	87	252	**553**	18
May	0	2	176	76	331	**585**	19
Jun	1	4	188	61	260	**514**	17
Jul	0	1	211	67	324	**603**	19
Total	**3**	**40**	**2,098**	**829**	**2,749**	**5,719**	**16**

Table 3.3-5 Daily Crossings of the Proposed 1E Low MOA (July 2023 – August 2024)

Day of Week	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Daily Average
Monday	0	2	286	66	388	**742**	14
Tuesday	1	8	246	213	369	**837**	16
Wednesday	1	5	354	141	440	**941**	18
Thursday	1	6	293	236	434	**970**	19
Friday	0	9	301	148	403	**861**	17
Saturday	0	5	314	9	391	**719**	14
Sunday	0	5	304	16	324	**649**	12
Total	**3**	**40**	**2,098**	**829**	**2,749**	**5,719**	**16**

Table 3.3-6 Hourly Crossings of the Proposed 1E Low MOA (July 2023 – August 2024)

Hour	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Daily Average
0	0	0	11	1	8	**20**	0
1	0	3	5	0	5	**13**	0
2	0	0	2	0	2	**4**	0
3	0	0	2	0	5	**7**	0
4	0	0	0	0	5	**5**	0
5	0	0	3	1	8	**12**	0
6	0	1	16	1	21	**39**	0
7	0	1	44	3	101	**149**	0
8	1	1	114	52	210	**378**	1
9	0	0	184	112	213	**509**	1
10	0	9	207	61	244	**521**	1
11	0	4	216	76	260	**556**	2
12	0	8	203	116	217	**544**	1
13	1	2	235	101	236	**575**	2
14	0	0	190	56	200	**446**	1
15	0	5	177	81	251	**514**	1
16	0	2	128	92	248	**470**	1
17	1	2	114	40	224	**381**	1
18	0	1	76	21	120	**218**	1
19	0	0	58	6	75	**139**	0
20	0	1	45	2	47	**95**	0
21	0	0	29	4	25	**58**	0
22	0	0	26	1	15	**42**	0
23	0	0	13	2	9	**24**	0
Total	**3**	**40**	**2,098**	**829**	**2,749**	**5,719**	**16**

Aircraft crossing durations are listed in **Table 3.3-7** by operator category. Ninety-four percent of the crossings occurred in 15 minutes or less and most of the remaining crossings (5.8 percent) occurred over a 15- to 30-minute period. Crossing durations could be used to estimate potential impacts (delays) on IFR flights by comparing the crossing times of existing flights with estimated times for any future flights that would potentially be rerouted due to the Proposed Action.

Table 3.3-7 Distribution of Aircraft Crossing Durations in the Proposed 1E Low MOA (July 2023 – August 2024)

Time (minutes)	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Percent
0-15	3	39	1,957	817	2,561	**5,377**	94.0
15-30	0	0	138	10	183	**331**	5.8
30-45	0	1	2	1	4	**8**	0.1
45-60	0	0	0	0	0	**0**	0.0
60-75	0	0	0	1	0	**1**	0.0
75-90	0	0	0	0	1	**1**	0.0
90-105	0	0	0	0	0	**0**	0.0
105-120	0	0	0	0	0	**0**	0.0
> 120	0	0	1	0	0	**1**	0.0
Total	**3**	**40**	**2,098**	**829**	**2,749**	**5,719**	**100.0**

The distribution of aircraft crossings by altitude (in 1,000-foot increments) is listed for each operator category in **Table 3.3-8**. Most aircraft crossings (42.6 percent) occurred at an average operating altitude of 2,000 feet MSL. Generally, the remaining crossings were evenly distributed in the other 1,000-foot altitude bands, from 1,000 to 7,000 feet MSL. Approximately 3.5 percent of all aircraft crossings occurred at or below 1,000 feet MSL and 53.6 percent occurred in the 2,000- to 3,000-foot MSL bands.

Table 3.3-8 Distribution of Aircraft Crossings by Altitude in the Proposed 1E Low MOA

Altitude (MSL)	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Percent
1,000	0	1	49	5	87	**142**	3.5
2,000	0	7	468	356	1,656	**2,487**	42.6
3,000	0	9	162	68	396	**635**	11.0
4,000	1	4	230	26	232	**493**	8.7
5,000	0	3	287	70	139	**666**	9.2
6,000	2	4	483	66	111	**622**	11.4
7,000	0	12	419	238	128	**797**	13.9
Total	**3**	**40**	**2,098**	**829**	**2,749**	**5,719**	**100.0**

A summary of the air traffic crossing data for the proposed Vance 1E Low MOA, shown in the previous tables, is presented in **Table 3.3-9**. This summary table provides high-level information for each of the air traffic metrics shown and characterizes the existing conditions for air traffic in the proposed Vance 1E Low MOA that primarily define the affected environment.

Similarly, air traffic summary tables are provided for the other SUA (Vance 1A/1C/1D MOA) in **Table 3.3-10** and Vance 1A/1C/1D ATCAA in **Table 3.3-11**, that are also considered part of the affected environment. These airspace could potentially be affected during times when the proposed Vance 1E Low MOA would be active, causing a shift in traffic flows from the low MOA to these higher altitude airspace (though the need for this type of traffic shift is currently unknown).

Included in the military air traffic reported for the Vance 1A/1C/1D MOA and Vance 1A/1C/1D ATCAA are the existing annual flight operations conducted by the 71 FTW at Vance AFB including: T-38C flight operations (3,214 in 1A, 7,445 in 1C, and 55 in 1D), T-1 operations (3,214 in 1A, 7,445 in 1C, and 55 in 1D), and T-6 operations reported separately for the 1B MOA in **Table 3.3-12**. The 71 FTW schedules and uses the Vance 1A/1C/1D MOA and Vance 1A/1C/1D ATCAA simultaneously, Monday through Friday, nominally from 8:00 a.m. to 9:00 p.m., Monday through Friday and 2:00 p.m. to 6:00 p.m. on Sunday (all times local), adjusted seasonally as needed. Most of the flight operations are during daytime hours, so this flying window would normally be shorter during the fall and winter months.

These three flying periods also occur during the busiest period of air traffic, each day, in the existing airspace designated for the proposed Vance 1E Low MOA, 8:00 a.m. to 6:00 p.m. **(Table 3.3-6)**.

Table 3.3-9 Summary of Air Traffic Crossings in the Proposed Vance 1E Low MOA (August 2023 – July 2024)

Air Traffic Metric	Summary Information
Total Aircraft Crossings	5,719 aircraft transited the proposed Vance 1E Low MOA with 38% civilian operators (98% by general aviation), 14% military, and 48% unknown operators.
VFR / IFR	63% VFR and 37% IFR.
Monthly Aircraft Crossings (High / Low)	Air traffic peaked in July with 603 total aircraft crossings and the lowest traffic counts were in January with 329 total aircraft crossings.
Daily Aircraft Crossings (High / Low)	On average, 16 aircraft per day transited the proposed Vance 1E Low MOA with the highest on Thursdays (19 aircraft per day) and the lowest on Sundays (12 aircraft per day).
Civilian Air Traffic, Flight Paths, and Arrival/Departure Airports	Civilian traffic was busiest on Wednesdays between 9:00 a.m. and 5:00 p.m. General aviation traffic counts were highest from 10:00 a.m. to 4:00 p.m. Air taxi traffic counts peaked from 10:00 a.m. and 12:00 p.m. Civilian traffic transiting the proposed low MOA included medical helicopters landing/departing Alva Regional (AVK), collegiate aircraft flying direct between Garden City Regional (GCK) and Tulsa International Airport (TUL) or Tulsa Riverside Airport (RVS), and aircraft flying practice approaches to AVK. The helicopters primarily operated at or below 3,500 feet MSL. Most collegiate aircraft were Piper Cherokees, operating at VFR altitudes between 4,500 and 7,500 ft MSL. The most common arrival and departure airports for civilian traffic were AVK, GCK, and RVS.
Military Air Traffic, Flight Paths, and Arrival Departure Airports	Military activity was concentrated to mid-week, with most flights occurring from 9:00 a.m. to 1:00 p.m. and 3:00 to 4:00 p.m. The most prevalent determinable airports for military traffic transiting the proposed Vance 1E Low MOA were Vance AFB (END), Enid Woodring Regional (WDG), and AVK.

3.3.2.2 Vance 1A/1C/1D MOA

Air traffic crossings that occurred in the Vance 1A, 1C, and 1D MOAs between August 2023 and July 2024 are summarized in **Table 3.3-10**.

Table 3.3-10 Summary of Air Traffic Crossings in the Vance 1A, 1C, and 1D MOAs (August 2023 – July 2024)

Air Traffic Metric	Summary Information
Total Aircraft Crossings	39,873 aircraft transited the Vance 1A/1C/1D MOA with 25% civilian operators, 73% military operators, and 2% unknown operators.
VFR / IFR	61% VFR, 39% IFR, with 4% of the VFR unknown; 60% of IFR crossings were made by civilian operators and 40% by military operators.
Monthly Aircraft Crossings (High / Low)	Air traffic peaked during August with 4,201 total aircraft crossings. The lowest traffic counts occurred during January with 2,237 total aircraft crossings.
Daily Aircraft Crossings (High / Low)	On average, 109 aircraft per day transited the Vance 1A/1C/1D MOA. Overall, daily crossings were highest on Wednesdays (151 aircraft per day) and lowest on Sundays (44 aircraft per day).

Table 3.3-10 Summary of Air Traffic Crossings in the Vance 1A, 1C, and 1D MOAs (August 2023 – July 2024)

Air Traffic Metric	Summary Information
Civilian Air Traffic and Arrival Departure Airports	Civilian traffic was consistent Monday through Sunday between 7:00 p.m. and 7:00 p.m. Air carrier crossings were highest on Saturday and Sunday, between 12:00 and 3:00 p.m. and 6:00 and 12:00 a.m. The most common origin and destination airports for civilian traffic were Denver International Airport (DEN), Dallas Fort Worth International Airport (DFW), Will Rogers International (OKC), and Wichita Dwight D. Eisenhower National Airport (ICT).
Military Air Traffic and Arrival/Departure Airports	Military aircraft crossings were consistent Monday (5,521 total annual) through Friday (4,378 total annual), with the fewest military crossings occurring on the weekends. The most common arrival and departure airport for military traffic was END.

3.3.2.3 Vance 1A/1C/1D ATCAA

Air traffic crossings that occurred in the Vance 1A, 1C, and 1D ATCAA between August 2023 and July 2024 are summarized in **Table 3.3-11**.

Table 3.3-11 Summary of Air Traffic Crossings in the Vance 1A, 1C, and 1D ATCAA (August 2023 – July 2024)

Air Traffic Metric	Summary Information
Total Aircraft Crossings	18,097 aircraft transited the Vance 1A/1C/1D ATCAA with 49% identified as civilian operators, 49% as military operators, and 2% as unknown.
Monthly Aircraft Crossings (High / Low)	Air traffic in Vance 1A/1C/1D ATCAA peaked during October with 1,636 total aircraft crossings. The lowest traffic counts occurred during December and January with 1,259 and 1,227 total aircraft crossings, respectively.
Daily Aircraft Crossings (High / Low)	On average, 50 aircraft per day transited into the Vance 1A/1C/1D ATCAA. Overall, daily crossings were highest Tuesdays through Thursdays and lowest on the weekends.
Civilian Air Traffic and Arrival Departure Airports	Civilian traffic was busiest on Sundays between 11:00 a.m. and 3:00 p.m. The most common origin and destination airports for civilian traffic were DEN, DFW, OKC, and ICT.
Military Air Traffic and Arrival/Departure Airports	Military activity in the Vance 1A/1C/1D ATCAA was highest Tuesdays through Thursdays from 9:00 a.m. to 4:00 p.m. and lowest on the weekends. The predominant origin or destination airport for military traffic was END.

3.3.2.4 Vance 1B MOA

Table 3.3-12 summarizes air traffic crossings that occurred in the Vance 1B MOA between August 2023 and July 2024.

Table 3.3-12 Summary of Air Traffic Crossings in the Vance 1B MOA (August 2023 – July 2024)

Air Traffic Metric	Summary Information
Total Aircraft Crossings	49,972 aircraft transited the Vance 1B MOA with 17% civilian operators, 82% military operators, and 1% unknown operators.
VFR / IFR	65% VFR, 35% IFR; 45% of IFR crossings were made by civilian operators and 55% by military operators.

Table 3.3-12 Summary of Air Traffic Crossings in the Vance 1B MOA (August 2023 – July 2024)

Air Traffic Metric	Summary Information
Monthly Aircraft Crossings (High / Low)	Air traffic peaked in August with 5,547 total aircraft crossings. The lowest traffic counts occurred during December with 2,831 total aircraft crossings.
Daily Aircraft Crossings (High / Low)	On average, 137 aircraft per day transited the Vance 1B MOA. Overall, daily crossings were highest on Wednesdays (200 aircraft per day) and lowest on Saturdays (33 aircraft per day).
Civilian Air Traffic and Arrival Departure Airports	Civilian traffic was consistent Monday through Sunday between 7:00 p.m. and 7:00 p.m. Air carrier crossings were highest on Saturday and Sunday, between 12:00 and 8:00 p.m. The most common origin and destination airports for civilian traffic were WDG and DEN.
Military Air Traffic and Arrival/Departure Airports	Military aircraft crossings were consistent Monday (2,486 total annual) through Friday (2,186 total annual), with the fewest military crossings occurring on the weekends. The most common arrival and departure airport for military traffic was END.

3.3.2.5 Local Civilian Airports with Flight Operations in the Proposed Vance 1E Low MOA

Civilian flight operations at local and regional airports that transit the proposed MOA are summarized by origin and destination airport and prevalence of flight operations in **Table 3.3-13**. Based on the air traffic analysis, **Table 3.3-13** identifies the local civilian airports that could be affected by the Proposed Action. AVK followed by RVS and GCK are the largest operators that have flight traffic in the proposed Vance 1E Low MOA. Three airports, including AVK, Farney Field Airport (42KS), and Walz Airport (4KS) are located in the ROI (i.e., directly under the proposed Vance 1E Low MOA). For safety and deconfliction purposes, AVK has a 6 NM ring around it containing Class E airspace that starts at 700 feet AGL. AVK, Freedom Municipal Airport (K77), 42KS, May Field (Private), Medicine Lodge Airport (K51), and 4KS would have a 3 NM exclusion zone around them in compliance FAA Order 7400.2 Section 25-1-4.

Table 3.3-13 Local and Regional Airport Operators in the Proposed Vance 1E Low MOA

Origin Airport	Prevalence
Alva Regional (AVK)	15%
Tulsa Riverside Airport (RVS)	9%
Garden City Regional (GCK)	6%
Wiley Post Airport (PWA)	4%
Wichita Dwight D. Eisenhower National (ICT)	2%
Other/Unknown	64%
Destination Airport	**Prevalence**
Alva Regional (AVK)	23%
Garden City Regional (GCK)	9%
Tulsa International Airport (TUL)	4%
Tulsa Riverside Airport (RVS)	4%
Wiley Post Airport (PWA)	2%
Other/Unknown	59%

There are also multiple, smaller local airports operating just outside of the study ROI including:

- Cherokee Municipal Airport
- Freedom Municipal Airport
- Waynoka Municipal Airport
- Medicine Lodge Airport
- Anthony Municipal Airport
- Wilcox Field Airport
- Harper Municipal Airport

Many of the aircraft flying out of the smaller airports are not on flight plans and thus do not appear in the radar data that were collected and analyzed in the final airspace report (ATAC, 2025).

3.3.2.6 Military Airfields with Flight Operations in the Proposed Vance 1E Low MOA

Military airfields or airports that have military air traffic through the proposed Vance 1E Low MOA are summarized by the origin and destination airfields and prevalence of flight operations in **Table 3.3-14**. Vance AFB has the most air traffic through the proposed MOA followed by AVK and WDG.

Table 3.3-14 Origin and Destination Airfield Military Operators in the Proposed Vance 1E Low MOA

Origin Airfield	Prevalence
Vance AFB (END)	35%
Alva Regional (AVK)	3%
Other/Unknown	62%
Destination Airfield	**Prevalence**
Vance AFB (END)	61%
Enid Woodring Regional (WDG)	3%
Destination Airfield *(cont'd)*	**Prevalence**
Alva Regional (AVK)	2%
Other/Unknown	34%

3.3.2.7 Military Training Routes that Cross the Proposed Vance 1E Low MOA

Segments of eight MTRs cross the proposed Vance 1E Low MOA: SR-235, SR-253 (the reverse of SR-235), IR-175, IR-185 (the reverse of IR-175), IR-145**,** IR-146, VR-119 and VR-138 **(Figure 3.3-5)**. Annual operations by aircraft type within these segments are listed in **Table 3.3-15** (DAF, 2024d). Aircraft operating in segments of VR-119 within the ROI are authorized to fly as low as 100 feet AGL; however, based on the altitude utilization data provided by the DAF **(Appendix C)**, most aircraft typically fly at or above 500 feet AGL on this MTR. All active MTRs have route ceilings that are well above the floor of the proposed Vance 1E Low MOA (500 feet AGL), and MTR operations are prohibited when a low-altitude MOA is active; therefore, if implemented, the Proposed Action would have the potential to affect operations on these MTRs.

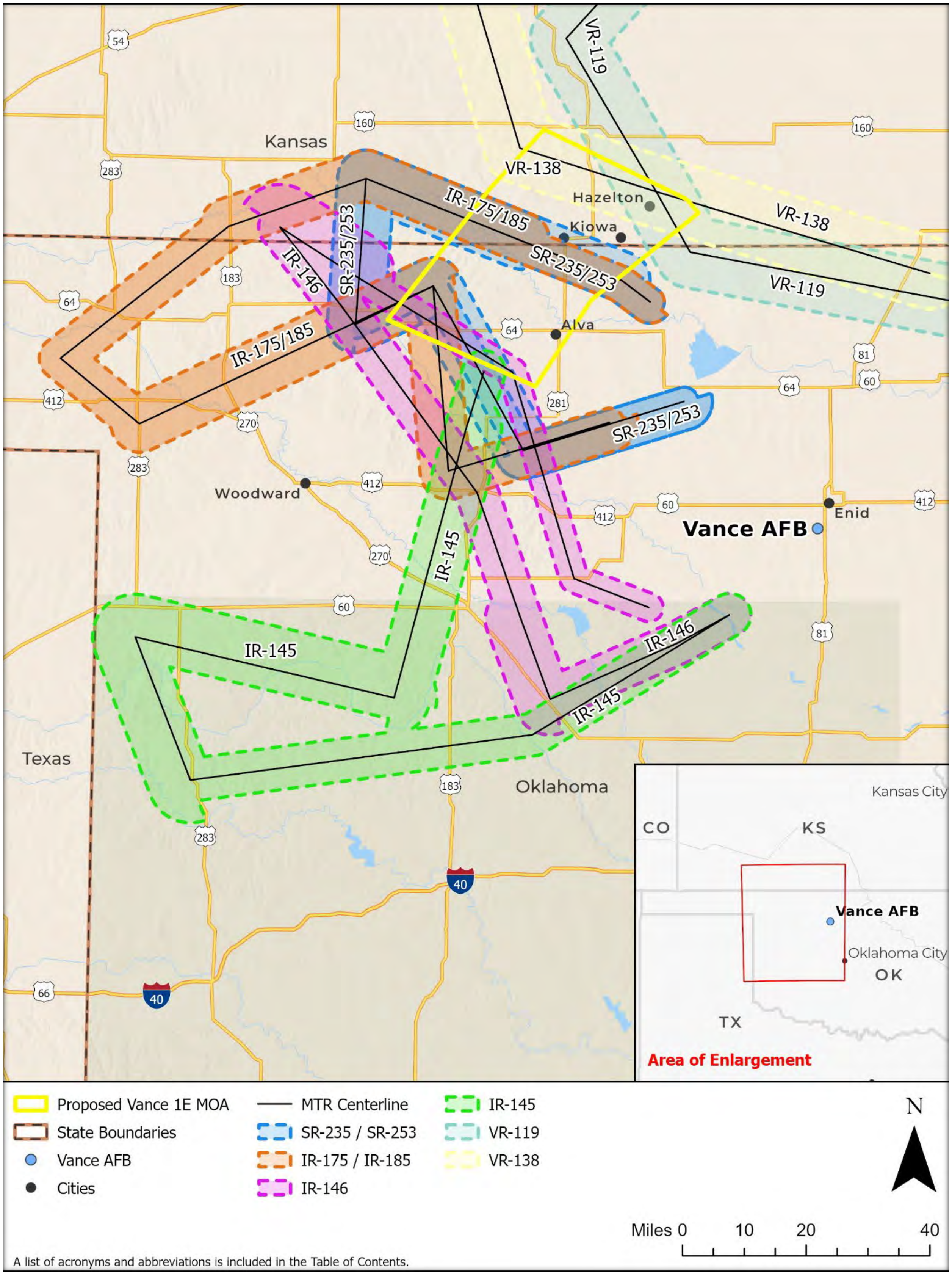


Figure 3.3-5 Existing MTR Segments that Cross the Proposed Vance 1E Low MOA

Table 3.3-15 Existing Annual Flight Operations on MTR Segments Crossing the Proposed Vance 1E Low MOA

MTR	Segment	Aircraft	Airfield	Existing Floor (feet)	Existing Ceiling (feet)	Day Operations [1]	Night Operations [2]
IR-175	G-H	T-38C	Vance AFB	500	4,000	136	0
IR-175	G-H	T-1A	Vance AFB	500	4,000	4	0
IR-185	B-D	T-38C	Vance AFB	500	4,000	194	0
IR-185	B-D	T-1A	Vance AFB	500	4,000	64	0
VR-119	B-C	T-38C	Vance AFB	100	3,000	2	0
VR-119	B-C	T-1A	Vance AFB	100	3,000	49	0
VR-119	B-C	T-6A	Vance AFB	100	3,000	34	0
VR-119	B-C	F-16C	Tulsa OK ANG	100	3,000	4	0
SR-235	B-C	T-1A	Vance AFB	500	N/A	24	0
SR-235	B-C	T-6A	Vance AFB	500	N/A	19	0
SR-253	E-F	T-1A	Vance AFB	500	N/A	22	0
SR-253	E-F	T-6A	Vance AFB	500	N/A	38	0

Notes:
One annual operation is one sortie flying the route.
[1] Day Operations hours are 7:00 a.m. to 10:00 p.m. local time for the purposes of this analysis.
[2] Night Operations hours are 10:00 p.m. to 7:00 a.m. local time for the purposes of this analysis.

3.3.3 Environmental Consequences

3.3.3.1 Evaluation Criteria

Impacts on airspace and airspace management would be considered adverse if the Proposed Action encroached on or caused disruptions to existing aviation traffic in the ROI. An adverse impact would be considered significant if the Proposed Action permanently reduced the volume of an existing airspace or required changes to the lateral or horizontal extents of such airspace to continue operation. Additionally, any impact on airspace management would be considered significant if implementation of the Proposed Action were to substantially increase risks associated with flying activities; safety of personnel, contractors, military personnel, or the local community; hinder the ability to respond to an emergency; or introduce new health or safety risks for which the DAF or the surrounding community is not prepared or does not have adequate management and response plans in place.

Potential impacts from the Proposed Action on existing airspace and flight operations are assessed in terms of several measures, including:

- Airspace size – Does the proposed airspace have adequate size and vertical and lateral dimensions to accommodate the proposed flight operations in addition to existing flight operations?
- Airspace capacity - Can airspace controllers effectively manage the increased workload associated with the proposed flight operations?

- Impacts on existing flight operations, including flight delays, that could potentially result from rerouting traffic to avoid the proposed Vance 1E Low MOA when it is active, instead of crossing through it.

Existing conditions and potential impacts on flight safety are addressed in **Section 3.9**.

3.3.3.2 Alternative 1 – Establish Low-Altitude MOA Under Portions of Existing Vance 1A, 1C, and 1D MOAs

Alternative 1 would establish the Vance 1E Low MOA as described in **Section 2.1**. Training activities would be as described in **Section 2.1.1.**

While there is an FAA regulatory prohibition on nonparticipating flying in an active MOA during IFR conditions, there is no such prohibition when it is active under VFR conditions. Nonparticipating civilian and military aircraft operating in the ROI using VFR procedures would have the same mutual obligation to use "see and avoid" flying to prevent conflicts. The FAA Kansas City and Fort Worth ARTCCs would procedurally deconflict civilian and military IFR flights during times when the proposed Vance 1E Low MOA would be active and, in some cases, flights may be rerouted around the proposed MOA.

Airspace Size and Capacity

In evaluating potential impacts, the approach is to assess the size of the airspace, existing traffic flow, additional traffic flow that would result from the Proposed Action, and consider the additional airspace deconfliction procedures required by Vance ATC in coordination with FAA.

The proposed Vance 1E Low MOA would encompass approximately 1,050 square statute miles and the vertical extent would be from 500 feet AGL to, but not including 8,000 feet MSL. As shown in **Table 3.3-2**, 5,719 aircraft transited the proposed Vance 1E Low MOA from August 2023 through July 2024 (38 percent civilian operators [37 percent by general aviation], 14 percent military, and 48 percent unknown operators). Overall, there was an average of 16 crossings per day (6 IFR and 10 VFR) in the airspace. Further, the busiest traffic periods occurred between 10:00 a.m. and 4:00 p.m., with an average of 1 to 2 aircraft crossings per hour. Alternative 1 would add 1,170 flight operations per year in the airspace within the proposed Vance 1E Low MOA, an increase of just over 20 percent. T-38C sorties would include one to four aircraft in the proposed Low MOA at a time. Should Alternative 1 be selected for implementation, pilots approved to operate in the proposed MOA would be responsible for remaining within the assigned area. The supporting controlling agency, per letter of agreement determination, may assist with providing radar advisory service, workload permitting, to aid pilots in remaining in the assigned areas.

Existing aircraft crossings within the proposed airspace total 16 per day or 1 to 2 crossings per hour during the busiest traffic periods. These operations are easily accommodated by the airspace and controllers at Vance ATC and FAA. The proposed Vance 1E Low MOA would also likely accommodate all the aircraft traffic that would result if Alternative 1 were to be implemented; resulting in about 19 flights per day, based on 365 days, or 29 flights per day based on 240 T-38C flying days per year. On average, approximately 2 to 3 aircraft would be in the Vance 1E Low MOA per hour during the busiest traffic periods (with the maximum estimated to be 6 aircraft per hour in cases when four T-38Cs would use the airspace at the same time). Civilian aircraft operators would continue to conduct most of the crossings in the airspace. Based on size and the number of hourly and daily crossings, the proposed Vance 1E Low MOA would be more than adequate to absorb the additional traffic flow associated with Alternative 1.

The FAA considers airspace nominal capacity to be the maximum demand per hour a controller can safely handle in a particular sector (FAA, 2025b). Airspace capacity measures could include the maximum number of aircraft entering an airspace sector in a given period or the maximum number of aircraft within an airspace sector in a given period. The capacity of an airspace changes routinely based on a variety of dynamic factors including weather, temporary restrictions, and sectorization (virtual division of airspace to balance controller workload with respect to traffic flows). While the capacity of the existing airspace may be able to absorb a 20 percent traffic increase due to Alternative 1, Vance ATC and FAA would review controller workload at the control centers to ensure the safe and efficient handling of this increase in traffic.

These assessments of the proposed Vance 1E Low MOA, based on the analysis of aircraft operations in the airspace between August 2023 and July 2024 (ATAC, 2025), suggest that it would have the size and capacity to accommodate the proposed additional air traffic. A third measure used to evaluate potential impacts on existing aviation activity is the potential for flight conflicts that could result from Alternative 1 when the Vance 1E Low MOA would be active. These conflicts could potentially cause IFR flights to be rerouted, with associated delays, or require schedule adjustments that may be impractical. However, these types of conflicts are routinely addressed throughout the NAS primarily through FAA procedural deconfliction (as would be the case for IFR flights requesting to cross the proposed Vance 1E Low MOA, if established, when it would be operational). A secondary means to resolve certain types of conflicts could involve some local operators making flight schedule adjustments. The potential for flight conflicts between military operations in the proposed Vance 1E Low MOA and existing civilian and military air traffic, and how these conflicts would be addressed, are described in the following sections.

Proposed Vance 1E Low MOA

As reported in **Table 3.3-3,** approximately 37 percent of the 5,719 crossings in the proposed Vance 1E Low MOA are IFR. This includes 1,736 of 2,098 civilian crossings (83 percent) and 328 of 829 military aircraft crossings (40 percent) flying IFR. Potential impacts on future flights in the proposed Vance 1E Low MOA would include all IFR flights that occur during the period expected to be scheduled daily by the 71 FTW (during daylight hours only; nominally 8:00 a.m. to 9:00 p.m. Monday through Friday and 2:00 p.m. to 6:00 p.m. Sunday, local time, but adjusting to a shorter period during the fall and winter months).

As established by FAA letter of agreement with Vance AFB and the 71 FTW, Vance ATC and FAA control centers would procedurally deconflict IFR traffic by restricting military operations by sector or by altitude band, as needed to route crossing air traffic through the remaining airspace. This would be the most efficient approach to deconflict IFR crossings from military operations in the proposed Vance 1E Low MOA. A less efficient alternative would be to reroute the IFR traffic, to the north or south, around the proposed Vance 1E Low MOA which could result in substantial delays for some flights. VFR traffic in the proposed Vance 1E Low MOA, if established, would continue to use “see and avoid” flying to prevent conflicts. FAA deconfliction of the IFR traffic in the proposed Vance 1E Low MOA would help to minimize impacts on air traffic and ensure that they would not be significant.

Special Use Airspace (Existing Vance 1A/1C/1D MOA)

Table 3.3-10 summarizes the existing crossings in the Vance 1A/1C/1D MOA as 61 percent VFR, 39 percent IFR, and 4 percent of the VFR crossings unknown. The IFR crossings, 60 percent by civilian operators and 40 percent by military operators, already require FAA procedural deconfliction with existing military operations in the Vance 1A/1C/1D MOA, using either airspace restrictions by sector or altitude band. Impacts on future air traffic in the existing Vance 1A/1C/1D MOA would potentially include all IFR flights that occur during the period scheduled daily by the 71 FTW (nominally 8:00 a.m. to 9:00 p.m. Monday through Friday and 2:00 p.m. to 6:00 p.m. Sunday, local time, but adjusting to a shorter period during the fall and winter months). These impacts would be substantially reduced via FAA procedural deconfliction. As such, impacts on air traffic in the existing Vance 1A/1C/1D MOA would not be significant.

Air Traffic Control-Assigned Airspace (Vance 1A/1C/1D ATCAA)

There were 18,097 existing crossings in the existing Vance 1A/1C/1D ATCAA **(Table 3.3-11)**, with 49 percent identified as civilian operators, 49 percent as military operators, and 2 percent unknown. The percentages of civilian and military crossings are similar to those reported for the Vance 1A/1C/1D MOA, though the percentage of IFR flights was not reported for the ATCAA. Regardless, it is expected that all future IFR flights in Vance 1A/1C/1D ATCAA would be handled using FAA deconfliction procedures, like the Vance 1A/1C/1D MOA, such that impacts on these flights would not be significant.

Local Civilian Airports with Flight Operations in the Proposed Vance 1E Low MOA

The three most prevalent determinable arrival and departure airports for civilian traffic transiting the proposed Vance 1E Low MOA during August 2023 through July 2024 were AVK, RVS, and GCK. The most prevalent local civilian airports operating within the ROI, under the proposed Vance 1E Low MOA were AVK, 42KS, and 4KS. Local airport traffic counts are associated with flight tracks that started or ended at one of these airports or these airports were listed in the flight plan; thus, there may be more unidentified flights landing or departing these airports for which radar data did not extend to the airport or for which flight plan data were not available.

Civilian traffic transiting the proposed low MOA includes medical helicopters landing/departing AVK, aircraft flying direct between GCK and TUL or RVS, and aircraft flying practice approaches to AVK. The helicopters primarily operated at or below 3,500 feet MSL. Most collegiate aircraft were Piper Cherokees, operating at VFR altitudes between 4,500 and 7,500 feet MSL. In addition, there are multiple private airfields operating in the vicinity of the proposed Vance 1E Low MOA that have aircraft departing that are not on flight plans and do not appear in the radar data. Therefore, the number of local airport IFR flights is not known; however, as stated above, approximately 83 percent of the 2,141 civilian crossings (1,773) were flying IFR, most of which would be from local airports.

These local airport IFR flights operating within the proposed Vance 1E Low MOA could be affected by Alternative 1 whereas VFR flights would continue to use “see and avoid” flying to prevent conflicts. Since the proposed Vance 1E Low MOA would typically be scheduled simultaneously with the existing higher altitude Vance 1A/1C/1D MOA and Vance 1A/1C/1D ATCAA, FAA procedural deconfliction of local airport IFR flights would occur by the same restricting of military flights to certain airspace sectors or altitude bands to provide available airspace for these local flights to cross the Low MOA. A 6 NM exclusion zone around AVK containing Class E airspace starting at 700 feet AGL would continue to be observed. Additionally, AVK, K77, Farney Field, May Field, K51, and 4KS would have a 3 NM MOA exclusion zone around them in compliance with FAA Order 7400.2 Section 25-1-4. As a result, potential impacts on local airport IFR operators would not be significant.

Military Airfields with Flight Operations in the Proposed Vance 1E Low MOA

Most of the military flights that crossed the proposed Vance 1E Low MOA, and were identified in the radar data analysis, originated from Vance AFB (35 percent), followed by AVK (3 percent). Of the total number of existing military aircraft crossings in the proposed Vance 1E Low MOA (829), 328 were IFR (40 percent) and 501 were VFR (60 percent). Deconfliction of the affected military (IFR) flights would be required when the proposed Vance 1E Low MOA would be active. As with civilian IFR flights, Vance ATC and FAA control centers would be required to perform procedural deconfliction of these transiting military IFR operations from active Vance 1E Low MOA operations. Some military IFR flights might also fly around the MOAs. The resulting potential impact on military airfield IFR operators would not be significant.

Military Training Routes that Cross the Proposed Vance 1E Low MOA

The five active MTRs that cross the proposed Vance 1E Low MOA (and the total number of annual operations on each) include IR-175 (140), IR-185 (258), VR-119 (89), SR-235 (43), and SR-253 (60). These MTR operations are a relatively low number of annual flight operations, compared with other existing flight activity in the proposed Vance 1E Low MOA. Annual operations on the MTRs are expected to remain about the same in the future, regardless of whether Alternative 1 is selected for implementation.

All five active MTRs have route ceilings well above the floor of the proposed Vance 1 E Low MOA (500 feet AGL), such that future operations on these routes have the potential to be affected by Alternative 1 if selected for implementation. However, VFR are used on three of these MTRs to prevent potential conflicts, and the low number of annual operations may offer some flexibility to schedule these MTRs during periods when the Vance 1E Low MOA is inactive. As such, deconfliction of these routes may not be required regularly; although should this become necessary, appropriate deconfliction procedures for aircraft operations in the MTRs and proposed Vance 1E Low MOA would need to be codified in an approved written agreement with Vance AFB scheduling authorities to schedule these operations safely and effectively, as required. Thus, potential impacts on MTR operations from Alternative 1 would not be significant.

3.3.3.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained and existing conditions would continue. The existing Vance 1A/1C/1D MOA and 1A/1C/1D ATCAA would continue to be used and their dimensions would remain unchanged. T-38C and T-1 operations in these airspace would remain about the same as existing conditions or potentially decrease. This would have no impact on airspace use or airspace management.

3.3.3.4 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Reasonably foreseeable future transportation projects summarized in **Appendix B** would occur entirely at ground level and would have no potential to contribute to cumulatively significant adverse effects on airspace management and use. The proposed recapitalization of T-7As at Vance AFB would result in the complete replacement of T-38Cs currently operating in the Vance Airspace Complex with T-7A aircraft (DAF, 2024a). Future operations of T-7As would be the same as those described for T-38Cs in the existing Vance 1A/1C/1D MOA and Vance 1A/1C/1D ATCAA **(Section 3.3.2)** and proposed Vance 1E Low MOA **(Section 2.1)**, if established. As such, impacts from future T-7A operations on airspace management and use would be the same as those described for Alternative 1 and would not be significant **(Section 3.3.3.2)**. As airspace demand in the region increases, the DAF would continue to coordinate with FAA and other managing agencies as needed to limit and minimize potential impacts on the NAS. Therefore, the Proposed Action would not contribute to significant adverse impacts on airspace management and use when considered with the potential effects from other reasonably foreseeable future actions listed in **Appendix B**.

3.4 Noise

3.4.1 Definition of the Resource

Military aircraft noise consists of sound events from subsonic flight operations, which occur in MOAs and are discussed in this section, and supersonic flight operations (when aircraft exceed the speed of sound and generate a sonic boom; no supersonic operations would occur under the Proposed Action). Several metrics are used to describe noise events. The primary metrics used for policy decisions, based on guidelines for aircraft noise compatibility, are cumulative, average day metrics including day-night average sound level (DNL or L_{dn}) and onset-rate adjusted monthly day-night average sound level (L_{dnmr}). Other supplemental metrics that are useful to characterize the noise environment in MOAs from individual military aircraft overflights are the maximum sound level (L_{max}) and sound exposure level (SEL). These noise metrics are briefly described in **Table 3.4-1**.

Table 3.4-1 Descriptions of Noise Metrics Used in the Noise Analysis

Noise Metric	Description
Maximum Sound Level (**L_{max}**)	L_{max} is the highest A-weighted sound level measured during a single event in which the sound changes with time. L_{max} is the maximum level that occurs over a fraction of a second. L_{max} is important in determining if a noise event will interfere with conversation, television or radio listening, or other common activities. Although it provides some measure of the event, it does not fully describe the noise because it does not account for how long the sound is heard.
Sound Exposure Level (SEL)	SEL combines both the intensity of a sound and its duration into a single metric. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in 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 a few seconds, the SEL of an overflight is usually greater than the L_{max} of the overflight.

Table 3.4-1 Descriptions of Noise Metrics Used in the Noise Analysis

Noise Metric	Description
Equivalent Sound Level (L_{eq})	Equivalent Sound Level (L_{eq}) is a "cumulative" metric that combines a series of noise events over a period of time. L_{eq} is the sound level that represents the decibel average sound exposure level (SEL) of all sounds in the time period. Just as SEL has proven to be a good measure of a single event, L_{eq} has proven to be a good measure of series of events during a given period.
Day-Night Average Sound Level (DNL or L_{dn})	DNL is a cumulative metric that accounts for all noise events in a 24-hour period. A 10-decibel (dB) penalty is applied to events during the nighttime period (defined as 10:00 p.m. to 7:00 a.m.) to account for the increased sensitivity of humans to noise occurring at night.
Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr})	L_{dnmr} is a cumulative daily noise metric devised to account for the "surprise" effect of the sudden onset of aircraft noise events on humans associated with the sporadic nature aircraft operations in training and operational airspace. Onset rates between 15 and 150 dB per second require an adjustment of 0 to 11 dB to the event's SEL while onset rates below 15 dB per second require no adjustment to the event's SEL (Stusnick et al., 1992).

L_{dn} and L_{dnmr} are the primary noise metrics used in this noise analysis. Aircraft operations in the proposed Vance 1E Low MOA would include flights at altitudes as low as 500 feet AGL and airspeeds of up to 425 knots (489 miles per hour). Analysis has shown that, for most flight conditions, L_{dnmr} is the same as L_{dn} or only 0.1 to 0.2 dB higher for a few flight conditions in the proposed Vance 1E Low MOA due to the onset rate penalty. L_{max} and SEL are used to characterize noise that would result from individual T-38C, F-16C, and T-7A aircraft overflights in the MOAs. Noise metrics presented in this EA were calculated using the MR_NMAP (Lucas and Calamia, 1997) and (Ikelheimer and Downing, 2013), NOISEMAP (Czech and Plotkin, 1998), and NMPLot (Wasmer and Maunsell, 2024a, 2024b) software and are reported as A-weighted decibels (dBA). The dBA unit, an expression of the relative loudness of sounds as perceived by the human ear, is used to better represent and characterize human perception of and sensitivity to sound. Detailed information regarding noise metrics, noise models, and other acoustic principles is provided in **Appendix C.2**.

This analysis considers noise levels associated with current T-38C and T-1A operations in the existing Vance 1A, 1C, and 1D MOAs and T-6A operations in the Vance 1 B MOA, which represent existing conditions; noise levels associated with proposed future operations of T-38C, T-1A, and Oklahoma ANG F-16C aircraft under the Proposed Action; and T-7A operations replacing T-38C operations under reasonably foreseeable future conditions (see **Section 3.4.3.4**). Flight operations on MTRs that cross the existing Vance 1A, 1C, and 1D MOAs are also included in this noise analysis. This analysis focuses on the military aircraft that regularly utilize the Vance 1A, 1C, and 1D MOAs and ATCAA; other civilian and military aircraft that fly through these airspace, however, were not modeled because most are small aircraft which generate lower noise levels, have limited modeling data available, and do not regularly fly at lower altitudes such that they would be difficult to model and would have a negligible effect on noise.

The noise ROI consists of airspace within and lands below the proposed Vance 1E Low MOA and parts of the existing Vance 1A, 1C, and 1D MOAs and ATCAA.

3.4.2 Affected Environment

3.4.2.1 Background Noise Levels

Background noise levels were estimated for areas under the Vance 1A, 1C, and 1D MOAs using the methods in American National Standard Institute – *Quantities and Procedures for Description and Measurement of Environmental Sound Part 3: Short-Term Measurements with an Observer Present* which provides estimated background noise levels for different land use categories. **Table 3.4-2** shows the levels (DNL and L_{eq}) estimated for rural or remote areas for several different categories of suburban and urban residential land use which can be used to represent background levels occurring under the Vance 1A, 1C, and 1D MOAs and surrounding areas (i.e., observed levels not including aircraft flights or other identifiable noise sources). Land areas under the Vance 1A, 1C, and 1D MOAs are mostly rural but include several small towns and cities. These populated areas have relatively low levels of ambient noise, and background sound levels without aircraft normally do not exceed 45 dBA L_{eq} in the daytime, or 39 dBA L_{eq} at night. Background sound levels are typically lower in rural areas and much lower in remote areas. According to these estimates, many of the remote areas under the Vance 1A, 1C, and 1D MOAs would be expected to have a DNL less than 49 dBA while active parts of the cities of Alva, Oklahoma and Medicine Lodge, Kansas would be expected to have a DNL in the range of 50 to 55 dBA.

Table 3.4-2 Estimated Background Sound Levels

Land Use Category	DNL Range (dBA)	Typical DNL (dBA)	L_{eq}	
			Daytime	Nighttime
Normal suburban residential	50-55	52.0	50.0	44.0
Quiet suburban residential	45-50	47.0	45.0	39.0
Rural residential	<45	42.0	40.0	34.0
Rural/Remote	<45	<42	<40	<34

3.4.2.2 Vance 1A, 1B, 1C, and 1D MOAs

The primary source of noise within the existing Vance 1A, 1B, 1C, and 1D MOAs is aircraft operations. Existing annual operations include T-38C (10,714), T-1A (3,169), and T-6A (28,487) in the Vance 1A, 1C, and 1D (and 1B) MOAs as summarized in **Table 3.4-3**. Over 99 percent of these operations occur annually in the MOA during the daytime period (defined as 7:00 a.m. to 10:00 p.m. for the purposes of this analysis using DNL). Sixty percent of all T-38C operations in the Vance 1A, 1C, and 1D MOAs occur between 8,000 feet MSL and FL180 with the remaining 40 percent occurring in the ATCAA; 80 percent of T-1A flights occur between 8,000 feet MSL and FL180 and 20 percent occur in the ATCAA; and 80 percent of T-6A flights occur between 7,000 feet MSL and FL180 and the remaining 20 percent occur in the ATCAA. These operations and their associated average airspeeds, power settings, time in airspace, and altitudes are the primary inputs to the noise models used in this analysis.

Table 3.4-3 Summary of Existing T-38C, T-1A, and T-6A Operations in the Vance 1A, 1B, 1C, and 1D MOAs (2024)

Vance 1A MOA Operations			
	Aircraft	**T-38C**	**T-1A**
	Number of Day[1] Sorties	3,201	619
	Number of Night[2] Sorties	13	1
	Time in Airspace per Sortie (minutes)	45	90
Altitude Utilization (feet MSL)			
	0-7,999	0%	0%
Existing Vance 1A MOA	8,000-9,000	10%	20%
	9,000-12,000	10%	20%
	12,000-15,000	20%	20%
	15,000-FL180	20%	20%
ATCAA	FL180-FL210	20%	10%
	FL210-FL240	20%	10%
Vance 1B MOA Operations			
	Aircraft	**T-6A**	
	Number of Day[1] Sorties	28,383	
	Number of Night[2] Sorties	104	
	Time in Airspace per Sortie (minutes)	40	
Altitude Utilization (feet MSL)			
	0-6,999	0%	
Existing Vance 1A MOA	7,000-9,000	40%	
	9,000-12,000	20%	
	12,000-15,000	10%	
	15,000-FL180	10%	
ATCAA	FL180-FL210	10%	
	FL210-FL240	10%	
Vance 1C MOA Operations			
	Aircraft	**T-38C**	**T-1A**
	Number of Day[1] Sorties	7,441	2,509
	Number of Night[2] Sorties	4	8
	Time in Airspace per Sortie (minutes)	45	90
Altitude Utilization (feet MSL)			
	0-7,999	0%	0%
Existing Vance 1A MOA	8,000-9,000	10%	20%
	9,000-12,000	10%	20%
	12,000-15,000	20%	20%
	15,000-FL180	20%	20%
ATCAA	FL180-FL210	20%	10%
	FL210-FL240	20%	10%
Vance 1D MOA Operations			
	Aircraft	**T-38C**	**T-1A**
	Number of Day[1] Sorties	49	30
	Number of Night[2] Sorties	6	2
	Time in Airspace per Sortie (minutes)	45	90

Table 3.4-3 Summary of Existing T-38C, T-1A, and T-6A Operations in the Vance 1A, 1B, 1C, and 1D MOAs (2024)

Altitude Utilization (feet MSL)			
	0-7,999	0%	0%
Existing Vance 1A MOA	8,000-9,000	10%	20%
	9,000-12,000	10%	20%
	12,000-15,000	20%	20%
	15,000-FL180	20%	20%
ATCAA	FL180-FL210	20%	10%
	FL210-FL240	20%	10%

Notes:
[1] Daytime hours are defined as 7:00 a.m. to 10:00 p.m. local time for the purposes of this analysis using DNL.
[2] Nighttime hours are defined as 10:00 p.m. to 7:00 a.m. local time for the purposes of this analysis using DNL.

Table 3.4-4 shows cumulative noise levels from existing T-38C, T-1A and T-6A operations in the Vance 1A, 1B, 1C, and 1D MOAs and existing T-38C, T-1A, T-6A, and F-16C operations on existing MTR segments underlying each MOA (such that noise on the ground from both MOA and MTR operations would be additive). The estimated L_{dn} and L_{dnmr} for the existing Vance 1A, 1B, 1C, and 1D MOAs and each MTR segment is less than 35 dBA (the lower limit for MOAs reported by the MR_NMAP program is 35 dBA; additional information on the MR_NMAP program is provided in **Appendix C.2**). As shown in **Table 3.4-4**, estimated cumulative aircraft noise levels do not exceed 65 dBA under any part of the existing Vance 1A, 1B, 1C, and 1D MOAs and therefore, do not exceed the threshold for compatibility of aircraft noise with underlying land uses. Estimated total noise levels, reported as less than 35 dBA in **Table 3.4-4**, are primarily due to existing high-altitude flight operations in the MOAs **(Table 3.4-3)** and the low number of annual aircraft operations in each MTR **(Appendix C.2.2.3)**.

Table 3.4-4 Estimated Cumulative Noise Levels in the Vance 1A, 1B, 1C, and 1D MOAs from Existing Aircraft Operations in the MOAs and MTRs

Aircraft	MTR Segment and Aircraft	Vance 1A MOA		MTRs		Total (MOA+MTRs)	
		L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)
T-38C, T-1A, and T-6A	IR-145 A-C (T-38C and T-1A)	<35[2]	<35	<35	<35	< 35	<35
	IR-175 A-B (T-38C and T-1A)			<35	<35	<35	<35
	IR-185 I-K (T-38C and T-1A)			<35	35	<35	<35
	SR-235 E-G and SR-253 A-C (T-1A,T-6A)			<35	<35	<35	<35
Aircraft	**MTR Segment and Aircraft**	**Vance 1B MOA**		**MTRs**		**Total (MOA+MTRs)**	
		L_{dn} (dBA)	**L_{dnmr} (dBA)**	**L_{dn} (dBA)**	**L_{dnmr} (dBA)**	**L_{dn} (dBA)**	**L_{dnmr} (dBA)**
T-38C, T-1A, and T-6A	IR-175 H-I (T-38C and T-1A)	<35	<35	<35	<35	<35	<35
	IR-185 A-B (T-38C and T-1A)			<35	<35	<35	<35
	VR-119 A-C (T-38C, T-1A, T-6A, and F-16C)			<35	<35	<35	<35
	SR-235 A-B and SR-253 F-G (T-1A, T-6A)			<35	<35	<35	<35

Table 3.4-4 Estimated Cumulative Noise Levels in the Vance 1A, 1B, 1C, and 1D MOAs from Existing Aircraft Operations in the MOAs and MTRs

Aircraft	MTR Segment and Aircraft	Vance 1C MOA		MTRs		Total (MOA+MTRs)	
		L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)
T-38C, T-1A, and T-6A	IR-145 B-D, E-H (T-38C and T-1A)	<35	<35	<35	<35	<35	<35
	IR-175 A-H (T-38C and T-1A)			<35	<35	<35	<35
	IR-185 B-E, G-K (T-38C and T-1A)			<35	<35	<35	<35
	SR-235 B-F and SR-253 B-F (T-1A, T-6A)			<35	<35	<35	<35
Aircraft	**MTR Segment and Aircraft**	**Vance 1D MOA**		**MTRs**		**Total (MOA+MTRs)**	
		L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)
T-38C, T-1A, T-6A, and F-16C	IR-175 G1-I (T-38C and T-1A)	<35	<35	<35	<35	<35	<35
	IR-185 B-C (T-38C and T-1A)			<35	<35	<35	<35
	VR-119 B-D (T-38C, T-1A, T-6A, and F-16C)			<35	<35	<35	<35
	SR-235 B-C and SR-253 E-F (T-1A, T-6A)			<35	<35	<35	<35

Notes:
[1] Daytime hours are defined as 7:00 a.m. to 10:00 p.m. local time for the purposes of this analysis using DNL.
[2] MR_NMAP reports 35 dBA as the lower limiting noise level for MOAs and <35 dBA for MTRs and specific points. All levels are reported here as <35 dBA.

Potential noise-sensitive receptors underlying or near the existing Vance 1A, 1C, and 1D MOAs that overly the proposed Vance 1E Low MOA are listed in **Table 3.4-5** and shown on **Figure 3.4-1**. The numbers shown on **Figure 3.4-1** correspond to the numbers listed in **Table 3.4-5**. As with the estimated cumulative noise levels shown in **Table 3.4-4**, estimated cumulative noise levels from existing T-38C, T-1A, T-6A, and F-16C operations at potential noise-sensitive receptors listed in **Table 3.4-5** are less than 35 dBA and do not exceed the 65 dBA compatibility threshold for underlying land uses.

Table 3.4-5 Estimated Noise Levels from Existing T-38C, T-1A, T-6A, and F-16C Operations at Potential Noise-Sensitive Receptors Under or Near the Vance 1A, 1C, and 1D MOAs

Potential Noise-Sensitive Receptor	ID[1]	Latitude (degrees)	Longitude (degrees)	L_{dn} (dBA)	L_{dnmr} (dBA)
City of Medicine Lodge, KS	1	37.281125	-98.580358	<35	<35
Medicine Lodge Peace Treaty Site, KS	2	37.267932	-98.550578	<35	<35
Barber State Fishing and Wildlife Area, KS	3	37.301583	-98.581744	<35	<35
Gerlane, KS	4	37.150399	-98.549367	<35	<35
Corwin, KS	5	37.086079	-98.304192	<35	<35
Town of Hazelton, KS	6	37.090466	-98.400098	<35	<35
City of Kiowa, KS	7	37.016990	-98.485108	<35	<35
Stubbs, KS	8	37.015584	-98.567504	<35	<35
Town of Hardtner, KS	9	37.013720	-98.649270	<35	<35
Eldred, KS	10	37.050251	-98.766882	<35	<35
Town of Burlington, OK	11	36.901781	-98.424690	<35	<35
Town of Capron, OK	12	36.896801	-98.577696	<35	<35
Cedar Grove Wesleyan Church / Winchester OK	13	36.942769	-98.833265	<35	<35
Northwestern Oklahoma State University / Alva OK	14	36.796751	-98.668101	<35	<35
Tegarden, OK	15	36.797697	-98.970221	<35	<35

Table 3.4-5 Estimated Noise Levels from Existing T-38C, T-1A, T-6A, and F-16C Operations at Potential Noise-Sensitive Receptors Under or Near the Vance 1A, 1C, and 1D MOAs

Potential Noise-Sensitive Receptor	ID[1]	Latitude (degrees)	Longitude (degrees)	L_{dn} (dBA)	L_{dnmr} (dBA)
City of Freedom, OK	16	36.769773	-99.113107	<35	<35
Town of Avard, OK	17	36.698127	-98.789156	<35	<35
Hopeton Wesleyan Church, Hopeton, OK	18	36.686743	-98.666033	<35	<35

Notes:
[1] ID = Sensitive receptor identification number; numbers listed here correspond to those shown on **Figure 3.4-1**.

Individual Overflight Noise

Noise from individual overflights is considered here, in addition to DNL, to more completely describe the noise environment from existing military aircraft operations in the Vance 1A, 1C, and 1D MOAs. While DNL is used to assess land use compatibility for airfield and airspace actions, the FAA and DAF support the use of supplemental metrics, typically based on L_{max} or SEL, to describe other potential noise effects such as hearing loss, sleep and speech interference, and structural damage. Supplemental metrics are useful to assess the noise impacts of airfield flight activity, and particularly for airspace flight activity. This is because the DNL or average noise exposure tends to be lower, due to flight operations being spread throughout the airspace, whereas individual overflights can generate potentially higher noise levels at sensitive receptors, particularly for direct overflights. The NOISEMAP program was used to calculate L_{max} and SEL for individual overflights beneath the Vance 1A, 1C, and 1D MOAs to assess the potential for causing speech or sleep interference to more fully understand the potential noise effects. Structural damage from aircraft flight events is more typically caused by supersonic flights that generate sonic booms with peak overpressures above 2 pounds per square foot, rather than from subsonic flight events. Since there are no supersonic flight operations in the Vance 1A, 1C, and 1D MOAs, the potential for structural damage is low.

Hearing Loss

Considerable data on hearing loss have been collected and analyzed by the scientific and medical communities, and it has been well established that continuous exposure to high noise levels will damage human hearing. People exposed to high noise environments may experience temporary or permanent hearing loss; those exposed over a long period of time are at an increased risk of experiencing permanent hearing loss. While various government organizations have defined noise thresholds based on L_{eq}, to protect workers from noise exposure during their lifetime working period (40 hours per week over 40 years), the DoD uses a screening threshold for residences of DNL 80 dB to ensure a conservative approach to assessing the potential for hearing loss (DNWG, 2012). If residences are identified within the DNL 80 dB exposure area, then additional analysis should be performed using L_{eq}. Estimates of DNL, made under the Vance 1A, 1C, and 1D MOAs, indicate that existing operations on the MOA and MTRs that cross the MOA are well below the DNL threshold for potential hearing loss.

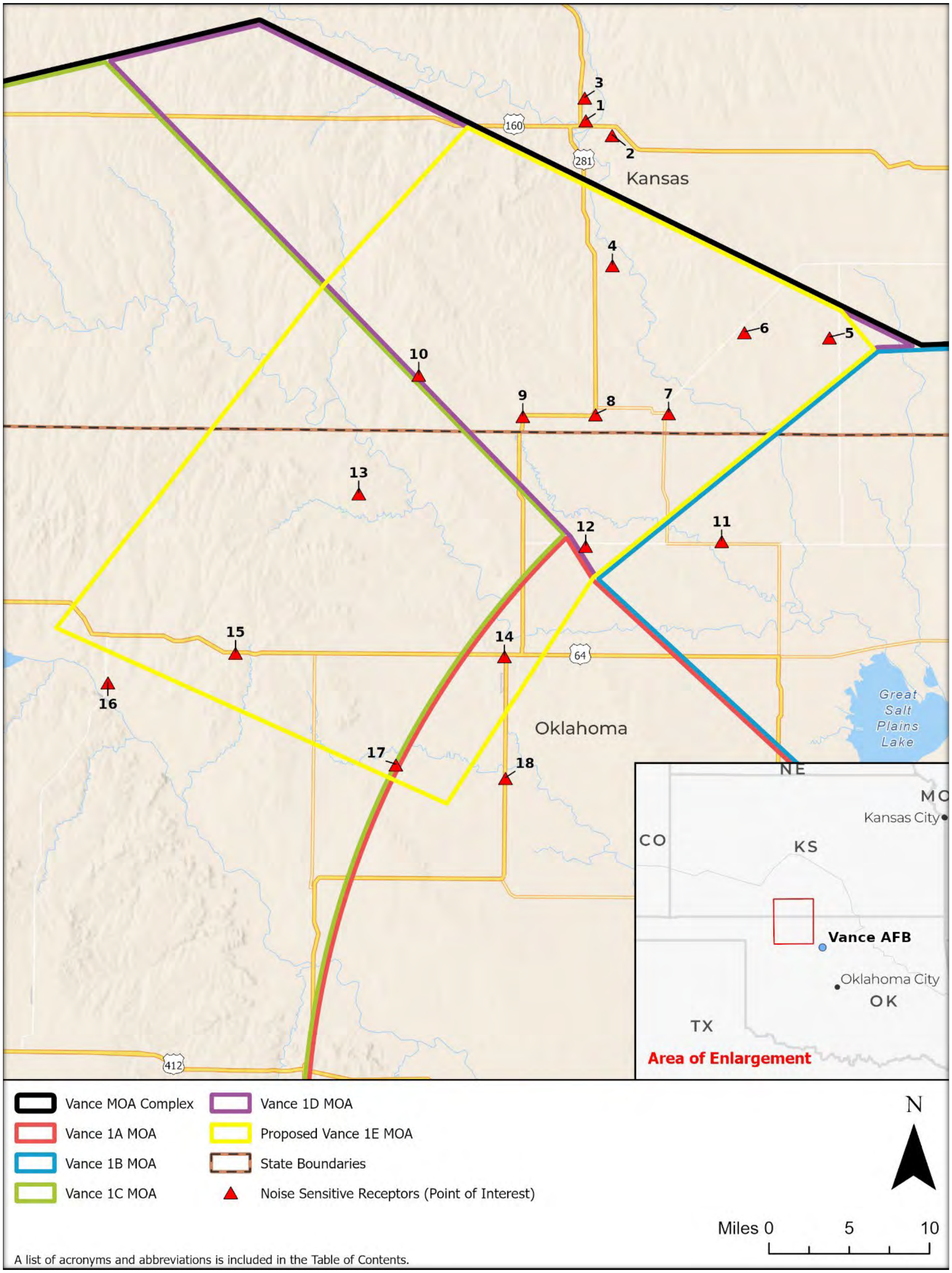


Figure 3.4-1 Potential Noise-Sensitive Receptors Under or Near the Existing Vance Airspace Complex and Proposed Vance 1E Low MOA

Additionally, the Occupational Safety and Health Administration and Air Force Occupational Safety and Health guidelines are intended to protect human hearing from long-term, continuous exposures to high noise levels and aid in the prevention of noise-induced hearing loss. Both guidelines have permissible daily noise exposure limits including a L_{max} of 115 dBA for a duration of 15 minutes or less. This level and duration indicate when a hearing conservation program should be implemented at a given site. As shown in **Table 3.4-6**, overflights in the Vance 1A, 1C, and 1D MOAs, individually or together, are not expected to exceed 115 dBA for 15 minutes or longer on any given day.

Table 3.4-6 Estimated Noise Levels for Existing T-38C and T-1A Overflights in the Vance 1A, 1C, and 1D MOAs at Various Altitudes

Altitude (feet MSL)	T-38C		T-1A	
	L_{max} [1] (dBA)	SEL [1] (dBA)	L_{max} [1] (dBA)	SEL [1] (dBA)
8,000	55.7	65.1	46.8	55.0
12,000	47.5	57.1	37.6	46.4
15,000	42.8	52.4	32.5	42.2

Notes:
[1] Noise levels (L_{max} and SEL) were calculated using NOISEMAP.

Table 3.4-6 shows estimated single event noise levels (L_{max} and SEL), directly under the flight path, for T-38C and T-1A aircraft at representative altitudes in the existing Vance 1A, 1C, and 1D MOAs from 8,000 feet MSL up to 15,000 feet MSL. For each altitude, the estimated SEL values are higher than the L_{max} values as the SEL includes both the overflight noise levels and the event duration. For both metrics, estimated noise levels are loudest for aircraft at an altitude of 8,000 feet MSL (that is, the floor of the existing Vance 1A, 1C, and 1D MOAs) and levels decrease accordingly at higher altitudes. **Table 3.4-6** shows the expected range of levels estimated to occur for T-38C and T-1A overflights in the Vance 1A, 1C, and 1D MOAs with the highest levels including L_{max} of 55.7 dBA and SEL of 65.1 dBA. Overflights above 8,000 feet MSL in the MOAs are audible to individuals on the ground, but do not normally interfere with communication at ground level. Note that flight paths would typically be distributed within the MOA such that these highest overflight levels, estimated directly under the flight path, would not be expected to occur repeatedly at a single location on the ground.

Noise generated by aircraft within the boundaries of the Vance 1A, 1C, and 1D MOAs is occasionally audible in areas beyond the MOA boundaries. Military aircraft assigned to operate in a MOA utilize onboard mapping tools which assist them in avoiding flying too close to the MOA boundary to decrease the potential of an aircraft “spill out” (military aircraft unintentionally and temporarily flying beyond the airspace boundaries) which, should such an event occur, could cause noise events to be heard outside the MOA boundary. However, loud overflight noise events are experienced less frequently outside the MOA boundary, than within the boundary, and are limited to some extent by the higher altitudes being flown. In general, people would need to be within about 5 miles of a military aircraft overflight to hear it clearly above the ambient noise levels.

Speech Interference

In general, low- to mid-altitude aircraft overflights (e.g., below 1,000 feet AGL to several thousand feet AGL) can interfere with communication on the ground, and in homes, schools or other buildings directly under their flight path. The disruption of routine activities in the home, such as radio or television listening, telephone use, or family conversation, can cause annoyance. 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. The threshold at which aircraft noise may begin to interfere with speech and communication is established at 75 dBA outdoors (DNWG, 2012) which corresponds to roughly 50 dBA indoors assuming 25 dB of structural noise reduction. This level is consistent with the thresholds outlined in the ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools*. None of the individual overflight levels shown in **Table 3.4-6** exceed L_{max} 75 dBA; therefore, speech interference on the ground, is not expected due to the existing overflights in the Vance 1A, 1C, and 1D MOAs.

Sleep Interference

Sleep interference is another source of annoyance associated with louder low altitude aircraft overflights. This is especially true due to the intermittent nature of aircraft noise, which can be more disturbing than continuous noises. Sleep disturbance is not just a factor of the loudness, but also the duration, of each noise event; therefore, sleep disturbance is best reflected with the SEL metric, which captures the total energy (i.e., level and duration) of each noise event. The Federal Interagency Committee on Aviation Noise (FICAN) recommends the use of the following SEL-based relationship for assessing potential sleep disturbance caused by aircraft noise (FICAN, 1997):

$$\text{Awakenings} = 0.0087 \times (\text{SEL}-30)^{1.79}$$

The above relationship, which defines the FICAN 1997 curve, should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened", or the "maximum % awakened" for a given residential population. This relationship predicts that 10 percent awakenings would occur to people exposed to an indoor SEL of 80 dB and less than 5 percent awakenings would occur to people exposed to an indoor SEL of 60 dBA. Existing T-38C or T-1A aircraft activities on the Vance 1A, 1C, and 1D MOAs are conducted between 10:00 p.m. and 7:00 a.m. below one percent of the time in most cases and the outdoor SELs for these overflight operations **(Table 3.4-6)** are expected to be less than SEL 65 dBA and indoor SELs would be 15 to 25 dB lower depending on housing construction; therefore, sleep interference during nighttime hours is not anticipated.

3.4.3 Environmental Consequences

3.4.3.1 Evaluation Criteria

Potential impacts from noise associated with the Proposed Action would be beneficial if the number of sensitive receptors exposed to unacceptable noise levels is reduced. Adverse impacts would occur if noise associated with the Proposed Action permanently exceeded the 65 dBA cumulative noise threshold below which most types of land use are compatible.

The FAA defines a threshold for significant noise impacts as an increase in noise by 1.5 dB DNL or more in a noise sensitive area that is exposed to noise at or above the 65 dB DNL noise exposure level, or that will be exposed at or above the 65 dB DNL level due to a 1.5 dB or greater increase, when compared to the No Action Alternative for the same timeframe (FAA Order 1050.1).

For airspace actions, FAA requires that an action proponent identify where noise will change by the following specified amounts in noise sensitive areas (FAA Order 1050.1):

- For DNL 65 dB and higher: +/- DNL 1.5 dB (significant)
- For DNL 60 dB to <65 dB: +/- DNL 3 dB (reportable)
- For DNL 45 dB to <60 dB: +/- DNL 5 dB (reportable)

Per FAA Order 1050.1, a noise sensitive area is defined as an area where noise interferes with normal activities associated with its use. Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, cultural and historical sites, and parks, recreational areas, wilderness areas, and wildlife refuges. The FAA recognizes that there are settings where the 65 dB DNL standard for land use compatibility may not apply. These areas would likely be areas of extreme quiet, very rural areas, or natural areas with little human activity, such as wilderness areas or other protected natural areas.

The primary effect of recurring aircraft noise on exposed communities is long-term annoyance. The scientific community has adopted the use of long-term annoyance as a primary indicator of community response because it attempts to account for all negative aspects of effects from noise, including sleep disturbance, speech interference, and distraction from other human activities. Attitudinal surveys conducted over the past 30 years show a consistent relationship between DNL and the percentages of people who express annoyance. DNL estimates for the existing Vance 1A, 1C, and 1D MOAs and proposed Vance 1E Low MOA addressed in this EA can be evaluated using **Table 3.4-7** to provide an estimate of the percentage of the population that would be "highly annoyed" by the noise.

Table 3.4-7 Relationship of DNL to Human Annoyance

DNL (dBA)	Highly Annoyed (percent)
45	0.83
50	1.66
55	3.31
60	6.48
65	12.29
70	22.10

3.4.3.2 Alternative 1 - Establish Low-Altitude MOA Under Portions of Existing Vance 1A, 1C, and 1D MOAs

Proposed T-38C, T-1A, and F-16C operations on the Vance 1A, 1C, and 1D MOAs and proposed Vance 1E Low MOA are summarized in **Table 3.4-8**. T-38C low-altitude air-to-ground training operations were analyzed with the T-1A and F-16C training operations and using the flight parameters shown in **Table 3.4-9**.

Table 3.4-8 Proposed Flight Operations in the Vance 1A, 1C, 1D, and 1E MOAs

Aircraft	Annual Operations (Sorties)[1]			Time in Airspace per Sortie (minutes)
	MOA	Day (7:00 a.m. to 10:00 p.m. local)	Night (10:00 p.m. to 7:00 a.m. local) [2]	
T-38C	Vance 1A, 1C, and 1D (High) MOAs	9,995	5	35
	Vance 1E Low MOA	1,170	0	35
	Total	**11,165**	**5**	
T-1A	Vance 1A, 1C, and 1D (High) MOAs	615	5	90
	Vance 1E Low MOA	0	0	0
	Total	**615**	**5**	
F-16C	Vance 1A, 1C, and 1D (High) MOAs	24	0	120
	Vance 1E Low MOA	288	0	38
	Total	**312**	**0**	

Notes:
[1]One annual operation is one sortie flying the MOA.
[2]No FBF training operations are proposed in the Vance 1E Low MOA after 9:00 p.m. local time. However, a small number of nighttime operations in the existing Vance Airspace Complex were modeled for the noise analysis to account for T-38C and T-1A aircraft transiting to or from the Vance 1E Low MOA outside of proposed operating hours (see **Section 2.1**).

T-38C annual operations would consist of 1,170 daytime flights in the Vance 1E Low MOA and 9,995 daytime and 5 nighttime flights in the Vance 1A, 1C, and 1D (High) MOAs. T-1A annual operations would consist of 615 daytime and 5 nighttime operations in the High MOAs and F-16C annual operations would consist of 288 daytime flights in the Vance 1E Low MOA and 24 daytime flights in the Vance 1A, 1C, and 1D (High) MOAs. These operations and associated average airspeeds, power settings, time in airspace, and altitudes are the primary inputs to the noise models used in this analysis.

Table 3.4-9 Altitude Band Utilization for Proposed Flight Training Operations in the Vance 1A, 1C, 1D, and 1E MOAs and ATCAA

Altitude Band Utilization		T-38C Training Operations	T-1A Training Operations	F-16C Training Operations
Number of Proposed Sorties		11,170	620	312
Percent of Low MOA Sorties		10	0	92
Altitude Utilization (percent)				
Proposed Vance 1E Low MOA	500 to 1,000 feet AGL	20	0	25
	1,000 to 2,000 feet AGL	55	0	25
	2,000 to 3,000 feet AGL	16	0	25
	3,000 to 5,000 feet AGL	5	0	25
	5,000 AGL to 7,999 feet MSL	4	0	0
Existing Vance 1A, 1C, and 1D MOAs	8,000 to 12,000 feet MSL	30	40	30
	12,000 to 15,000 feet MSL	30	20	30
	15,000 to FL180 feet MSL	35	20	35
ATCAA	FL180 to FL280 feet MSL	5	10	5

Estimated cumulative noise levels (L_{dn} and L_{dnmr}) from proposed aircraft operations in the Vance 1E Low MOA and Vance 1A, 1C, and 1 D (High) MOAs under Alternative 1, and estimated noise levels from aircraft operations on MTR segments that cross the Vance 1E Low MOA and Vance High MOAs, would not exceed 47 dBA **(Table 3.4-10)**. Estimated noise levels from aircraft operations in the MTR segments would not contribute to the overall noise level under the Vance 1E Low and Vance High MOAs. Areas under the proposed Vance 1E Low MOA would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise. However, all noise level changes in **Table 3.4-10** involving the Vance 1E Low MOA range from 11.5 dBA to 11.6 dB. These changes (increases) in noise levels from Alternative 1 would be considered “reportable” but not significant in accordance with FAA Order 1050.1.

Table 3.4-10 Estimated Cumulative Noise Levels Under the Vance 1A, 1C, 1D, and 1E MOAs from Proposed Aircraft Operations

Aircraft	Vance 1E Low MOA, Vance 1A, 1C, and 1D MOAs, and ATCAA		MTRs			Total		Change		FAA Determination of Impact in Noise Sensitive Areas
	L_{dn} dBA	L_{dnmr} (dBA)	MTR/ Segment	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	
T-38C, T-1A, and F-16C	46.2	46.3	IR-145	<35	<35	46.5	46.6	>11.5	>11.6	Reportable
			IR-175	<35	<35	46.5	46.6	>11.5	>11.6	Reportable
			IR-185	<35	<35	46.5	46.6	>11.5	>11.6	Reportable
			VR-119	<35	<35	46.5	46.6	>11.5	>11.6	Reportable
			SR-235 and SR-253	<35	<35	46.5	46.6	>11.5	>11.6	Reportable
			High MOAs/ATCAA Levels Only			35.0	35.0	0.0	0.0	Not Significant

Estimated noise levels from proposed aircraft operations that would occur at potential noise-sensitive receptors under or near the Vance 1E Low MOA and Vance 1A, 1B, 1C, and 1D MOAs under Alternative 1 are presented in **Table 3.4-11**. The receptor locations are shown on **Figure 3.4-2**. These estimated noise levels would not exceed 46.3 dBA at any potential noise-sensitive receptor and would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise. All noise level changes at the noise sensitive receptors in **Table 3.4-11** would range from 5.5 dBA to 11.3 dB (and potentially greater than these values) compared with the existing noise levels in **Table 3.4-5**; no noise level changes would occur at the receptors located well outside the Vance 1E Low MOA boundary (including the cities of Medicine Lodge, Kansas and Freedom, Oklahoma). Most of the changes (increases) in noise levels due to the Proposed Action, compared with the No Action alternative, would be considered “reportable” but not significant in accordance with FAA Order 1050.1.

The number of aircraft operations in the MOAs would show an increase under Alternative 1, relative to the No Action Alternative, and noise levels would increase primarily due to the addition of low-altitude T-38C (primary user) and F-16C operations in the proposed Vance 1E Low MOA. However, noise from proposed aircraft operations under Alternative 1 would not be expected to temporarily or permanently impede or prevent the continued occupation of any land use underlying the Vance 1E Low MOA and Vance 1A, 1C, and 1D MOAs and associated ATCAA. Therefore, long-term impacts from noise under Alternative 1 would not be adverse.

Table 3.4-11 Estimated Noise Levels from Proposed T-38C, T-1A and F-16C Operations at Potential Noise-Sensitive Receptors Under or Near the Vance 1A, 1C, 1D, and 1E MOAs

Potential Noise-Sensitive Receptor	ID[1]	L_{dn} (dBA)	L_{dnmr} (dBA)	Change		FAA Determination of Impact in Noise Sensitive Areas
				L_{dn} (dBA)	L_{dnmr} (dBA)	
City of Medicine Lodge, KS	1	<35	<35	0.0	0.0	Not significant
Medicine Lodge Peace Treaty Site, KS	2	<35	<35	0.0	0.0	Not significant
Barber State Fishing and Wildlife Area, KS	3	<35	<35	0.0	0.0	Not significant
Gerlane, KS	4	46.3	46.3	>11.3	>11.3	Reportable
Corwin, KS	5	46.2	46.2	>11.2	>11.2	Reportable
Town of Hazelton, KS	6	46.3	46.3	>11.3	>11.3	Reportable
City of Kiowa, KS	7	40.7	40.7	>5.7	>5.7	Not significant
Stubbs, KS	8	40.7	40.7	>5.7	>5.7	Not significant
Town of Hardtner, KS	9	46.3	46.3	>11.3	>11.3	Reportable
Eldred, KS	10	46.3	46.3	>11.3	>11.3	Reportable
Town of Burlington, OK	11	<35	<35	0.0	0.0	Not significant
Town of Capron, OK	12	46.2	46.2	>11.2	>11.2	Reportable
Cedar Grove Wesleyan Church / Winchester OK	13	46.2	46.3	>11.2	>11.2	Reportable
Northwestern Oklahoma State University / Alva OK	14	40.5	40.5	>5.5	>5.5	Not significant
Tegarden, OK	15	46.2	46.3	>11.2	>11.3	Reportable
City of Freedom, OK	16	<35	<35	0.0	0.0	Not significant
Town of Avard, OK	17	45.1	45.2	>10.1	>10.1	Not significant
Hopeton Wesleyan Church, Hopeton, OK	18	<35	<35	0.0	0.0	Not significant

Notes:
[1] ID = Sensitive receptor identification number

Under Alternative 1, estimated L_{max} and SEL values for proposed T-38C and F-16C operations in the Vance 1E Low and Vance High MOAs would be highest at altitudes of 500 feet AGL and would decrease accordingly at higher altitudes **(Table 3.4-12)**. T-1A aircraft would only fly at higher altitudes (above 8,000 feet MSL) generating lower levels than most of the examples provided in **Table 3.4-12**. Estimated SEL values for each aircraft are somewhat higher at each representative altitude, relative to the corresponding L_{max} values, because SEL includes both the overflight noise levels and the event duration. Note that the noise levels estimated in **Table 3.4-12** are based on different airspeed and power settings, for both aircraft, for low-altitude and high-altitude flight conditions. Flight paths for each aircraft would typically be distributed across the MOAs such that these highest overflight levels (estimated directly under the flight path) would not be expected to occur repeatedly at a single location on the ground.

Table 3.4-12 Estimated Noise Levels from Proposed Aircraft Overflights in the Vance 1A, 1C, 1D, and 1E MOAs at Various Altitudes

Proposed Aircraft Overflights	Altitude (feet)							
	500 AGL	1,000 AGL	5,000 MSL	8,000 MSL	500 AGL	1,000 AGL	5,000 MSL	8,000 MSL
	L_{max} (dBA)[1]				SEL (dBA)[1]			
T-38C Low-Altitude Air-to-Ground Training and High MOA Training	91.3	83.4	66.8	55.7	94.7	88.6	74.7	65.1
F-16C Low and High MOA Training	110.6	103.2	87.6	50.3	113.2	107.6	94.8	61.7

Notes:
[1] Noise levels (L_{max} and SEL) shown in this table were calculated using NOISEMAP.

Individual noise events from proposed aircraft operations under Alternative 1 would be heard at various locations under the Vance 1E Low MOA and Vance 1A, 1C, and 1D MOAs. However, most annual training flights would occur in the High MOA at high altitudes; approximately eighty-eight percent of annual T-38C, T-1A, and F-16C flights (10,644 of 12,102) would occur in the Vance 1A, 1C, and 1D MOAs, at altitudes above 8,000 feet MSL. Most of the flights would therefore not be expected to cause annoyance or disrupt common activities any more than typical everyday events (e.g., automobile noise, lawn mowing, other civil aircraft flyovers). Of the remaining flights in the proposed Vance 1E Low MOA under the Proposed Action, individual noise events would occasionally be heard, though flight paths in the proposed Vance 1E Low MOA (like the Vance 1A, 1C, and 1D MOAs) would typically be distributed throughout the airspace such that the highest expected overflight levels would not occur repeatedly, at a single location on the ground. Noise from individual military overflights within the boundaries of the Vance 1E Low MOA would increase due to the requirements for low altitude training. Most of the noise generated by T-38C and F-16C aircraft would be contained within the Vance 1E Low MOA boundary. Additionally, military aircraft would typically avoid flying too close to the MOA boundary to decrease the potential of an aircraft “spill out” (military aircraft unintentionally and temporarily flying beyond the airspace boundaries) which, should such an event occur, could cause noise events to be heard outside the Low MOA boundary. No residences were identified within the DNL 80 dB exposure area, such that Proposed Action noise levels would be below the DNL threshold for potential hearing loss.

Table 3.4-12 indicates L_{max} values of up to 91 dB for individual T-38C low-altitude training flights, and up to 111 dB for F-16C training flights. However, these values, individually or cumulatively throughout the day, would not be expected to exceed 115 dB for the associated permitted exposure duration of 15 minutes. As such, overflights in the Vance 1E Low MOA, and Vance 1A, 1C, and 1D MOAs, and MTRs, individually or together, would not have the potential to cause hearing loss.

These same aircraft, however, would be loud enough to occasionally interfere with speech occurring indoors, such as in residences or schools. Direct overflights from T-38C and F-16C activity on the low MOA would generate levels that exceed L_{max} 75 dBA **(Table 3.4-12)**, such that, occasionally, speech interference would occur. Any such interference would be brief due to the short nature of these events (planes flying at hundreds of miles per hour). Due to the low number of proposed nighttime flight operations, sleep interference during nighttime hours is not anticipated. Flights would also be dispersed throughout the Vance Low and High MOAs, limiting the number of overflights of a particular area on the ground.

3.4.3.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained, and existing conditions would continue. The existing Vance 1A, 1C, and 1D MOAs would continue to be used and their dimensions would remain unchanged; thus having no adverse impact on noise.

3.4.3.4 Reasonably Foreseeable Future Actions and Other Environmental Consequences

Reasonably foreseeable actions, which are summarized in **Appendix B** and include the proposed T-7A recapitalization at Vance AFB, could result in short-term and long-term impacts from noise. The proposed recapitalization of the T-7A at Vance AFB would involve the one-for-one replacement of T-38C aircraft with T-7A aircraft as defined in the EIS that is currently being prepared separately from this EA (DAF, 2024a). This analysis assumes that under reasonably foreseeable conditions, T-7As would perform the same training activities in the proposed Vance 1E Low MOA and the existing Vance 1A, 1C, and 1D (High) MOAs that are described for T-38Cs under Alternative 1 **(Section 3.4.3.2)**.

Proposed T-7A, T-1A, and F-16C operations on the Vance 1A, 1C, and 1D MOAs and proposed Vance 1E Low MOA are summarized in **Table 3.4-13**. Proposed T-7A low-altitude air-to-ground training operations were analyzed with the T-1A and F-16C training operations and using the flight parameters shown in **Table 3.4-14**.

Table 3.4-13 Reasonably Foreseeable Annual Flight Operations in the Vance 1A, 1C, 1D, and 1 E MOAs

Aircraft	Annual Operations (Sorties)[1]			Time in Airspace per Sortie (minutes)
	MOA	Day (7:00 a.m. to 10:00 p.m. local)	Night (10:00 p.m. to 7:00 a.m. local) [2]	
T-7A	Vance 1A, 1C, and 1D (High) MOAs	9,995	5	35
	Vance 1E Low MOA	1,170	0	35
	Total	**11,165**	**5**	
T-1A	Vance 1A, 1C, and 1D (High) MOAs	615	5	90
	Vance 1E Low MOA	0	0	0
	Total	**615**	**5**	
F-16C	Vance 1A, 1C, and 1D (High) MOAs	24	0	120
	Vance 1E Low MOA	288	0	38
	Total	**312**	**0**	

Notes:
[1]One annual operation is one sortie flying the MOA.
[2]No FBF training operations are proposed in the Vance 1E Low MOA after 9:00 p.m. local time. However, a small number of nighttime operations in the existing Vance Airspace Complex were modeled for the noise analysis to account for T-38C and T-1A aircraft transiting to or from the Vance 1E Low MOA outside of proposed operating hours (see **Section 2.1**).

Table 3.4-14 Altitude Band Utilization for Reasonably Foreseeable Flight Training Operations in the Vance 1A, 1C, 1D, and 1E MOAs and ATCAA

Altitude Band Utilization		T-7A Training Operations	T-1A Training Operations	F-16C Training Operations
Number of Proposed Sorties		11,170	620	312
Percent of Low MOA Sorties		10	0	92
Altitude Utilization (percent)				
Proposed Vance 1E Low MOA	500 to 1,000 feet AGL	20	0	25
	1,000 to 2,000 feet AGL	55	0	25
	2,000 to 3,000 feet AGL	16	0	25
	3,000 to 5,000 feet AGL	5	0	25
	5,000 AGL to 7,999 feet MSL	4	0	0
Existing Vance 1A, 1C, and 1D MOAs	8,000 to 12,000 feet MSL	30	40	30
	12,000 to 15,000 feet MSL	30	20	30
	15,000 to FL180 feet MSL	35	20	35
ATCAA	FL180 to FL280 feet MSL	5	10	5

Proposed T-7A annual operations would consist of 1,170 daytime flights in the Vance 1E Low MOA and 9,995 daytime and 5 nighttime flights in the Vance 1A, 1C, and 1D (High) MOAs. T-1A annual operations would consist of 615 daytime and 5 nighttime operations in the High MOAs and F-16C annual operations would consist of 288 daytime flights in the Vance 1E Low MOA and 24 daytime flights in the Vance 1A, 1C, and 1D (High) MOAs. These operations and associated average airspeeds, power settings, time in airspace, and altitudes are the primary inputs to the noise models used in this analysis.

Accounting for the proposed use of T-7As in lieu of T-38Cs, estimated cumulative noise levels (L_{dn} and L_{dnmr}) from proposed aircraft operations in the Vance 1E Low MOA and Vance 1A, 1C, and 1 D (High) MOAs, and estimated noise levels from aircraft operations on MTR segments that cross the Vance 1E Low MOA and Vance High MOAs, would not exceed 50 dBA **(Table 3.4-15)**. Estimated noise levels from aircraft operations in the MTR segments would contribute minimally (0.1 – 0.2 dB in addition to the MOA noise levels) to the overall noise level under the Vance 1E Low and Vance High MOAs. Areas under the proposed Vance 1E Low MOA would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise. However, all noise level changes in **Table 3.4-15** involving the Vance 1E Low MOA range from 13.2 dBA to 14.7 dBA. These changes (increases) in noise levels due to the proposed use of T-7As in lieu of T-38Cs, compared with the No Action alternative, would be considered “reportable” but not significant in accordance with FAA Order 1050.1.

Table 3.4-15 Estimated Cumulative Noise Levels Under the Vance 1A, 1C, 1D, and 1E MOAs from Reasonably Foreseeable Future Aircraft Operations

Aircraft	Vance 1E Low MOA, Vance 1A, 1C, and 1D MOAs, and ATCAA		MTRs			Total		Change		FAA Determination of Impact in Noise Sensitive Areas
	L_{dn} dBA)	L_{dnmr} (dBA)	MTR/ Segment	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	
T-7A, T-1A, and F-16C	49.4	49.5	IR-145	35.1	35.1	49.6	49.7	>14.5	>14.6	Reportable
			IR-175	<35	<35	49.6	49.7	>14.6	>14.7	Reportable
			IR-185	36.4	36.4	49.6	49.7	>13.2	>13.3	Reportable
			VR-119	<35	<35	49.6	49.7	>14.6	>14.7	Reportable
			SR-235 and SR-253	<35	<35	49.6	49.7	>14.6	>14.7	Reportable
			High MOAs / ATCAA Levels Only			<37.0	<37.0	<2.0	<2.0	Not Significant

Estimated noise levels from proposed aircraft operations that would occur at potential noise-sensitive receptors under or near the Vance 1E Low MOA and Vance 1A, 1B, 1C, and 1D MOAs, accounting for the proposed use of T-7As in lieu of T-38Cs, are presented in **Table 3.4-16**. The receptor locations are shown on **Figure 3.4-1**. These estimated noise levels would not exceed 50 dBA at any potential noise-sensitive receptor and would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise. All noise level changes at the noise sensitive receptors in **Table 3.4-16** would range from 2.1 dBA to 14.7 dBA (and potentially greater than these values) compared with the existing noise levels in **Table 3.4-5**; no noise level changes would occur at the receptors located well outside the Vance 1E Low MOA boundary (including the cities of Medicine Lodge, Kansas and Freedom, Oklahoma). Most of the changes (increases) in noise levels associated with the proposed use of T-7As in lieu of T-38Cs under reasonably foreseeable future conditions would be considered "reportable" but not significant in accordance with FAA Order 1050.1.

Table 3.4-16 Estimated Noise Levels from Reasonably Foreseeable T-7A, T-1A, and F-16C Operations at Potential Noise-Sensitive Receptors Under or Near the Vance 1A, 1C, 1D, and 1E MOAs

Potential Noise-Sensitive Receptor	ID[1]	L_{dn} (dBA)	L_{dnmr} (dBA)	Change		FAA Determination of Impact in Noise Sensitive Areas
				L_{dn} (dBA)	L_{dnmr} (dBA)	
City of Medicine Lodge, KS	1	<35	<35	0.0	0.0	Not significant
Medicine Lodge Peace Treaty Site, KS	2	<35	<35	0.0	0.0	Not significant
Barber State Fishing and Wildlife Area, KS	3	<35	<35	0.0	0.0	Not significant
Gerlane, KS	4	49.7	49.7	>14.7	>14.7	Reportable
Corwin, KS	5	49.6	49.7	>14.6	>14.7	Reportable
Town of Hazelton, KS	6	49.7	49.7	>14.7	>14.7	Reportable
City of Kiowa, KS	7	44.2	44.2	>9.2	>9.2	Not significant
Stubbs, KS	8	44.2	44.2	>9.2	>9.2	Not significant

Table 3.4-16 Estimated Noise Levels from Reasonably Foreseeable T-7A, T-1A, and F-16C Operations at Potential Noise-Sensitive Receptors Under or Near the Vance 1A, 1C, 1D, and 1E MOAs

Potential Noise-Sensitive Receptor	ID[1]	L_{dn} (dBA)	L_{dnmr} (dBA)	Change		FAA Determination of Impact in Noise Sensitive Areas
				L_{dn} (dBA)	L_{dnmr} (dBA)	
Town of Hardtner, KS	9	49.7	49.7	>14.7	>14.7	Reportable
Eldred, KS	10	49.6	49.6	>14.6	>14.6	Reportable
Town of Burlington, OK	11	37.1	37.1	>2.1	>2.1	Not significant
Town of Capron, OK	12	49.5	49.6	>14.5	>14.6	Reportable
Cedar Grove Wesleyan Church / Winchester OK	13	49.5	49.5	>14.5	>14.5	Reportable
Northwestern Oklahoma State University / Alva OK	14	43.5	43.5	>8.5	>8.5	Not significant
Tegarden, OK	15	49.5	49.6	>14.5	>14.6	Reportable
City of Freedom, OK	16	<35	<35	0.0	0.0	Not significant
Town of Avard, OK	17	48.4	48.4	>13.4	>13.4	Reportable
Hopeton Wesleyan Church, Hopeton, OK	18	<35	<35	0.0	0.0	Not significant

Notes:
[1] ID = Sensitive receptor identification number; numbers correspond to those shown on **Figure 3.4-1**.

The number of aircraft operations in the MOAs would show an increase under reasonably foreseeable future conditions, relative to the No Action Alternative, and noise levels would increase primarily due to the addition of low-altitude T-7A (primary user) and F-16C operations in the proposed Vance 1E Low MOA. However, noise from proposed aircraft operations under reasonably foreseeable future conditions would not be expected to temporarily or permanently impede or prevent the continued occupation of any land use underlying the Vance 1E Low MOA and Vance 1A, 1C, and 1D MOAs and associated ATCAA. Therefore, long-term impacts from noise under reasonably foreseeable future conditions would not be significant.

Under reasonably foreseeable future conditions, estimated L_{max} and SEL values for proposed T-7A and F-16C operations in the Vance 1E Low and Vance High MOAs would be highest at altitudes of 500 feet AGL and would decrease accordingly at higher altitudes **(Table 3.4-17)**. T-1A aircraft would only fly at higher altitudes (above 8,000 feet MSL) generating lower levels than most of the examples provided in **Table 3.4-17**. Estimated SEL values for each aircraft are somewhat higher at each representative altitude, relative to the corresponding L_{max} values, because SEL includes both the overflight noise levels and the event duration. Note that the noise levels estimated in **Table 3.4-17** are based on different airspeed and power settings, for both aircraft, for low-altitude and high-altitude flight conditions. Flight paths for each aircraft would typically be distributed across the MOAs such that these highest overflight levels (estimated directly under the flight path) would not be expected to occur repeatedly at a single location on the ground.

Table 3.4-17 Estimated Noise Levels from Reasonably Foreseeable Aircraft Overflights in the Vance 1A, 1C, 1D, and 1E MOAs at Various Altitudes

Proposed Aircraft Overflights	Altitude (feet)							
	500 AGL	1,000 AGL	5,000 MSL	8,000 MSL	500 AGL	1,000 AGL	5,000 MSL	8,000 MSL
	L_{max} (dBA)[1]				SEL (dBA)[1]			
T-7A Low-Altitude Air-to-Ground Training and High MOA Training	104.7	97.4	81.5	69.1	106.6	101.2	88.0	77.4
F-16C Low and High MOA Training	110.6	103.2	87.6	50.3	113.2	107.6	94.8	61.7

Notes:
[1] Noise levels (L_{max} and SEL) shown in this table were calculated using NOISEMAP.

Individual noise events from proposed aircraft operations under reasonably foreseeable future conditions would be heard at various locations under the Vance 1E Low MOA and Vance 1A, 1C, and 1D MOAs. However, most annual training flights would occur in the High MOAs at high altitudes; approximately 88 percent of annual T-7A, T-1A, and F-16C flights (10,644 of 12,102) would occur in the Vance 1A, 1C and 1D MOAs, at altitudes above 8,000 feet MSL. Most of the proposed flights would therefore not be expected to cause annoyance or disrupt common activities any more than typical everyday events (e.g., automobile noise, lawn mowing, other civil aircraft flyovers). Of the remaining flights in the proposed Vance 1E Low MOA under reasonably foreseeable future conditions, individual noise events would occasionally be heard, though flight paths in the proposed Vance 1E Low MOA (like the Vance 1A, 1C, and 1D MOAs) would typically be distributed throughout the airspace such that the highest expected overflight levels would not occur repeatedly, at a single location on the ground. Noise from individual military overflights within the boundaries of the proposed Vance 1E Low MOA would increase due to the requirements for low altitude training. Most of the noise generated by T-7A and F-16C aircraft would be contained within the proposed Vance 1E Low MOA boundary. Additionally, military aircraft would typically avoid flying too close to the MOA boundary to decrease the potential of an aircraft “spill out” (military aircraft unintentionally and temporarily flying beyond the airspace boundaries) which, should such an event occur, could cause noise events to be heard outside the Low MOA boundary. No residences were identified within the DNL 80 dB exposure area, such that noise levels associated with reasonably foreseeable future conditions would be below the DNL threshold for potential hearing loss.

Table 3.4-17 indicates L_{max} values of up to 105 dB for individual T-7A low-altitude training flights, and up to 111 dB for F-16C training flights under reasonably foreseeable future conditions. However, these values, individually or cumulatively throughout the day, would not be expected to exceed 115 dB for the associated permitted exposure duration of 15 minutes. As such, overflights in the proposed Vance 1E Low MOA, and Vance 1A, 1C, and 1D MOAs, and MTRs, individually or together, would not have the potential to cause hearing loss.

These same aircraft, however, would be loud enough to occasionally interfere with speech occurring indoors, such as in residences or schools. Direct overflights from T-7A and F-16C activity on the low MOA would generate levels that exceed L_{max} 75 dBA **(Table 3.4-17)**, such that, occasionally, speech interference would occur. Such interference would be short in duration due to the brief nature of these events (jet aircraft traveling at hundreds of miles per hour). Due to the low number of proposed nighttime flight operations, sleep interference during nighttime hours is not anticipated. Flights would also be dispersed throughout the Vance Low and High MOAs, limiting the number of overflights of a particular area on the ground.

Reasonably foreseeable transportation projects listed in **Appendix B** could result in short-term and long-term impacts from noise. These impacts would vary based on the location of the noise source, duration and intensity of the noise that would be generated, and proximity to potential listeners. None of the transportation projects listed in **Appendix B** would establish a new permanent source of noise; elevated noise levels associated with these projects would occur during demolition and construction activities, would be highly localized, and would end when construction activities are completed. Through project planning and design, coordination with applicable regulatory agencies, and in accordance with applicable regulatory requirements, these projects would incorporate BMPs and other measures to prevent or minimize excessive noise and ensure impacts from noise would not be significant. Therefore, the Proposed Action would not contribute to significant adverse impacts from noise considered with the potential effects from other reasonably foreseeable future actions listed in **Appendix B**.

3.5 Land Use

3.5.1 Definition of Resource

The term "land use" generally refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. Land use descriptions are often codified in local zoning laws; however, no nationally recognized convention or uniform terminology has been adopted for describing land use categories. As a result, the meanings of various land use descriptions, labels, and definitions vary among jurisdictions.

The land use ROI consists of lands below the proposed Vance 1E Low MOA **(Figure 3.5-1)**. These lands are within portions of Alfalfa and Woods Counties in Oklahoma and Barber and Harper Counties in Kansas.

3.5.2 Affected Environment

Given the large geographic area within the ROI, data from the U.S. Geological Survey's (USGS) National Land Cover Database (USGS, 2024) was used to characterize existing land use. Although more generalized than locality-specific land use data, the National Land Cover Database data is generally indicative of existing land use conditions and appropriate to characterize potential impacts from the Proposed Action at this scale of analysis.

The land use ROI contains approximately 1,056,001 acres of land. Land use categories within the ROI are summarized in **Table 3.5-1** and shown on **Figure 3.5-1**. Lands categorized as Grassland/Herbaceous (674,837.7 acres) and Cultivated Crops (330,280.5 acres) represent approximately 95 percent of land within the ROI. Less than 4 percent of land in the ROI is categorized as developed, while lands categorized as Open Water, Barren, Forest, and Wetlands each represent less than 1 percent of lands in the ROI.

Table 3.5-1 Land Cover Types in the ROI

Land Cover Type	Area (acres)	Percent of ROI
Open Water	2,816.4	0.27
Developed	40,176.1	3.8
Barren Land	278.4	0.03
Forest	4,093.5	0.4
Shrub/Scrub and Grassland/Herbaceous	675,181.0	63.9
Cultivated Crops	330,280.5	31.3
Wetlands	3,175.3	0.3
Total	**1,056,001.2**	**100.0**

Source: USGS, 2024

Lands in the ROI are sparsely developed, with a population density of less than 10 persons per square mile **(Section 3.10)**. Cities with larger concentrations of development are primarily within the eastern and north-central portions of the ROI. These cities are summarized in **Table 3.5-2** and shown on **Figure 3.5-2**.

Table 3.5-2 Cities in the ROI

City	County, State	Population
Hazelton	Barber County, Kansas	82
Kiowa	Barber County, Kansas	869
Hardtner	Barber County, Kansas	161
Alva	Woods County, Oklahoma	4,882

Source: League of Kansas Municipalities, 2024a; 2024b; 2024c;
Alva Chamber of Commerce, 2022

There are no national parks, national wildlife refuges, wildlife management areas, Native American reservations, or state parks within the ROI. At least three airports are within the ROI **(Figure 3.5-2)**; these are briefly described in **Table 3.5-3**.

Table 3.5-3 Airports in the ROI

Airport	Location (County, State)	Description
Alva Regional (AVK)	Woods County, Oklahoma	This airport is owned and operated by the City of Alva and is located immediately south of downtown. The airport has a single, approximately 5,000-foot-long concrete runway and supports IFR aircraft operations. Class E airspace associated with the airport has a floor of 700 feet AGL.
Farney Field Airport (42KS)	Barber County, Kansas	This airport is approximately 1.7 miles east of Kiowa, Kansas and is privately owned. It has an approximately 2,200-foot-long turf runway and supports VFR aircraft operations only.
Walz Airport (4KS)	Barber County, Kansas	This airport is approximately 5 miles northwest of Kiowa, Kansas and is privately owned. It has an approximately 2,000-foot-long dirt runway and supports VFR aircraft operations only.

Source: City of Alva, 2025; AirNav, 2025a; 2025b; 2025c

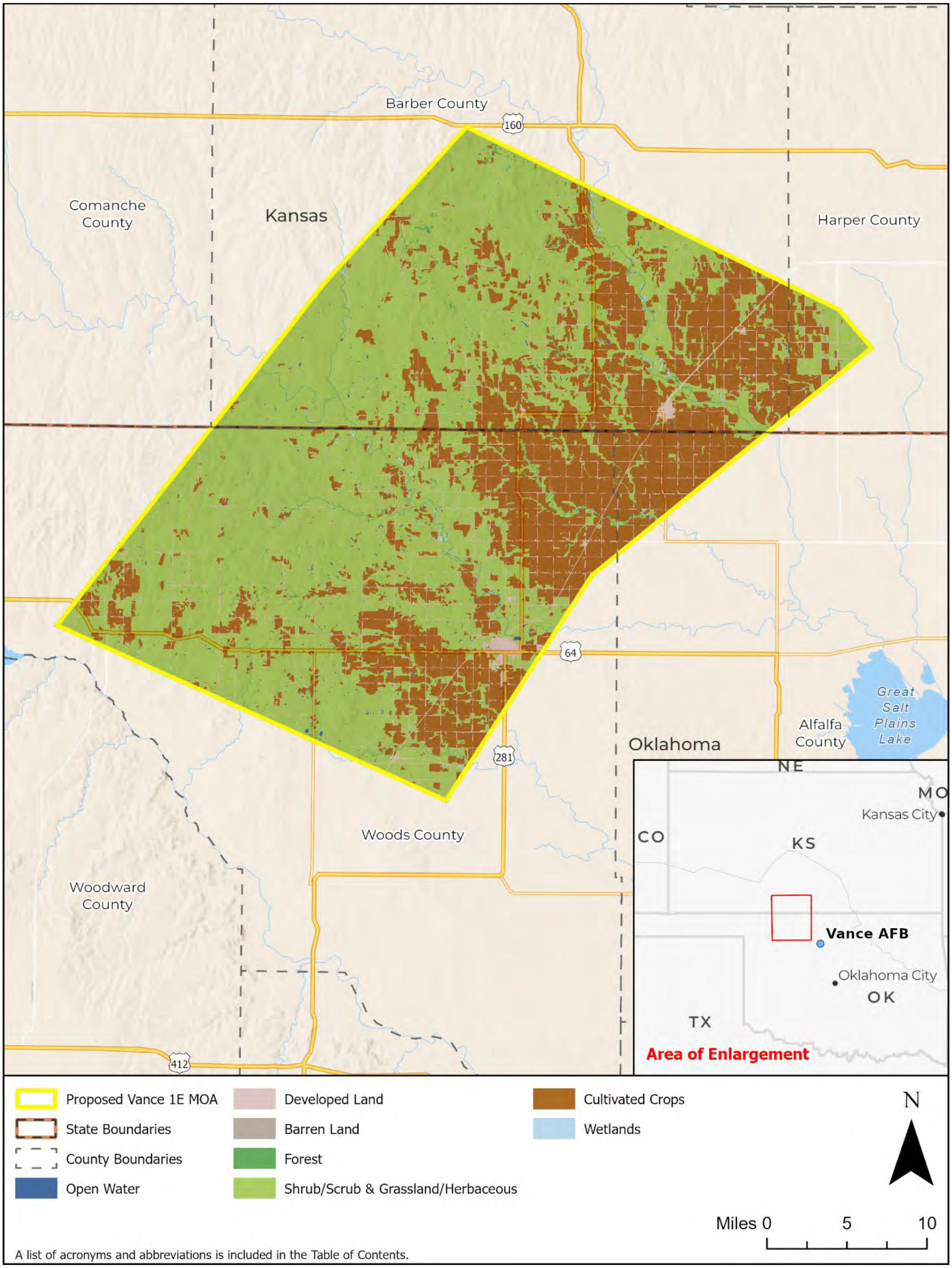


Figure 3.5-1 Existing Land Cover in the ROI

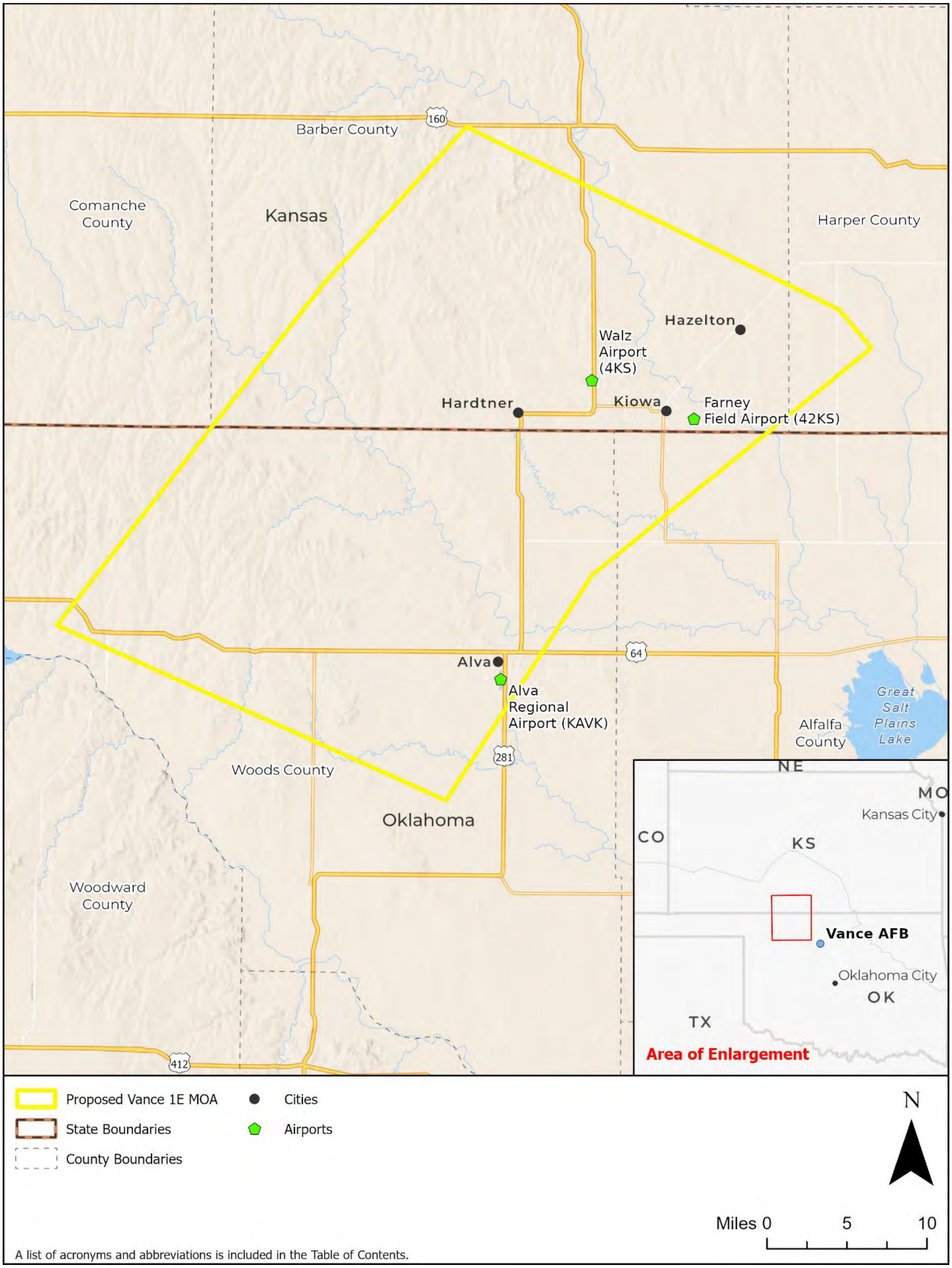


Figure 3.5-2 Cities and Airports in the ROI

Although not shown on Figure 3.5-1, oil and gas well sites are a prevalent land use in the ROI. More than 2,000 such sites are within the Oklahoma portion of the ROI and nearly 3,600 are within the Kansas portion, equating to a density of approximately 3.4 well sites per square mile (OOC, 2025; Kansas Geoportal, 2024). Of these, approximately 38 percent are considered active, while the remainder include those categorized as inactive or not explicitly identified as "active" or "producing" **(Table 3.5-4)**.

Table 3.5-4 Oil and Gas Well Sites in the ROI

Status	Kansas	Oklahoma	Total Well Sites	Percent
Active	949	1,148	2,097	37.5
Other[1]	2,624	865	3,489	62.5
Total	**3,573**	**2,013**	**5,586**	**100.0**

Notes:
[1] "Other" could include plugged and abandoned wells/sites; active or inactive injection wells; sites where permits were issued but wells were never constructed or operated; sites with expired permits; and sites for which the current status is categorized as unknown or could not otherwise be determined.
Source: OCC, 2025; Kansas Geoportal, 2024

The DAF identifies wind turbines, local airfields, airports, towers, and other vertical structures as avoidance areas that are factored into flight plans. The potential for overflight obstruction hazards is a shared concern for all aviation users, including the DoD, commercial, business, and general aviation users. As with any large vertical construction project, such as telecommunication towers or wind turbines, the DoD considers potential impacts of wind farm development on flight safety from obstructions introduced near DoD airfields, training ranges, and in areas used for military flight operations.

No utility-scale wind turbines are currently located in the ROI (USGS, 2025a). Areas where annual average wind speeds are at least 13 miles per hour are considered optimal for siting utility-scale turbines, which range from 500 feet to as high as 900 feet tall (USEIA, 2024). Annual average wind speeds in and around the ROI, modeled at 328 feet above the ground surface, vary from approximately 20 to 26 miles per second (USDOE, 2023).

The DoD is supportive of renewable energy where it is compatible with the DoD mission to test, train, and operate. The DAF is a member of the DoD Siting Clearinghouse established by Congress in January 2011 in Section 358 of the Ike Skelton National Defense Authorization Act for FY11 (Public Law 111-383). That authority was amended and codified in 2017 as 10 U.S.C. § 183a. The Clearinghouse provides a timely, transparent, and repeatable process that can evaluate potential impacts and explore mitigation options, while preserving the DoD mission through collaboration with internal and external stakeholders. In addition to the DoD Clearinghouse process, all structures constructed taller than 200 feet trigger a review from the FAA (through the Obstruction Evaluation / Airport, Airspace, Analysis process).

3.5.3 Environmental Consequences

3.5.3.1 Evaluation Criteria

Impacts on land use and recreational resources are evaluated to determine whether proposed activities would preclude or alter the suitability of an area for existing or planned uses. In general, potential impacts on land use would be considered significant if the proposed activities:

- Fail to comply with existing land use plans or policies.
- Undermine the viability of existing land uses.
- Prevent continued use or occupation of an area.
- Create incompatibility with adjacent land uses that threatens public health or safety.
- Conflict with planning criteria established to protect human life and property.

Recreational resources would be affected if proposed activities:

- Change the access to or availability of recreation sites or activities.
- Alter the characteristics of the area in a way that diminishes recreational opportunities.

3.5.3.2 Alternative 1

Establishment of the proposed Vance 1E Low MOA would be unlikely to result in development activities or population changes in the ROI that would require changes to existing or proposed land use patterns or be inconsistent with existing land use plans and policies. Aircraft operations in the proposed Vance 1E Low MOA would increase noise experienced at underlying land uses **(Section 3.4.3)** due to lowering the flight floor to 500 feet AGL; however, aircraft would not exceed supersonic speeds while operating within the proposed airspace. Cumulative noise levels from proposed aircraft operations under Alternative 1 would be similar to existing ambient noise conditions in the ROI and would not exceed the 65 dBA threshold below which most types of land use are compatible with aircraft noise. Of the operations in the proposed Vance 1E Low MOA under Alternative 1, individual noise events would be heard but would be distributed throughout the airspace such that the highest expected overflight levels would not occur repeatedly at a single location on the ground.

If Alternative 1 is selected for implementation and future development of utility-scale wind turbines is proposed on land in the ROI, the DoD would evaluate the turbine project and engage with the developer(s) through the DoD Siting Clearinghouse process to identify technically feasible and affordable mitigation measures to avoid flight obstruction impacts on proposed low-level aircraft operations. Much of the proposed MOA is already subject to DoD Siting Clearinghouse review because segments of six existing MTRs cross the airspace (see **Figure. 3.3-5**). Therefore, if Alternative 1 is selected for implementation, airspace within the proposed MOA would continue to be subject to DoD Siting Clearinghouse reviews. In most cases, the DoD Energy Siting Clearinghouse, through its mitigation response team process, finds a compromise where turbines can proceed under the airspace if proposed turbine locations are laterally relocated or through the implementation of other mitigation strategies. In the 13-year history of the DoD Energy Siting Clearinghouse process, only a few objections have been issued out of thousands of proposed wind farms.

Overall, Alternative 1 would be unlikely to require temporary or permanent changes to existing or proposed land uses, prevent the continued use and occupation of existing land uses, or result in incompatibilities with existing or planned land use plans and policies. Therefore, impacts on land use from Alternative 1 would not be significant.

3.5.3.3 No Action Alternative

Under the No Action Alternative, the proposed airspace would not be obtained, and existing conditions would continue. This would have no impact on land use.

3.5.3.4 Reasonably Foreseeable Future Actions and Other Environmental Consequences

Reasonably foreseeable future actions listed in **Appendix B** would have the potential to affect land use in the ROI. Noise from the operation of T-7As in the existing and proposed Vance MOAs could periodically be noticeable to listeners in the ROI. However, any such noise would not exceed 50 dBA, and all areas under the proposed Vance 1E Low MOA would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise **(Section 3.4.3.4)**. The construction of new facilities associated with the proposed recapitalization of T-7As at Vance AFB (DAF, 2024a) would occur entirely within the boundaries of the base and would have no potential to affect land use in the ROI.

Noise, construction, and traffic detours associated with transportation projects summarized in **Appendix B** could result in adverse effects on land use by causing annoyance to persons living or working nearby, or disrupting access to those land uses. However, any such effects would be intermittent, localized, avoided or minimized through applicable planning requirements and BMPs, and would end following the completion of those projects. None of the reasonably foreseeable future actions listed in **Appendix B** would be anticipated to permanently impede or prevent the continued operation or occupation of existing or planned land uses in the ROI, or result in permanent land use incompatibilities. Therefore, the Proposed Action would not contribute to significant adverse impacts on land use when considered with the potential effects from other reasonably foreseeable future actions listed in **Appendix B**.

3.6 Air Quality

3.6.1 Definition of Resource

Ambient air quality in a specified area or region is measured by the concentration of various pollutants in the atmosphere. Pollutant concentrations are affected by both the amount of pollutants in the atmosphere and the extent to which these pollutants can be transported and diluted in the air.

National Ambient Air Quality Standards

The Clean Air Act (CAA) authorizes the U.S. Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for select air pollutants, referred to as “criteria pollutants,” that are known to affect human health and the environment (40 CFR Part 50). Criteria pollutants regulated by the NAAQS consist of ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter, including particulates equal to or less than 10 microns in diameter (PM_{10}) and particulates equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb).

The USEPA has established Air Quality Control Regions (AQCRs) throughout the United States to evaluate compliance with the NAAQS. Regulatory areas within each AQCR that exceed the NAAQS for a pollutant are classified non-attainment for that pollutant. Regulatory areas where air pollutant concentrations are within an applicable NAAQS are designated attainment/unclassifiable for that NAAQS. Areas that have transitioned from nonattainment to attainment are designated as maintenance, and as such are required to follow requirements in the state's maintenance plans to ensure continued compliance with the NAAQS.

The air quality ROI consists of the four Oklahoma and Kansas counties that underlie the Vance 1A, 1C, and 1D MOAs and the AQCRs that contain these counties. These counties and associated AQCRs are listed in **Table 3.6-1**. Each of the AQCRs listed in **Table 3.6-1** are in attainment (or are unclassifiable) for each of the criteria pollutants regulated under the NAAQS (40 CFR 81.337 and 40 CFR 81.317).

Table 3.6-1 Counties and Associated AQCRs in the Air Quality ROI

State	County	AQCR
Kansas	Barber	Southwest Kansas Intrastate
	Harper	South Central Kansas Intrastate
Oklahoma	Alfalfa	Northwestern Oklahoma Intrastate
	Woods	

Air quality permits are not required for flight operations in airspace. Additionally, no new stationary sources of air emissions would be established under the Proposed Action; therefore, air quality permitting requirements are not applicable and are not addressed in this analysis.

Clean Air Act General Conformity

Under the CAA, the USEPA established the General Conformity rule (40 CFR Part 93), which applies to federal actions occurring in nonattainment or maintenance areas. Proposed federal actions are evaluated to determine if the total indirect and direct net emissions from those actions would be below de minimis levels (that is, too trivial or minor to merit consideration) for each of the pollutants as specified in 40 CFR § 93.153. If de minimis levels would not be exceeded for any of the pollutants, no further evaluation is required. Additional analysis would be required if net emissions from the proposed project would exceed the de minimis thresholds for one or more of the specified pollutants.

The CAA provides special protections for air quality in pristine areas of the country known as Class 1 areas. Class 1 areas include National Parks greater than 6,000 acres or National Wilderness Areas greater than 5,000 acres. Any deterioration of air quality, based on Prevention of Significant Deterioration (PSD) criteria established by USEPA, is considered significant in Class 1 areas. The USEPA has also established regional haze regulations that require states to make initial improvements in visibility within their Class 1 areas.

Greenhouse Gases

GHG are gases, occurring from natural processes and human activities, that trap heat in the atmosphere. GHG are generally not a concern to human health at normal ambient levels and can only potentially cause warming of the climatic system on a cumulative global scale. The USEPA regulates GHG emissions via permitting and reporting requirements that are applicable mainly to large stationary sources of emissions. GHG produced by fossil-fuel combustion are primarily carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). emissions. Emissions from GHG are typically quantified and expressed in terms of the CO_2 equivalents (CO_2e), which is a measure used to compare the emissions from various GHG based upon their Global Warming Potential (GWP). The GWP is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2. The larger the GWP, the more that a given gas warms the earth compared to CO_2 over the same time period. Analysts cumulatively compare emission estimates of different gases using standardized GWPs.

Detailed information on air quality regulations, general conformity, and GHG is provided in **Appendix C.3**.

3.6.2 Affected Environment

Regional Climate

The general climate conditions for Alva, in northwestern Oklahoma in Woods County, are classified as humid subtropical (this location was chosen to represent regional climate conditions in the ROI). Such areas are characterized by elevated temperatures with evenly distributed precipitation throughout the year. Summers generally tend to be hot and humid, while winters are cold and short. Typically, annual precipitation in the area results from very violent spring and early summer thunderstorms. The annual average temperature in Alva is 59.3 degrees Fahrenheit (°F). The warmest month, on average, is July with an average temperature of 82.7°F. The coolest month on average is January, with an average temperature of 35.5°F. The average amount of annual precipitation in Alva is 27.1 inches, with an annual average of 15.1 inches of snow (Weatherbase, 2024). The average hourly wind speed in Alva experiences mild seasonal variation over the course of the year. The windier part of the year lasts for nearly 3 months, March through May, with average wind speeds of more than 11.2 miles per hour. From June through February, the climate is calmer and less windy (Weatherspark, 2024).

Regional Air Quality

The counties underlying the proposed Vance 1E Low MOA are in attainment (or are unclassifiable) for each of the criteria pollutants regulated under the NAAQS (Air Conformity Applicability Model [ACAM], 2023). Therefore, the General Conformity Rule does not apply to the Proposed Action.

The proposed Vance 1E Low MOA would not be located within 100 kilometers (approximately 62 miles) of any USEPA-designated Class 1 areas protected by the Regional Haze Rule. No Class 1 areas would be affected by emissions associated with the Proposed Action.

Greenhouse Gases

Kansas's GHG emissions, based on a 5-year average (2016 through 2020), is reported to be 61.187 million metric tons a year (mton/yr) of CO_2e and Oklahoma's GHG emissions averaged over the same 5-year period is reported to be 95.844 million mton/yr of CO_2e (ACAM GHG emissions). Taken together, they represent approximately 3 percent of the total U.S. CO_2e emissions, which is reported to be 5,163 million mton/yr of CO_2e (ACAM GHG emissions).

3.6.3 Environmental Consequences

Jurisdictions within the ROI are in attainment (or are unclassifiable) for each of the criteria pollutants regulated under the NAAQS. As such, the General Conformity Rule is not applicable to emissions from the Proposed Action and is not addressed in this air quality analysis.

Estimated criteria pollutant emissions from the Proposed Action were compared against the insignificance indicator of 250 tons per year (tpy) (25 tpy for Pb) PSD major source permitting threshold for actions occurring in areas that are in attainment for all criteria pollutants (Air Force, 2020). These "Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts on air quality based on current ambient air quality relative to the NAAQS. These insignificance indicators do not define a significant impact; rather, they provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for a criteria pollutant indicates that the action would not cause or contribute to emissions that would exceed one or more of the NAAQS. Although PSD and Title V permit requirements are not applicable to mobile sources, the PSD major source thresholds provide a benchmark for the comparison of estimated emissions and description of potential impacts.

The ACAM Version 5.0.24a (ACAM, 2024) was used to estimate the total non-exempt direct and indirect net emissions from the Proposed Action. The Proposed Action is completely new, and therefore, the total emissions from the Proposed Action would be entirely additive (the current level would be zero). Impacts from the Proposed Action are evaluated based on the estimated net change in emissions compared against insignificance indicators for each pollutant. Pollutants emitted by aircraft above 3,000 ft AGL (or above the mixing height) are excluded from the air quality impact analysis for criteria pollutants.

The start date in ACAM is assumed to be January 1, 2026, which is the date when the proposed Vance 1E Low MOA would be assumed to become operational. The projected number of aircraft and aircraft operations is based on information in the data validation package prepared for the noise analysis **(Section 3.3)** (DAF, 2024d). This analysis assumes that potential impacts on air quality from the Proposed Action would be associated with the operation of T-38Cs and F-16Cs in the proposed new Vance 1E Low MOA starting January 2026 and operating indefinitely. The assessment of cumulative impacts on air quality considers emissions associated with the proposed recapitalization of T-7A aircraft at Vance AFB (see **Section 1.2.2**). The cumulative impact analysis assumes that the proposed recapitalization of T-7As at Vance AFB, if selected for implementation, would begin on January 1, 2032; T-38Cs would end operations by December 31, 2031 **(**AETC, 2024).

Greenhouse Gases

ACAM Version 5.0.24a was also used to evaluate GHG emissions from the Proposed Action. The GHG Emissions Evaluation calculates potential GHG emissions (CO_2e) from the action, determines if the action's emissions are insignificant, and provides a relative significance comparison. For the analysis, the PSD threshold for GHG of 75,000 tpy of CO_2e (or 68,039 mton/yr) was used as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; rather, it provides a threshold to identify actions that are insignificant (de minimis). Actions with a net change in GHG (CO_2e)

emissions below the insignificance indicator (threshold) are considered too insignificant on a global scale to warrant further analysis. Note that actions with a net change in GHG (CO_2e) emissions above the insignificance indicator (threshold) are only considered potentially significant and require further assessment to determine if the action would have a significant impact. Action-related GHG emissions have no significant impact on local air quality. However, from a global perspective, GHG emissions from individual actions each make a relatively small addition to global atmospheric GHG concentrations. If activities have de minimis (insignificant) GHG emissions, then on a global scale they are effectively zero and irrelevant.

ACAM assumptions, detailed emissions calculations, and summary results for the Proposed Action are provided in **Appendix C.2.7**.

3.6.3.1 Alternative 1

Under Alternative 1, the proposed Vance 1E Low MOA would become operational starting January 2026. **Table 3.6-2** presents the total yearly emissions associated with Alternative 1. These emissions are associated with the operation of T-38Cs and F-16Cs in the proposed new Vance 1E Low MOA, starting in 2026 and assumed to operate indefinitely.

Emissions for each pollutant would increase as a result of proposed operations under Alternative 1, but the estimated emission increase for each criteria pollutant would be less than their associated insignificance indicator values. As shown in **Table 3.6-2**, the highest annual emission increase would be for CO (41.74 tpy), which would be well below the insignificance indicator value of 250 tpy (25 tpy for Pb). These estimated net increases in criteria pollutant emissions would not be significant under Alternative 1, and therefore, are not expected to result in an exceedance of the NAAQS for any criteria pollutant or cause an adverse impact on the attainment status of the AQCR comprising the ROI.

Table 3.6-2 Estimated Total Annual Criteria Pollutant Emissions for Alternative 1

Pollutant	Emissions (tons/year)		Insignificance Indicator	Exceeds Indicator Level in any Year?
	2026	2027 and Beyond		
VOC	1.89	1.89	250	No
NO_x	6.05	6.05	250	No
CO	41.74	41.74	250	No
SO_x	1.03	1.03	250	No
PM_{10}	1.37	1.37	250	No
$PM_{2.5}$	1.23	1.23	250	No
Pb	0.00	0.00	25	No
NH_3	0.00	0.00	N/A	N/A

Notes:
CO = carbon monoxide; N/A = not applicable; NH_3 = ammonia; NOx = nitrogen oxides; Pb = lead; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SOx = sulfur oxides; VOC = volatile organic compound

The ACAM Report Record of Air Analysis and the Detailed ACAM Report are provided in **Appendix C.2.7**.

Greenhouse Gases

Table 3.6-3 summarizes estimated increases in maximum annual GHG emissions through the projected life cycle of Alternative 1 and provides its relative significance in a national and global context. The annual increase in GHG emissions from Alternative 1 is estimated to be 2,800 mton/yr CO_2e, which would result from the combustion of fossil fuels during aircraft operations in the proposed Vance 1E Low MOA. This increase would be far less than the insignificance indicator thresholds for GHG, and as such would represent approximately 0.0046 percent of total GHG emissions in the state of Kansas (worst-case value; these emissions as a percentage of total GHG emissions in the state of Oklahoma would be smaller) **(Section 3.5.2)**. At these low levels, Alternative 1 would not result in significant impact from GHG at a regional or global scale.

Table 3.6-3 Estimated Total GHG Emissions for Alternative 1

Year	GHG Emissions (mton/yr)[1]				Threshold (mton/yr)[2]	Exceedance
	CO_2	CH_4	N_2O	CO_2e		
2026	2,790	0.1173303	0.02289117	2,800	68,039	No
2027 [SS Year] - 2047	2,790	0.1173303	0.02289117	2,800	68,039	No
Total GHG (CO_2e) Relative Significance (mton)[1]						
Percent of State Totals	0.00457627%					
Percent of U.S. Totals	0.00005423%					

Notes:
[1] ACAM output results of GHG emissions and percent of Kansas State (worse-case) GHG emissions (see **Appendix C.2.7**).
[2] Air Force PSD threshold for GHG of 75,000 tpy of CO_2e (or 68,039 mton/yr) as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas.
CH4 = methane; CO2 = carbon dioxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gases; mton/yr = metric ton per year; N_2O = nitrous oxide; SS = steady state

3.6.3.2 No Action Alternative

Under the No Action Alternative, the proposed low altitude airspace would not be obtained, and current operational conditions would continue. The existing Vance Airspace Complex would continue to be used, and its dimensions would remain unchanged. This would have no adverse impact on air quality.

3.6.3.3 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Criteria pollutants regulated by the NAAQS would be emitted during the respective construction and operational phases of the reasonably foreseeable future projects listed in **Appendix B**. Quantities of criteria pollutants emitted during each of the projects would vary widely; however, these emissions would be regulated in accordance with applicable regulatory and permitting requirements to ensure that they do not contribute to the substantial degradation of local or regional air quality or result in a change to an AQCR attainment designation. Aircraft operations included in the Proposed Action would generate very low levels of GHG emissions. In a global context, its contribution would be negligible when considered with reasonably foreseeable future actions.

This analysis of reasonably foreseeable future actions considers the complete phase-out of T-38Cs at Vance AFB by December 2031 and the implementation of proposed T-7A operations at the base beginning in January 2032 (AETC, 2024). For the purposes of this analysis, it was assumed that all annual aircraft operations in the proposed Vance 1E Low MOA included in the Proposed Action

(1,170) would be performed by pilots flying T-7As beginning in January 2032. **Table 3.6-4** summarizes the annual net change (increase, decrease, or zero) in estimated criteria pollutant emissions associated with the proposed recapitalization of T-7As at Vance AFB.

Table 3.6-4 Total Estimated Annual Net Emissions from Reasonably Foreseeable T-7A Operations in the Proposed Vance 1E Low MOA

Pollutant	Emissions (tpy)[1]								Insignificance Indicator	Exceeds Indicator Level?
	2026	2027	2028	2029	2030	2031	2032	2033 and Beyond		
VOC	1.89	1.89	1.89	1.89	1.89	1.89	5.05	5.05	250	No
NO_x	6.05	6.05	6.05	6.05	6.05	6.05	41.28	41.28	250	No
CO	41.74	41.74	41.74	41.74	41.74	41.74	4.12	4.12	250	No
SO_x	1.03	1.03	1.03	1.03	1.03	1.03	2.67	2.67	250	No
PM_{10}	1.37	1.37	1.37	1.37	1.37	1.37	0.51	0.51	250	No
$PM_{2.5}$	1.23	1.23	1.23	1.23	1.23	1.23	0.44	0.44	250	No
Pb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	No
NH_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	N/A	N/A

Notes:
[1] Estimated ACAM output results (see **Appendix C.2.7**)
CO = carbon monoxide; N/A = not applicable; NH_3 = ammonia; NO_x = nitrogen oxides; Pb = lead; $PM_{2.5}$ = particulate matter <2.5 microns; PM_{10} = particulate matter <10 microns; SO_x = sulfur oxides; tpy = tons per year; VOC = volatile organic compound

For NO_x, there would be a noticeable net increase in emissions and for CO there would be a noticeable net decrease during the transition years, and beyond. For VOC and SO_x, a marginal increase in annual net emissions would be anticipated. However, for PM_{10} and $PM_{2.5}$, there would be a slight decrease in net emissions during the transition years and later. As shown in **Table 3.6-4**, the highest annual emission increase would be for CO (41.74 tpy), which would be well below the insignificance indicator value of 250 tpy (25 tpy for Pb). These estimated net increases in criteria pollutant emissions would not be significant under the cumulative impact analysis, and therefore, are not expected to result in an exceedance of the NAAQS for any criteria pollutant or cause an adverse impact on the attainment status of the AQCR comprising the ROI. When considered with the potential effects from other reasonably foreseeable future actions listed in **Appendix B**, the Proposed Action would not contribute to significant adverse impacts on air quality.

Greenhouse Gases

Table 3.6-5 summarizes estimated increase in maximum annual GHG emissions through the project's projected life cycle and provides its relative significance in a national and global context. The annual increase in steady-state GHG emissions is estimated to be 7,275 mton/yr CO_2e, which would result from the combustion of fossil fuels associated with the proposed recapitalization of T-7As at Vance AFB. The increased emissions would be far less than the insignificance indicator thresholds for GHG, and as such would account for approximately 0.0103 percent of Kansas' GHG emissions (worst-case value) **(Section 3.5.2)**. At these low levels, Alternative 1 would not contribute to significant adverse effects from GHG at a regional or global scale when considered with the potential effects from other reasonably foreseeable future actions.

Table 3.6-5 Annual GHG Emissions from Reasonably Foreseeable T-7A Emissions in the Proposed Vance 1E Low MOA Compared to Insignificance Indicator

Year	CO_2 (mton/yr)[1]	CH_4 (mton/yr)[1]	N_2O (mton/yr)[1]	CO_2e (mton/yr)[1]	Threshold (mton/yr)[2]	Exceedance
2026	2,790	0.1173	0.0229	2,800	68,039	No
2027	2,790	0.1173	0.0229	2,800	68,039	No
2028	2,790	0.1173	0.0229	2,800	68,039	No
2029	2,790	0.1173	0.0229	2,800	68,039	No
2030	2,790	0.1173	0.0229	2,800	68,039	No
2031	2,790	0.1173	0.0229	2,800	68,039	No
2032	7,250	0.3049	0.0595	7,275	68,039	No
2033 [SS Year]	7,250	0.3049	0.0595	7,275	68,039	No
Total GHG (CO_2e) Relative Significance (mton)[1]						
Percent of State Totals	0.01032305%					
Percent of U.S. Totals	0.00012233%					

Notes:
[1] ACAM output results of GHG emissions and percent of Kansas State (worse-case) GHG emissions (see **Appendix C.2.7**).
[2] Air Force PSD threshold for greenhouse gas of 75,000 tons per year of CO_2e (or 68,039 mton/yr) as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas.
CH_4 = methane; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gases; mton/yr = metric ton per year; N_2O = nitrous oxide; SS = steady state

3.7 Biological Resources

3.7.1 Definition of Resource

Biological resources include flora (plants) and fauna (animals), along with their associated terrestrial and aquatic habitats. Species may include native, non-native/invasive/nuisance, and special status/protected (threatened and endangered) organisms. Federal and state protections are in place for some species, and include the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), and other species-specific conservation legal authorities.

Special status species are plant and animal species that are listed as endangered, threatened, candidate, or proposed for listing under the federal ESA. Federal candidate species and species proposed for listing are those organisms that could be federally listed as threatened or endangered in the near term but have no current statutory protection under the ESA. Critical habitat consists of federally designated geographic areas that contain essential features or areas that are essential to conserve federally listed species (USFWS, 2017).

The biological resources ROI consists of lands under and airspace within the proposed Vance 1E Low MOA where potential effects from the Proposed Action on wildlife and habitat could occur. The Proposed Action would occur entirely within airspace above the Earth's surface and would not affect common aquatic or marine species (such as fish, amphibians, and marine mammals) or their habitat; therefore, such species and their habitat (except for federally listed species) are not addressed further in this section.

3.7.2 Affected Environment

3.7.2.1 Location

The Oklahoma portion of the ROI is located within the Level III Central Great Plains Ecoregion, which is part of the larger Level II South Central Semi-Arid Prairies and the overall Level I Great Plains Ecoregion (USEPA, 2024). The Great Plains region has the largest north-south extent of any Level I North American ecoregion, along with low topographic relief, grassland dominance, limited forest extent (mainly in valleys), and a sub-humid to semi-arid climate (CEC, 2011). Historically, the Central Great Plains Level III Ecoregion was vegetated by tall grass prairie to the east and short grass prairie to the west. Summers are typically hot, and winters can range from mild to severe. The frost-free period in the northern portion of this ecoregion averages 150 days but may be up to 240 days in the south, with mean annual precipitation of 18 to 37 inches (CEC, 2011).

The Kansas portion of the ROI is generally located within the Level III Southwestern Tablelands Ecoregion, which is part of the larger Level II West-Central Semi-Arid Prairies and the overall Level I Great Plains (USEPA, 2024). Summers in this ecoregion are hot, with cool winters (typical for a dry, mid-latitude steppe climate). The frost-free period typically ranges from 90 to 200 days (depending partly on elevation), with mean annual precipitation of 10 to 28 inches (CEC, 2011).

The landscape in the southern (Oklahoma) portion of the ROI is characterized by rolling hills, broad alluvial stream valleys, and dissected plains (CEC, 2011). In contrast, the northern (Kansas) portion of the ROI (especially to the west) is drier and is characterized by elevated tablelands, mesas, badlands, gorges, and dissected river breaks in a landscape of broad rolling plains, piedmonts, and low-gradient plains (CEC, 2011). Elevations within the ROI typically range from approximately 1,200 to 1,600 feet (USGS, 2025b).

3.7.2.2 Vegetation

Though much of this region was once vegetated with native prairie species, most arable land was converted for crop production and grazing decades ago. Trees and persistent woody vegetation are generally found in valleys and riparian areas. Westward encroachment of invasive eastern redcedar (*Juniperus virginiana*) from eastern Kansas and Oklahoma has been observed in many areas.

Annual rainfall in the ROI varies from 26 to 34 inches (KSU, 2025; OCS, 2021). The Kansas landscape underlying the northern portion of the ROI is slightly drier than the Oklahoma (southern) portion. Generally, annual rainfall decreases from east to west in this portion of North America. This precipitation pattern has produced a gradual transition from historic tallgrass prairie species (to the east) to shortgrass prairie species (to the west).

Precipitation patterns, underlying soils, and landscape position were some of the most significant factors influencing vegetative species extents historically. Despite the increasing presence of invasive species, agricultural land conversion, and human development activities over time, many native species are still frequently found in relatively undisturbed portions of the ROI (CEC, 2011), as detailed in **Table 3.7-1** below:

Table 3.7-1 Common Plant Species in Ecoregions Within the ROI

Species	Present in Oklahoma (Southern Portion of the ROI)	Present in Kansas (Northern Portion of the ROI)
alkali sacaton *(Sporobolus airoides)*		✓
big bluestem *(Andropogon gerardi)*	✓	
black grama *(Bouteloua eriopoda)*		✓
blue grama *(Bouteloua gracilis)*	✓	✓
buffalograss *(Bouteloua dactyloides)*	✓	✓
cholla *(Cylindropuntia imbricata)*		✓
honey mesquite *(Neltuma glandulosa)*	✓	
Indiangrass *(Sorghastrum nutans)*	✓	
James galleta *(Pleuraphis jamesii)*		✓
little bluestem *(Schizachyrium scoparium)*	✓	✓
lotebush *(Ziziphus obtusifolia)*	✓	
sand bluestem *(Andropogon hallii)*	✓	
sand dropseed *(Sporobolus cryptandrus)*	✓	✓
sand sagebrush *(Artemesia filifolia)*	✓	✓
sideoats grama *(Bouteloua curtipendula)*	✓	✓
Texas wintergrass *(Nassella leucotricha)*	✓	
threeawn *(Aristida purpurea)*		✓
western wheatgrass *(Pascopyrum smithii)*		✓
white tridens *(Tridens albescens)*	✓	
yucca *(Yucca glauca)*	✓	✓

Riparian areas within stream valleys of both ecoregions are typically dominated by the following trees and woody species:

- eastern cottonwood (*Populus deltoides*)
- black willow (*Salix nigra*)
- American elm (*Ulmus americana*)
- hackberry (*Celtis laevigata*)

3.7.2.3 Wildlife

Wildlife within the ROI include a variety of grassland and generalist species, along with species that have adapted well to mixed agricultural landscapes. The most intensive human land use activities and crop production have generally occurred over time to the east and southeast, where the topography is more gradual and arable land is less bisected by stream valleys. Groundwater wells and surface water withdrawals throughout the region help support irrigated crop production and livestock grazing.

At least 24 common species of mammals, 109 species of birds, 47 reptile and amphibian species, and 16 species of fish have the potential to occur within the ROI (iNaturalist, 2025). These species are listed in **Table 3.7-2**.

Table 3.7-2 Common Wildlife Species Potentially Occurring in the ROI

Common Name	Scientific Name	Common Name	Scientific Name
Mammals			
American badger	*Taxidea taxus*	mouse-eared bats	*Myotis* spp.
American bison	*Bison bison*	North American porcupine	*Erethizon dorstum*
big brown bat	*Eptesicus fuscus*	Ord's kangaroo rat	*Dipodomys ordii*
black-tailed prairie dog	*Cynomys ludovicianus*	Plains harvest mouse	*Reithrodontomys montanus*
bobcat	*Lynx rufus*	Plains pocket gopher	*Geomys bursarius*
cave myotis	*Myotis velifer*	pronghorn	*Antilocapra americana*
coyote	*Canis latrans*	raccoon	*Procyon lotor*
eastern fox squirrel	*Sciurus niger*	striped skunk	*Mephitis mephitis*
evening bats	*Family Vespertilionidae*	Townsend's big-eared bat	*Corynorhinus townsendii*
hispid cotton rat	*Sigmodon hispidus*	tri-colored bat	*Perimyotis subflavus*
hispid pocket mouse	*Chaetodipus hispidus*	Virginia opossum	*Didelphis virginiana*
house mouse	*Mus musculus*	western deer mouse	*Peromyscus sonoriensis*
Mexican free-tailed bat	*Tadarida brasiliensis*	white-tailed deer	*Odocoileus virginianus*
Birds			
American avocet	*Recurvirostra americana*	house finch	*Haemorhous mexicanus*
American barn owl	*Tyto furcata*	house sparrow	*Passer domesticus*
American crow	*Corvus brachyrhynchos*	Hudsonian godwit	*Limosa haemastica*
American kestrel	*Falco sparverius*	killdeer	*Charadrius vociferus*
American robin	*Turdus migratorius*	lark sparrow	*Chondestes grammacus*
American tree sparrow	*Spizelloides arborea*	Lincoln's sparrow	*Melospiza lincolnii*
Baird's sandpiper	*Calidris bairdii*	loggerhead shrike	*Lanius ludovicianus*
bald eagle	*Haliaeetus leucocephalus*	mallard	*Anas platyrhynchos*
Baltimore oriole	*Icterus galbula*	Mississippi kite	*Ictinia mississippiensis*
barn swallow	*Hirundo rustica*	mountain bluebird	*Sialia currucoides*
barred owl	*Strix varia*	mourning dove	*Zenaida macroura*
Bell's vireo	*Viria belli*	northern bobwhite	*Colinus virginianus*
belted kingfisher	*Megaceryle alcyon*	northern cardinal	*Cardinalis cardinalis*
black-bellied whistling duck	*Dendrocygna autumnalis*	northern harrier	*Circus hudsonius*
black-necked stilt	*Himantopus mexicanus*	northern pintail	*Anas acuta*
blue grosbeak	*Passerina caerulea*	northern shoveler	*Spatula clypeata*
blue jay	*Cyanocitta critasta*	painted bunting	*Passerina ciris*
blue-gray gnatcatcher	*Polioptilia caerula*	painted bunting	*Passerina ciris*
blue-winged teal	*Spatula discors*	pectoral sandpiper	*Calidris melanotos*
blue-winged teal	*Spatula discors*	pied-billed grebe	*Podilymbus podiceps*
brown thrasher	*Toxostoma rufum*	pine siskin	*Spinus pinus*

Table 3.7-2 Common Wildlife Species Potentially Occurring in the ROI

Common Name	Scientific Name	Common Name	Scientific Name
Birds *(continued)*			
brown-headed cowbird	*Molothrus ater*	red crossbill	*Loxia curvirostra*
burrowing owl	*Athene cunicularia*	red-bellied woodpecker	*Melanerpes carolinus*
Canada goose	*Branta canadensis*	redhead	*Aythya americana*
cedar waxwing	*Bombycilla cedrorum*	red-headed woodpecker	*Melanerpes erythrocephalus*
chipping sparrow	*Spizella passerina*	red-shouldered hawk	*Buteo lineatus*
chukar	*Alectoris chukar*	red-tailed hawk	*Buteo jamaicensis*
clay-colored sparrow	*Spizella pallida*	red-winged blackbird	*Agelaius phoeniceus*
cliff swallow	*Petrochelidon pyrrhonota*	ring-billed gull	*Larus delawarensis*
common grackle	*Quiscalus quiscula*	ruddy duck	*Oxyura jamaicensis*
common nighthawk	*Chordeiles minor*	rufous-crowned sparrow	*Aimophilia ruficeps*
dark-eyed junco	*Junco hyemalis*	sanderling	*Calidris alba*
dickcissel	*Spiza americana*	sandhill crane	*Antigone canadensis*
double-crested cormorant	*Nannopterum auritum*	savannah sparrow	*Passerculus sandwichensis*
downy woodpecker	*Dyobates pubescens*	scissor-tailed flycatcher	*Tyrannus forficatus*
eastern bluebird	*Sialia sialis*	sharp-shinned hawk	*Accipiter striatus*
eastern kingbird	*Tyrannus tyrannus*	short-eared owl	*Asio flammeus*
eastern meadowlark	*Sturnella magna*	snowy egret	*Egretta thula*
eastern phoebe	*Sayornis phoebe*	song sparrow	*Melospiza melodia*
Eurasian collared-dove	*Streptopelia decaocto*	spotted sandpiper	*Actitis macularius*
European starling	*Sturnus vulgaris*	stilt sandpiper	*Calidris himantopus*
feral pigeon	*Columba livia domestica*	Swainson’s hawk	*Buteo swainsoni*
ferruginous hawk	*Buteo regalis*	trumpeter swan	*Cynus buccinator*
field sparrow	*Spizella pusilla*	turkey vulture	*Cathartes aura*
grasshopper sparrow	*Ammodramus savannarum*	western cattle egret	*Ardea ibis*
great blue heron	*Ardea herodias*	white-crowned sparrow	*Zonotrichia leucophrys*
great crested flycatcher	*Myiarchus crinitus*	white-faced ibis	*Plegadis chihi*
great horned owl	*Bubo virginianus*	wild turkey	*Meleagris gallopavo*
greater roadrunner	*Geococcyx californianus*	yellow warbler	*Setophaga petechia*
greater yellowlegs	*Tringa melanoleuca*	yellow-bellied cuckoo	*Coccyzus americanus*
green heron	*Butorides virescens*	yellow-bellied sapsucker	*Sphyrapicus varius*
hairy woodpecker	*Dryobates villosus*	yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Harris’s sparrow	*Zonotrichia querula*	yellow-shafted flicker	*Colaptes auratus*
horned lark	*Eremophilia alpestris*		

Table 3.7-2 Common Wildlife Species Potentially Occurring in the ROI

Common Name	Scientific Name	Common Name	Scientific Name
Reptiles and Amphibians			
American bullfrog	*Lithobates catesbeianus*	Plains black-headed snake	*Tantilla nigriceps*
barred tiger salamander	*Ambystoma mavortium*	Plains leopard frog	*Lithobates blairi*
Blanchard's cricket frog	*Acris blanchardi*	Plains spadefoot	*Spea bombifrons*
bullsnake	*Pituophis catenifer sayi*	pond slider	*Trachemys scripta*
Chihuahuan nightsnake	*Hypsiglena jani*	Prairie lizard	*Sceloporus consobrinus*
coachwhip	*Masticophis flagellum*	Prairie rattlesnake	*Crotalus viridis*
common garter snake	*Thamnophis sirtalis*	red-spotted toad	*Anaxyrus punctatus*
common snapping turtle	*Chelydra serpentina*	ring-necked snake	*Diadophis punctatus*
DeKay's brownsnake	*Storeria dekayi*	six-lined racerunner	*Aspidoscelis sexlineatus*
diamondback watersnake	*Nerodia rhombifer*	slender glass lizard	*Ophisaurus attenuatus*
eastern collared lizard	*Crotaphytus collaris*	speckled kingsnake	*Lampropeltis holbrooki*
eastern hognose snake	*Heterodon platirhinos*	spiny softshell	*Apalone spinifera*
glossy snake	*Arizona elegans*	spotted chorus frog	*Pseudacris clarkii*
gopher snake	*Pituophis catenifer*	Strecker's chorus frog	*Pseudacris streckeri*
Great Plains rat snake	*Pantherophis emoryi*	Texas blind snake	*Rena dulcis*
Great Plains ratsnake	*Pantherophis emoryi*	Texas horned lizard	*Phrynosoma cornutum*
Great Plains skink	*Plestiodon obsoletus*	western diamond-backed rattlesnake	*Crotalus atrox*
Great Plains toad	*Anaxyrus cognatus*	western earless lizard	*Holbrookia maculata*
lined snake	*Tropidoclonian lineatum*	western massasagua	*Sistrurus tergeminus*
little brown skink	*Scincella lateralis*	western narrow-mouthed toad	*Gastrophryne olivacea*
nine-banded armadillo	*Dasypus novemcinctus*	western ribbon snake	*Thamnophis proximus*
North American racer	*Coluber constrictor*	Woodhouse's toad	*Anaxyrus woodhousii*
ornate box turtle	*Terrapene ornata*	yellow mud turtle	*Kinosternon flavescens*
plain-bellied watersnake	*Nerodia erythrogaster*		

Source: iNaturalist, 2025

3.7.2.4 Domestic Animals

The eastern and southeastern portions of the ROI are characterized by row crop production (including winter wheat), with livestock grazing more commonly encountered to the west and northwest. Domestic livestock throughout both states underlying the ROI include cattle, horses, sheep, goats, and pigs, though USDA records indicate significantly more poultry operations in Oklahoma than in Kansas (USDA, 2023). Notably, Kansas is one of four states (including Texas, Iowa, and Nebraska) that produce approximately 49 percent of all red meat consumed annually in the United States (Nicoletta, 2022). Much of this production occurs in concentrated animal feeding operations; In 2023 there were 433 "concentrated animal feeding operations" in Kansas and 39 in Oklahoma.(USEPA, 2023).

3.7.2.5 Migratory Flyways

In North America, approximately 70 percent of bird species are known to migrate, with approximately 80 percent of these (especially smaller songbirds) primarily migrating at night (Job, 2023). Migrating at night may allow birds to take advantage of calmer air, avoid predators, use the stars and moon to aid navigation, and minimize the risk of overheating (Job, 2023). Based on available radar data, many of these species begin their migratory flights approximately 30 to 45 minutes after local sunset, with peak bird density normally occurring 2 to 4 hours after sunset (BirdCast, 2025), though some local variations to this pattern exist.

The ROI is located within the Central Flyway, a major north-south migratory corridor for waterfowl and songbirds that passes through both Oklahoma and Kansas. Approximately 400 avian species use this flyway to transit through central North America between summer breeding grounds to the north and wintering grounds to the south. It is estimated that up to 50 percent of all migratory waterfowl in North America use this flyway/migratory route (Fritts, 2022).

3.7.2.6 Threatened and Endangered Species, Critical Habitat, and Other Species of Concern

Federally Listed, Proposed, and Candidate Species and Federally Designated Critical Habitat

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to recover listed species. Section 7 of the ESA requires federal project proponents to consult with USFWS (and/or the National Oceanic and Atmospheric Administration [NOAA] Fisheries, as applicable) to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species or result in the destruction or adverse modification of designated critical habitat. The USFWS has primary responsibility for terrestrial and freshwater organisms, while NOAA Fisheries is primarily responsible for marine organisms and anadromous fish. Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future.

Federally listed, proposed, and candidate species known or having potential to occur in the ROI include one mammal, four birds, two fish, and one insect (USFWS, 2025a). These species are listed in **Table 3.7-3**. No federal critical habitat has been designated in the ROI for any of these species. The Official Species List for the ROI that was obtained from the USFWS Information for Planning and Consultation website is provided in **Appendix D**.

Table 3.7-3 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in ROI

Common and Scientific Name	Federal Status	Critical Habitat Present in the ROI?	Description
Mammals			
tricolored bat *Perimyotis subflavus*	Proposed Endangered	No	During the spring, summer, and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves. During the winter, tricolored bats hibernate in caves and mines. Where caves are infrequent, tricolored bats often hibernate in culverts, tree cavities, and abandoned wells. Tricolored bats emerge early in the evening and forage at treetop level or above but may forage closer to ground later in the evening. This and other bat species may migrate and forage at elevations which put them at risk of collisions with aircraft operating at low altitudes.
Birds			
lesser prairie chicken *Tympanuchus pallidicinctus*	Threatened (Northern Distinct Population Segment)	No	Lesser prairie chickens typically build ground nests in tall bunchgrasses or beneath shrubs, generally 1 to 2 miles from their leks. The home range of individuals from a single lek may encompass 12,000 to 50,000 acres. For a population to remain stable and resilient, a network of leks and suitable habitat are necessary. Due to habitat loss and fragmentation, the USFWS estimates that this species has declined by approximately 90 percent across its historical range. Lesser prairie chickens require large tracts of intact prairie grassland to thrive, and population numbers appear to follow a 'boom-bust' pattern in response to annual precipitation pattern changes (USFWS, 2022). Lesser prairie chicken populations occurring in the ROI belong to the Northern Distinct Population Segment, which is federally listed as threatened. Focal areas identified for conservation of this species by the Western Association of Wildlife and Fisheries Agencies are present in the western portion of the ROI (WAWFA, 2013).
piping plover *Charadrius melodus*	Threatened	No	This species may potentially be present in the ROI as a transient during migration.
rufa red knot *Calidris canutus rufa*	Threatened	No	This species may potentially be present in the ROI as a transient during migration. Although critical habitat for this species has been proposed, none of the designated units are present in the ROI.
whooping crane *Grus americana*	Endangered	No	This species (the tallest bird in the U.S.) occurs only in North America. Once thought to have previously numbered in excess of 10,000, current populations have descended from the last 15 remaining birds in 1941. This species has been impacted by habitat loss, wind turbines, land conversion, previous hunting pressure, and increasing urbanization (USFWS, 2025b).

Table 3.7-3 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in ROI

Common and Scientific Name	Federal Status	Critical Habitat Present in the ROI?	Description
Fishes			
Arkansas river shiner *Notropis girardi*	Threatened	No	This species is thought to need at least 100 miles of free-flowing river for long-term population stability. This shiner favors wide and shallow prairie rivers with sandy substrate, and use micro-habitats throughout the river cross-section (ODWC, 2025a). This species was once present throughout the Arkansas River Basin, but has been negatively impacted by dam construction, agricultural water withdrawals, and invasive species. In Kansas, this species is currently found in the Cimmaron River, the main stem Arkansas River, and the main stem South Fork Ninnescah River (KDWP, 2022).
peppered chub *Macrhybopsis tetranema*	Endangered	No	Once present in five states, peppered chub now inhabit only approximately 6 percent of their former range, with known populations in the Canadian River flowing through northeastern New Mexico and the panhandle of Texas. Critical Habitat has also been considered in a portion of Kansas. This species typically requires unobstructed, flowing river segments of at least 127 miles and varying water depths (USFWS, 2020a).
Insects			
monarch butterfly *Danaus plexippus*	Threatened (Proposed)	No	Monarchs lay their eggs on their obligate milkweed host plant (primarily *Asclepias* spp.), and larvae emerge after 2 to 5 days. Monarchs breed year-round in many regions. Individual monarchs in temperate climates undergo long-distance migration and live for an extended period. Monarchs that migrate south return to their breeding grounds restarting the cycle of generational migration.

Sources: USFWS,2025a

Though The Nature Conservancy does not currently manage any wildlife refuges within the ROI, conservancy staff are engaged in the Red Hills Initiative (based in Medicine Lodge, near the northern ROI boundary). The Red Hills Initiative works with ranchers to remove invasive eastern redcedar, maintain riparian vegetation along stream corridors, and protect local caves used by bats. Of the 700 known caves in Kansas, the majority are located in the Red Hills region (TNC, 2025).

Available records indicate no state wildlife management areas managed by the Kansas Department of Wildlife and Parks (KDWP) or Oklahoma Department of Wildlife Conservation (ODWC), no national parks (National Park Service), no national wildlife refuges or fish hatcheries (USFWS), no national forests and no national grasslands (U.S. Forest Service) are located within the ROI. The nearest wildlife refuge is the USFWS Salt Plains Wildlife Refuge, located approximately 16 miles (26 kilometers) southeast of the ROI.

In a letter dated March 24, 2025, the KDWP noted that the Proposed Action would not adversely impact management or public use of any property owned or managed by KDWP for wildlife conservation or outdoor public recreation. KDWP also concluded that the establishment of the proposed Vance 1E Low MOA would have limited likelihood of direct or indirect adverse impacts on any Kansas-listed wildlife with designated critical habitat in Comanche, Barber, and Sumner Counties. The ODWC noted in a letter dated March 27, 2025, that no state-listed fish or wildlife species occur within the Proposed Vance 1E Low MOA. No occurrences of relevant species within the vicinity of the project location were identified by the Oklahoma Biological Survey in a letter dated April 10, 2025. These letters are included in **Appendix A**.

Migratory Bird Treaty Act

Most bird species are protected under the MBTA, and their protection by federal agencies is mandated by E.O. 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds.* Under the MBTA, it is illegal for anyone, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, [or] possess migratory birds or their nests or eggs at any time, unless permitted by regulation. Under E.O. 13186, federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations are directed to develop and implement a memorandum of understanding (MOU) with the USFWS that promotes the conservation of migratory bird populations.

An MOU between DoD and USFWS signed in July 2006 identified specific activities (e.g., Partners in Flight and Integrated Natural Resources Plans) where cooperation between the DoD and USFWS would contribute to the conservation of migratory birds and their habitats. In February 2022, 50 CFR § 21.42 authorized the take of migratory birds incidental to military readiness activities. It states that the Armed Forces may take migratory birds incidental to military readiness activities provided that, for those ongoing or proposed activities that the Armed Forces determine may result in a significant adverse effect on a population of a migratory bird species, the Armed Forces must confer and cooperate with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects. Military readiness activities include all training and operations of the Armed Forces that relate to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use (PL 107-314, section 315(f) of the 2003 National Defense Authorization Act).

Bald and Golden Eagle Protection Act

The bald eagle was delisted under the ESA in 2007. However, bald and golden (*Aquila chrysaetos*) eagles remain federally protected under the BGEPA. The BGEPA prohibits anyone, without a permit issued by the Secretary of the Interior, from taking eagles, including their parts, nests, or eggs. The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. “Disturb” means “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (16 U. S. C. §§ 668-668d).

No nesting bald eagles have been identified within the four counties comprising the ROI (Audubon, 2025). However, bald eagles have potential to occur in the ROI, and are most frequently seen between October and April each year (ODWC, 2025b). Bald eagles are primarily found near larger water sources as they feed primarily on fish, but also eat a variety of waterfowl, small mammals, and turtles (Campbell, 2003). Large waterbodies within the ROI include Eagle Chief Creek, the Salt Fork Arkansas River, Driftwood Creek, Medicine Lodge River, and Sandy Creek (USGS, 2025b). The Great Salt Plains Lake is located approximately 16 miles southeast (outside) of the ROI, where up to 70 bald eagles are routinely seen at the USFWS wildlife refuge there. Although this known eagle concentration area is outside the ROI, it is possible that transient bald eagles could occur in the ROI. This species is reported as a potential migrant through the Central Flyway (USFWS, 2020b).

3.7.3 Environmental Consequences

3.7.3.1 Evaluation Criteria

Potential impacts on biological resources would be adverse if the Proposed Action resulted in the inadvertent injury or death of individual animals of common wildlife species, or the temporary removal of suitable habitat for one or more common wildlife species; temporarily impeded or prevented the continued foraging, breeding, nesting, or migration of common wildlife at the community, population, or species level; reduced the distribution of one or more common wildlife species; resulted in the spread of invasive or nonnative species; or if Section 7 consultation with USFWS determined that the Proposed Action would be likely to adversely affect federally listed threatened and endangered species under the ESA. Adverse impacts on biological resources would be considered significant if the Proposed Action permanently impeded or prevented the continued foraging, breeding, nesting, or migration of common wildlife at the community, population, or species level; resulted in the permanent destruction of suitable habitat for common wildlife species; or if adverse effects on special status species or critical habitat could not be mitigated through consultation with USFWS.

As required by the ESA, federal agencies must determine that their proposed actions do not adversely affect the existence of any threatened or endangered species. Federal agencies must avoid unauthorized "take" of federally threatened or endangered species or adverse modification of designated critical habitat. The ESA Section 7 consultation process results in a "no effect" determination, USFWS concurrence with the DAF's determination of "may affect, but not likely to adversely affect" federally listed species, or a "may affect, likely to adversely affect" determination, resulting in a biological opinion with either an Incidental Take Statement that authorizes a specified amount of "take" (or adverse modification of designated critical habitat) or a jeopardy determination.

3.7.3.2 Alternative 1 – Proposed Vance 1E Low MOA

Alternative 1 would have no effect on vegetation (including invasive species) or habitat because no construction, demolition, or other ground-disturbing activities would occur. Alternative 1 would have no effect on federally designated critical habitat because none is present within the ROI.

Several factors, including direct strikes and visual effects associated with approaching aircraft could potentially impact wildlife in the ROI. Any impacts from visual sightings of approaching aircraft would most likely occur within the ROI below 1,000 feet AGL, the altitude accounting for most reactions to visual stimuli by wildlife (Bowles, 1995). Studies investigating the effects of overflight noise on wildlife suggest that impacts vary depending on the species, as well as a variety of other factors such as type of aircraft, duration of overflight, frequency of overflights, and aircraft speed. In addition, natural factors that affect impacts include age and sex, reproductive condition, group size, season, terrain, weather, and temperament (Bowles,1995). Responses to aircraft noise include no response, increased heart rate, turning toward stimuli, or fleeing (mammals) and flushing (birds) (NPS, 1994).

Studies on the effects of noise on wildlife have been predominantly conducted on mammals and birds. Studies of subsonic aircraft disturbances on ungulates (e. g., pronghorn, bighorn sheep, elk, and mule deer), in both laboratory and field conditions, have shown that effects are transient and of short duration, and suggest that the animals habituate to the sounds (Bowles, 1995; Larkin, 1994; Weisenberger et al., 1996; Gladwin et al., 1988).

Noise that is close, loud, sudden, and combined with a visual stimulus produces the most intense reactions in animals. Rotary-wing aircraft (helicopters) generally induce startle effects more frequently than fixed-wing aircraft (Gladwin et al., 1988). Some species habituate to repetitive noises, especially noise associated with overflight of fixed-wing aircraft, better than other species (Krausman et al., 1999). Physiological and behavioral reactions to aircraft overflights are indications of temporary stress upon wildlife and domestic animals; however, the long-term implications to individuals have not been studied extensively.

Portions of the lands in the ROI support ranching and agriculture. The effects of aircraft overflights and their accompanying noise on domestic livestock (such as cattle and horses) have been the subject of numerous studies since the late 1950s (Gladwin et al., 1988; U.S. Forest Service [USFS], 1992). These studies have examined the effects on a wide range of livestock including poultry, cattle, sheep, pigs, goats, and mink. Exposure to multiple overflights at all altitudes provided the basis for testing the animal’s response. Several general conclusions are drawn from these studies:

- Overflights do not increase death rates and abortion rates or reduce productivity rates (e.g., birth rates and weights) and do not lower milk production among domestic livestock (Gladwin, 1988).
- Animals take care not to damage themselves and do not run into obstructions, unless confined or traversing dangerous ground at a high rate if overflown by aircraft 163 to 325 feet AGL (USFS, 1992).
- Domestic livestock habituate to overflights and other noise. Although they may look or startle at a sudden onset of aircraft noise, they typically resume normal behavior within two minutes after the disturbance.

Inconclusive results have been obtained in some cases because the effect observed is no different than any other disturbance livestock experience daily, such as from vehicles or blowing vegetation. Historical interactions between cattle and numerous overflights have not indicated a problem. For example, cattle have grazed under heavily used military airspace at Avon Park Range in Florida, Saylor Creek and Juniper Butte Ranges in Idaho, and Smoky Hill Air National Guard Range in Kansas for decades. At these training ranges, grazing cattle have been subject to upwards of 100 overflights per day, many as low as 100 feet AGL. No evidence exists that the health or well-being of the cattle have been threatened. The animals, including calves, show all indications of habituating to the noise and overflights.

The effects of fixed-wing aircraft flying below 1,000 feet AGL upon flight capable wildlife due to visual approach and noise are dependent upon species demeanor, time of day, migration cycle, and behavioral activity. These are largely bird aircraft strike hazard (BASH) considerations accommodated by flight scheduling. No ground disturbance is associated with the Proposed Action, and it is anticipated that wildlife and domestic animals would generally habituate to noise and visual elements associated with aircraft operating in the proposed Vance 1E Low MOA. Therefore, noise and visual effects associated with the Proposed Action would have no significant adverse effects on wildlife and domesticated animals.

The low floor (500 feet AGL) in the proposed Vance 1E Low MOA may increase the potential for bird strikes. However, given the large (1,051-square mile) area where the training would occur, that most training would occur during daytime hours (8:00 a.m. to 9:00 p.m. Monday through Friday and 2:00 p.m. to 6:00 p.m. on Sunday, local time, adjusted seasonally as needed), and the relatively low numbers of sorties proposed (1,458 annually, which would equate to an average of approximately 4 sorties per day), the likelihood for birds to encounter aircraft during training operations would remain low. Research suggests that approximately 80 percent of birds (especially smaller songbirds) using the Central Flyway primarily migrate at night (with peak volumes 3 to 4 hours after sunset). As a result, no significant increase in impacts on these migratory species is anticipated.

If BASH risk increases, pilots would follow additional avoidance procedures during low-altitude training. The inadvertent injury or death of birds from collisions with aircraft operating in the proposed Vance 1E Low MOA would represent an adverse impact. However, such impacts would occur at the individual level and would not permanently impede or prevent the continued foraging, breeding, nesting, or migration of common bird species wildlife at the community, population, or species level. Therefore, adverse impacts on birds would not be significant. Any “take” of birds protected by the MBTA would be small on an annual basis and would be considered incidental to military readiness activities in accordance with 50 CFR § 21.42.

Given the low frequency of proposed flight operations in the proposed Vance 1E Low MOA and the large area covered by the Low MOA, the DAF has determined that Alternative 1 may affect, but is not likely to adversely affect the lesser prairie chicken, piping plover, rufa red knot, or whooping crane; and would not jeopardize the continued existence of the tricolored bat or monarch butterfly. Alternative 1 would have no effect on the Arkansas river shiner or peppered chub because no earth disturbance or in-water activities would occur. These determinations are summarized in **Table 3.7-4**. USFWS concurrence with these determinations is pending.

Table 3.7-4 Summary of Effects Determinations for Federally Protected Species

Common and Scientific Name	Federal Status	Determination
Mammals		
tricolored bat *Perimyotis subflavus*	Proposed Endangered	Would not jeopardize the continued existence

Table 3.7-4 Summary of Effects Determinations for Federally Protected Species

Common and Scientific Name	Federal Status	Determination
Birds		
lesser prairie chicken *Tympanuchus pallidicinctus*	Threatened (Northern Distinct Population Segment)	May affect, not likely to adversely affect
piping plover *Charadrius melodus*	Threatened	May affect, not likely to adversely affect
rufa red knot *Calidris canutus rufa*	Threatened	May affect, not likely to adversely affect
whooping crane *Grus americana*	Endangered	May affect, not likely to adversely affect
Fishes		
Arkansas river shiner *Notropis girardi*	Threatened	No effect
peppered chub *Macrhybopsis tetranema*	Endangered	No effect
Insects		
monarch butterfly *Danaus plexippus*	Proposed Threatened	Would not jeopardize the continued existence

3.7.3.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained and existing conditions would continue. This would have no effect on biological resources.

3.7.3.4 Reasonably Foreseeable Future Actions and Other Environmental Considerations

To varying degrees, reasonably foreseeable future actions listed in **Appendix B** would have the potential to affect biological resources. It is anticipated that any potential adverse effects from the proposed recapitalization of T-7As at Vance AFB would be identified in the EIS currently being prepared (DAF, 2024a) and avoided, minimized, or mitigated as needed through incorporation of and adherence to established DAF procedures, applicable BMPs, and consultation with USFWS. Potential adverse effects from transportation projects listed in **Appendix B** would be avoided or minimized through adherence to applicable planning and permitting processes in coordination with local, regional, state, and federal agencies and authorities. Therefore, when considered with other reasonably foreseeable actions listed in **Appendix B**, the Proposed Action would not contribute to significant adverse impacts on biological resources.

3.8 Cultural Resources

3.8.1 Definition of Resource

Cultural resources include archaeological and architectural sites that provide essential information to understand the prehistory and historical development of the United States. The primary federal law protecting cultural resources is the NHP of 1966. Under Section 106 of the NHPA, federal agencies must consider the effects of their proposed actions (or undertakings) on any historic property (i.e., any district, site, building, structure, or object that is listed or eligible for listing in the National Register of Historic Places [NRHP]). To the extent possible, adverse effects on historic properties must be avoided, minimized, or mitigated in consultation with the SHPO and other consulting parties, as appropriate. The Oklahoma Historical Society is the SHPO for the state of Oklahoma and the Kansas Historical Society is the SHPO for Kansas.

Generally, if under Section 106 an action would have an adverse effect on a historic property listed in or eligible for the NRHP, the action would also have an adverse impact under NEPA. An adverse effect that is mitigated in consultation with the SHPO and other parties, as appropriate, can generally be considered a non-significant impact under NEPA.

The Proposed Action is considered an undertaking for the purposes of Section 106. The APE for this undertaking consists of lands underlying or intersected by the boundaries of the proposed Vance 1E Low MOA **(Figure 2.2-1)**. In March 2025, the DAF initiated consultation for the proposed undertaking with the Oklahoma and Kansas SHPOs in accordance with Section 106 and requested concurrence with the APE. Section 106 correspondence is provided in **Appendix A**.

Properties of traditional religious and cultural importance, also referred to as traditional cultural places (formerly traditional cultural properties) are places eligible for inclusion in the NRHP because of their association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (NPS, 2024a). E.O. 13007, Indian Sacred Sites, defines Indian sacred sites as “specific, discrete, narrowly delineated locations on Federal land that are identified by an Indian tribe…as sacred by virtue of their established religious significance to, or ceremonial use by, an Indian religion.” Indian sacred sites are strictly religious places and can be recent in age, in contrast with traditional cultural places which can be secular and must meet stricter NRHP eligibility criteria (ACHP, 2018). An Indian sacred site can be a traditional cultural place, but not all traditional cultural places are sacred sites. Indian sacred sites are considered under the NEPA process as part of the human environment.

Under the Native American Graves Protection and Repatriation Act, federal agencies are required to plan for and protect Native American human remains or cultural items that may be removed from federal lands and return such remains or items to lineal descendants or tribes (NPS, 2024b). DoD Instruction 4710.2, *DoD Interactions with Federally Recognized Tribes* (September 24, 2018) establishes policy, assigns responsibilities, and provides procedures for DoD interactions with federally recognized Native American tribes. The *2021 DoD Plan of Action on Tribal Consultation* (May 2021) outlines the DoD’s commitment to improving implementation of E.O. 13175, Consultation and Coordination With Indian Tribal Governments. Government-to-government consultation between the DAF and Native American tribes is conducted in accordance with Air Force Instruction 90-2002, Interactions with Federally Recognized Tribes (March 2025) and DAFMAN 32-7003, Environmental Conservation (June 2024).

The DAF has initiated government-to-government consultation with Native American tribes having historic, cultural, and religious ties to lands underlying the proposed airspace. Government-to-government correspondence is included in **Appendix A**.

The Proposed Action would occur entirely within airspace above the earth’s surface and does not include construction, demolition, or other ground-disturbing activities. Therefore, archaeological sites and architectural resources not formally listed or determined eligible for listing in the NRHP or not identified as traditional cultural properties are not addressed in this EA.

3.8.2 Affected Environment

The APE contains approximately 1,051 square miles of land within northwest Oklahoma (Alfalfa and Woods counties) and south-central Kansas (Barber and Harper Counties). Located within the Central Great Plains, the APE straddles the interface of the Red Hills and Prairie Tableland physiographic regions. This region is characterized by dissected uplands and low rolling to flat terrain, underlain by Permian shales, sandstone, and gypsum and Quaternary sand dune belts (Branson and Johnson, 1972). Vegetation is predominantly mixed grass prairie communities. From northwest to southeast, lands within the APE are dissected by tributaries of the Salt Fork Arkansas and Medicine Lodge rivers. Elevations in the APE vary between 1,000 and 2,000 feet MSL.

The APE contains 13 listed architectural resources (NPS, 2024c; Oklahoma SHPO, 2024). All 13 resources are located in the City of Alva, in Woods County, Oklahoma **(Figure 3.8-1)**. These resources consist of residential, commercial, community, educational, and military buildings constructed in the first half of the twentieth century **(Table 3.8-1)**.

No federally recognized tribal lands are present within the APE (BIA, 2016). Native American tribes with ancestral ties to land underlying the APE are listed in **Appendix A**. The DAF initiated government-to-government consultation with these tribes in March 2025. In a letter dated April 23, 2025, the Comanche Nation stated that no properties were identified through review of its site files. To date, no other tribal consultation responses have been received, and no traditional cultural properties or Indian sacred sites have been identified on lands underlying the APE. Government-to-government correspondence is included in **Appendix A**.

3.8.3 Environmental Consequences

3.8.3.1 Evaluation Criteria

Adverse impacts on cultural resources could include altering characteristics of the resource that make it eligible for listing in the NRHP. Such impacts could include introducing visual or audible elements that are out of character with the property or its setting; neglecting the resource to the extent that it deteriorates or is destroyed; or the sale, transfer, or lease of the property out of agency ownership (or control) without adequate enforceable restrictions or conditions to ensure preservation of the property's historic significance. For the purposes of this EA, an effect is considered adverse if it would alter the integrity of a NRHP-listed or eligible resource or if it has the potential to adversely affect traditional cultural properties or Indian sacred sites and the practices associated with the property or sacred site.

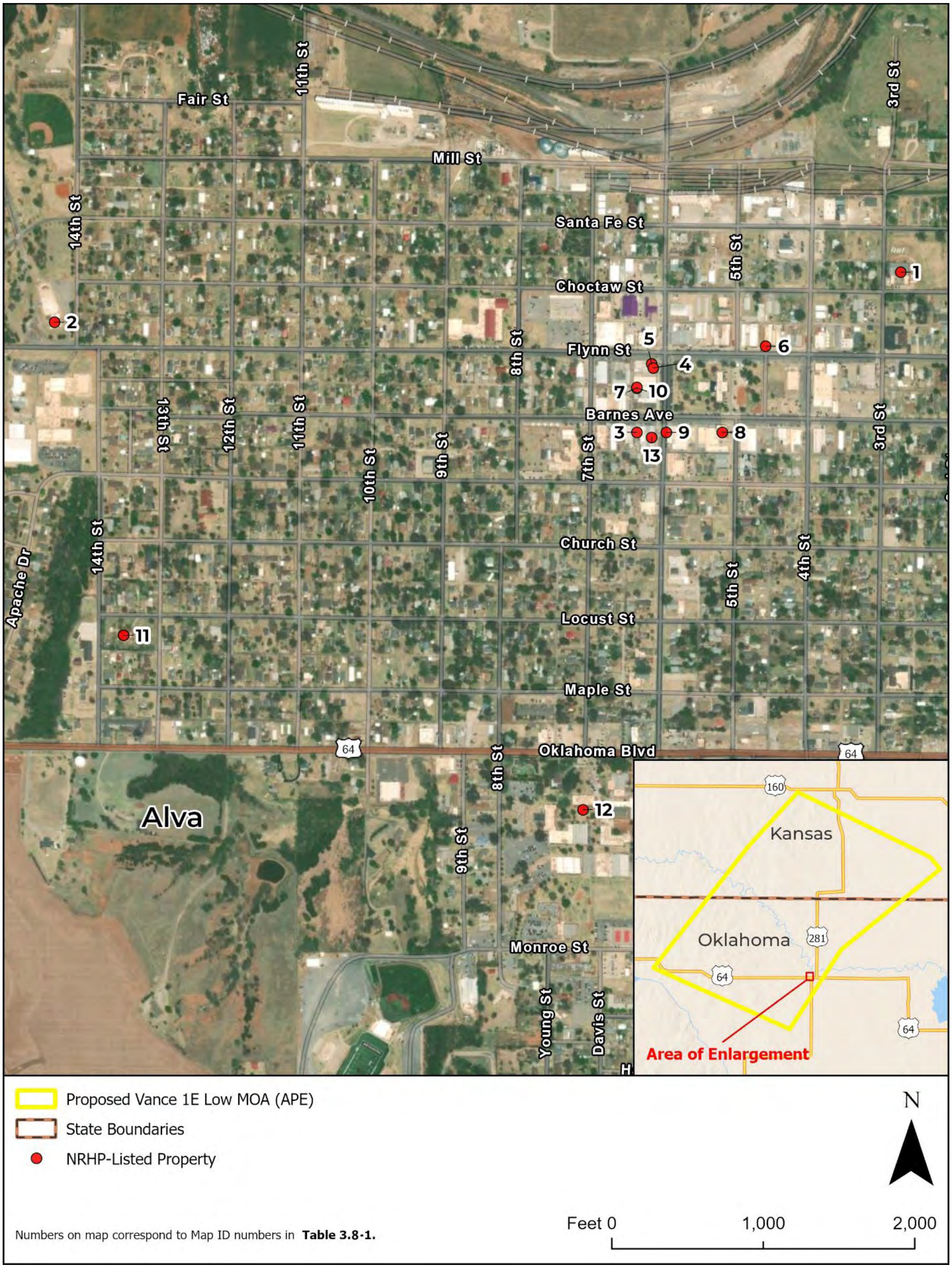


Figure 3.8-1 Locations of NRHP-Listed Resources in the APE

Table 3.8-1 Summary of NRHP-Listed Resources in the APE

Map ID [1]	Listed Resources	Year	County	Reference No.
1	Alva Armory	1936	Woods (OK)	88001360
2	Alva Municipal Swimming Pool and Bathhouse	1940	Woods (OK)	100008455
3	Branson Building	1905	Woods (OK)	84000700
4	Building at 405-407 College Avenue (commercial)	1905	Woods (OK)	84000702
5	Building at 409 College Avenue (commercial)	1901	Woods (OK)	84000703
6	Building at 500 Flynn Street (commercial)	1905	Woods (OK)	84000704
7	Central National Bank	1901	Woods (OK)	84000705
8	Hotel Bell	1927	Woods (OK)	13000395
9	Independent Order of Odd Fellows (I.O.O.F.) Hall	1905	Woods (OK)	84000706
10	Kavanaugh and Shea Building	1901	Woods (OK)	84000707
11	Nickel Ensor McClure House	1909	Woods (OK)	10000623
12	Science Hall (Northwestern Oklahoma State University)	1906	Woods (OK)	83002141
13	Stine Building	1906	Woods (OK)	82003717

Notes:
[1] Numbers listed in this column correspond to numbers shown on **Figure 3.8-1**.
Source: NPS, 2024b; Oklahoma SHPO, 2024

3.8.3.2 Alternative 1– Establish Low-Altitude MOA Under Portions of Existing Vance 1A, 1C, and 1D MOAs

Noise analysis conducted for the Proposed Action indicates that noise levels associated with Alternative 1 would not exceed 47 dBA in any area of the APE and would remain well below 65 dBA **(**see **Section 3.4)**. Noise levels that can negatively affect buildings and structures typically exceed 130 dBA (U.S. Navy, 2018), and noise levels at or below 47 dBA would not be expected to introduce audible elements that would alter the character, setting, or integrity of a historic property. Although some individual locations within the APE could experience noise levels from Alternative 1 that could exceed 47 dBA, these occurrences would be brief and relatively infrequent and would be unlikely to affect the integrity or character-defining features of any historic property. No ground disturbance would take place as part of Alternative 1; therefore, no archaeological resources (surface or subsurface) would be disturbed or otherwise affected. Likewise, Alternative 1 would not physically disturb or otherwise affect the NRHP-listed architectural resources in the APE. Alternative 1 would have no potential to affect traditional cultural properties or Indian sacred sites, as no such properties or sites have been identified in the APE.

Therefore, per guidance set forth in 36 CFR § 800.5, the DAF has determined that Alternative 1 would have no adverse effect on historic properties. In a letter dated March 11, 2025, the Oklahoma SHPO stated that there are no historic properties affected by the Proposed Action. Concurrence with the DAF's determination by the Kansas SHPO is pending. Section 106 correspondence is included in **Appendix A**.

3.8.3.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained, and existing conditions would continue. This would have no impact on historic properties.

3.8.3.4 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Reasonably foreseeable future actions listed in **Appendix B** could have the potential to affect historic properties, including architectural and archaeological resources, and/or traditional cultural properties. Implementation of these projects would be contingent on compliance with applicable federal, state, and local environmental compliance requirements, including NEPA and NHPA Section 106. It is anticipated that potential adverse effects on historic properties from these projects would be identified, avoided, minimized, or mitigated to less than significant levels through consultation with the Oklahoma and Kansas SHPOs, tribal governments, local authorities, and/or the ACHP, as applicable. Therefore, when considered with other reasonably foreseeable future actions listed in **Appendix B**, the Proposed Action would not be anticipated to contribute to significant adverse impacts on historic properties.

3.9 Safety

3.9.1 Definition of Resource

Safe, effective, and disciplined flying training operations are a critical priority of the DAF. Safety concerns associated with MOA flight activities are considered in this section and address issues related to the health and well-being of both military personnel operating in and civilians living under or near the Vance Airspace Complex and primarily the Vance 1A, 1C, and 1D MOAs and ATCAA.

The primary aspect of flight safety addressed in this section is the potential for aircraft accidents. Such accidents could include mid-air collisions involving two or more aircraft, collisions with terrain or manmade structures, collisions with birds or other wildlife, weather-related accidents, mechanical failure, or pilot error. Flight risks apply to civilian and military aircraft. Analysis of flight risks correlates mishap rates **(Section 3.9.2.2)** and BASH **(Section 3.9.2.3)** with airspace utilization.

The ROI for safety consists of airspace in and under portions of the existing Vance 1A, 1C, and 1D MOAs and ATCAA, including airspace above 500 feet AGL where the proposed low-altitude MOA would be established under the Proposed Action. The Proposed Action does not involve changes to and would have no impacts on ground safety, which pertains to the safety of personnel and facilities supporting flight operations at installations; therefore, ground safety is not addressed further.

3.9.2 Affected Environment

3.9.2.1 MOA Operating Procedures

Military aircraft flight training operations in MOAs are governed by standard rules of flight and may be conducted on a scheduled basis. MOAs are charted so nonparticipating aircraft may be aware of these operations. Additional information and operational procedures applicable to MOAs, including the existing Vance 1A, 1C, and 1D MOAs, are provided in Flight Publication (FLIP) AP/1A (DoD, 2024). Units responsible for scheduling flight training activities on MOAs must ensure that airspace information and procedures listed in FLIP AP/1A are complete and accurate for the safe and efficient operation of aircraft in the MOAs for which they are responsible. At a minimum, operational procedures or remarks provided in FLIP AP/1A typically include the following:

Scheduling and Coordination:

Each MOA has a designated military office responsible for scheduling all military flights for use of that area. Areas shall not be used for military training unless scheduled.

Special conditions of use and procedures for each MOA are established by letter of agreement between the local military authority and concerned ATC facility. The scheduling office will advise all scheduled military users of the operating procedures contained in the letter of agreement.

Military operations in excess of 250 knots below 10,000 feet should be conducted in SUA to the maximum extent possible.

Flight Procedures:

Military training operations within MOAs shall be conducted in accordance with the letter of agreement.

Although not required, ATC or a military radar unit may provide advisory/ monitoring/separation services within the MOA. However, the pilot is responsible for remaining within the area and exercising "see and avoid" during visual conditions.

Basic airmanship procedures exist for handling any deviations from air traffic control procedures due to an in-flight emergency; these procedures are defined in Air Force Manual 11-202 Volume 3, *Flight Operations* and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations which includes flight operation rules and procedures.

3.9.2.2 Aircraft Mishaps

Aircraft mishaps and their prevention represent a prime concern of the DAF. A mishap is an unplanned occurrence or series of occurrences, that result in damage or injury and meets Class A, B, C, D, and Class E event reporting criteria as defined in DAFMAN 91-224, *Ground Safety Investigations and Reports*. Class A mishaps are the most severe with total property damage of $2 million or more or a fatality and/or permanent total disability. Mishap classes are defined in **Table 3.9-1**.

Based on historical data on mishaps at all DoD installations, and under all conditions of flight, the military services calculate mishap rates per 100,000 flying hours for each type of aircraft in the inventory. Over the last decade, Air Force Safety Center reports of Class A mishaps for all manned aviation (excluding flight related ground operations) have ranged from 7 in 2014 (a rate of 0.44 per 100,000 flight hours) to 23 in 2018 (a rate of 1.51 per 100,000 flight hours) (HQ AFSEC, 2023a). Similarly, Air Force Safety Center reports of Class B mishaps for all manned aviation (excluding flight related ground operations) have ranged from 23 in 2019 (a rate of 1.54 per 100,000 flight hours) to 38 in 2016 (a rate of 2.34 per 100,000 flight hours) (HQ AFSEC, 2023b).

Table 3.9-1 Aircraft Mishap Classes and Criteria

Mishap Class	Mishap Criteria[1]
A	1. Direct mishap cost totaling $2,000,000 or more. 2. A fatality or permanent total disability. 3. Destruction of a Department of Defense aircraft. 4. Permanent loss of primary mission capability of a space vehicle.
B	1. Direct mishap cost totaling $600,000 or more but less than $2,500,000. 2. A permanent partial disability. 3. Inpatient hospitalization of three or more personnel. This does not include individuals hospitalized for observation, diagnostic, or administrative purposes that were treated and released. 4. Permanent degradation of primary or secondary mission capability of a space vehicle or the permanent loss of secondary mission capability of a space vehicle.
C	1. Direct mishap cost totaling $50,000 or more but less than $500,000. 2. Any injury or occupational illness that causes loss of one or more days away from work not including the day or shift it occurred. 3. An occupational injury or illness resulting in permanent change of job. 4. Permanent loss or degradation of tertiary mission capability of a space vehicle.
D	On-duty mishap resulting in one or more of the following: 1. Direct mishap cost totaling $20,000 or more but less than $50,000. 2. A recordable injury cost or illness not otherwise classified as a Class A, B, or C mishap. 3. Any work-related mishap resulting in a recordable injury or illness not otherwise classified as a Class A, B, or C mishap.
E	A work-related mishap that falls below Class D criteria. Most Class E mishap reporting is voluntary; events requiring mandatory reporting are listed in discipline-specific safety manuals.

Notes:
[1] Mishap criteria defined as resulting in one or more item listed by Class.
Source: DAF, 2024b

In comparison, from 2012 through 2021, T-38 aircraft have had 8 Class A mishaps (a rate of 0.79 per 100,000 flight hours) and 6 Class B mishaps (a rate of 0.59 per 100,000 flight hours) (Air Force Safety Center, 2021a). Over the same period, F-16 aircraft have had 35 Class A mishaps (a rate of 1.81 per 100,000 flight hours) and 24 Class B mishaps (a rate of 1.24 per 100,000 flight hours) (Air Force Safety Center, 2021b).

Vance's *Mishap Response Plan* (Vance AFB, 2018) is implemented following any major (Class A or B) Aviation, Occupational, Weapons or other category of mishap in the Vance AFB area of responsibility. Class A and B mishaps are the two categories with the most severe outcomes with regard to property damage, including destroyed aircraft, and fatalities and injuries. Over the last 5 years, while 62 events occurred, mostly related to low altitude, local patterns at the airfield, only five events were determined to have occurred in the northeastern portion of the Vance 1B MOA and the underlying MTRs.

3.9.2.3 Bird/Wildlife Aircraft Strike Hazard

Aircraft collisions with birds and wildlife present a safety concern for aircraft operations because of the potential for damage to aircraft or injury to aircrews or local populations if a crash should occur. Aircraft can encounter birds at nearly all altitudes up to 30,000 feet MSL; however, most birds fly close to the ground. Approximately 52 percent of strikes occur from birds flying below 400 feet and 88 percent occur at less than 2,000 feet AGL (Air Force Safety Center, 2016).

The Air Force BASH program was established to minimize the risk for collisions of aircraft with birds and wildlife and the potential for subsequent human injury or loss of life, and property damage. In accordance with DAF Instruction 91-202, *The DAF Mishap Prevention Program* (DAF, 2020), each DAF flying unit is required to develop a BASH plan to reduce hazardous bird/wildlife activity relative to airfield flight operations. The intent of each plan is to reduce BASH risks at airfields by establishing an integrated hazard abatement program through monitoring, avoidance, and actively controlling bird and animal population movements. Vance AFB is located within the Central Flyway migration corridor **(Section 3.7)**, resulting in the increased potential for in-flight encounters with birds during migration.

Areas near the existing Vance 1A, 1C, and 1D MOAs are classified by the Avian Hazard Advisory System as having generally low bird-strike risk during the night and moderate risk during the day throughout most of the spring and summer months. From October through February, the risk increases to moderate-to-severe during the morning hours. The *Vance AFB BASH Plan 91-2* (Vance AFB, 2024) establishes a program designed to minimize local and transient aircraft exposure to potentially hazardous bird/wildlife strikes at or near Vance AFB, in addition to other areas owned or managed by Vance AFB, including MOAs, where Vance local and transient aircraft operate on a regular basis. BASH incidents that occur in MOAs are reported and included in each installation's BASH statistics; incidents in or under the MOAs have been limited to occasional T-38C bird strikes during low level flying operations underneath the Vance 1C MOA (most recent occurring on August 13, 2024, on IR-175). No recent BASH incidents have been reported associated with flight operations in or under the existing Vance 1A and 1D MOAs.

3.9.2.4 Obstructions to Flight

A flight obstruction is any obstruction in navigable airspace that applies to existing and proposed human-made objects, objects of natural growth, and terrain.

Flight operations in the proposed Vance 1E Low MOA would begin and end outside the airfield traffic pattern airspace area or Class B, C, and D airspace areas. FAA considerations and guidance for evaluating obstructions in airspace where aircraft are operating under VFR (such as the MOAs) include (FAA, 2025a):

A structure would have an adverse effect upon VFR air navigation if its height is greater than 500 feet above the surface at its site, and within 2 statute miles of any regularly used VFR route.

Evaluation of obstructions located within MOAs or VFR routes must recognize that pilots may, and sometimes do, operate below the floor of controlled airspace during low ceilings and 1-mile flight visibility. When operating in these weather conditions and using pilotage navigation, these flights must remain within 1 mile of the identifiable landmark to maintain visual reference. Even if made more conspicuous by the installation of high intensity white obstruction lights, a structure placed in this location could be a hazard to air navigation because after sighting it, the pilot may not have the opportunity to safely circumnavigate or overfly the structure.

Operations in MOAs and MTRs provide military aircrews low altitude, high speed navigation and tactics training, and are a basic requirement for combat readiness (see FAA Order JO 7610.14, *Non-Sensitive Procedures and Requirements for Special Operations*). Surface structures have their greatest impact on VFR operations when ceiling and visibility conditions are at or near basic VFR minimums. Accordingly, the guidelines for a finding of substantial adverse effect on en route VFR operations are based on consideration for those operations conducted under 14 CFR Part 91 that permits flight clear of clouds with 1-mile flight visibility outside controlled airspace. A proposed structure's location within the boundaries of a MOA is not a basis for determining it to be a hazard to air navigation; however, in recognition of the military's requirement to conduct low-altitude training, the DAF would disseminate Part 77 notices and aeronautical study information to military representatives. Additionally, attempts are made to persuade the sponsor to lower or relocate a proposed structure that exceeds obstruction standards and has been identified by the military as detrimental to its training requirement.

Flight safety concerns include obstacle avoidance which varies by aircraft and is published for each aircraft’s associated 11-series publication. For example, Air Force Instruction 11-2F-16 Volume 3, *F-16 Operations Procedures* directs flight leads who are unable to visually acquire or ensure lateral separation from known vertical obstructions in the route of flight, to direct a climb to an altitude that ensures vertical separation, no later than 3 nautical miles prior to the obstruction.

With gentle, rolling plains in and around the ROI, potential flight obstructions in or near these airspaces include commercial wind turbines and cellular towers which are both prevalent throughout central Oklahoma. The U.S. Wind Turbine Database, which provides the location of land-based and offshore wind turbines in the United States, does not identify any wind turbines in the ROI. There are a small number of cellular communications towers below the proposed Vance 1E Low MOA, with the tallest at 489 feet. Safety concerns would involve proper monitoring and updating for future towers. Mitigation of these towers would include maintaining draw files on the T-38C to include updated tower locations and avoidance areas. Any safety concerns would be mitigated by applying similar procedures as Vance does with low level training.

3.9.3 Environmental Consequences

3.9.3.1 Evaluation Criteria

Impacts on safety from the Proposed Action are assessed according to the potential to increase or decrease safety risks to personnel, the public, property, or the environment. Adverse impacts on safety may include modifying the airspace such that aircraft would overfly populated areas at lower altitudes or implementing new flight procedures that result in greater flight safety risk; both types of changes could result from the establishment of the proposed Vance 1E Low MOA. For the purposes of this EA, an impact is considered significant if the proposed safety measures are not consistent with Air Force Office of Safety and Health and Occupational Safety and Health Administration standards resulting in unacceptable safety risks. Analysis of aircraft flight safety risks correlates projected Class A mishaps and potential collisions between birds with current airspace use to consider the magnitude of the change in risk associated with the Proposed Action.

3.9.3.2 Alternative 1 - Establish Low-Altitude MOA Under Portions of Existing Vance 1A, 1C, and 1D MOAs

Aircraft Mishaps

Under Alternative 1, DAF pilots would utilize the proposed Vance 1E Low MOA, with vertical extents from 500 feet AGL up to, but not including 8,000 feet MSL possibly along with the existing Vance 1A, 1C, and 1D MOAs and ATCAA. The proposed Vance 1E Low MOA would be managed and operated as a separate airspace distinct from the existing Vance 1A, 1C, and 1D MOAs and ATCAA. This would allow FAA civilian ATC to restrict military operations in the airspace, when needed, to facilitate safe transit of the airspace by civilian aircraft (including any civil airports located directly below the airspace). The proposed Vance 1E Low MOA could be combined with the existing Vance 1A, 1C, and 1D MOAs and ATCAA to provide seamless flight operations from 500 feet AGL to FL 240, which would increase the space for vertical maneuverability and improve flight safety in that respect. However, the Proposed Action includes reasons why flight safety could potentially deteriorate. Foremost, there would be new, low-altitude military flights in the proposed Vance 1E Low MOA (including 1,170 T-38C and 288 F-16C annual operations, which would be below 2,000 feet AGL most of the time, and down to 500 feet AGL), whereas all operations are currently above 7,000 to 8,000 feet MSL. Aircraft mishaps due to BASH incidents, weather-related accidents, mechanical failure, or pilot error would therefore have the potential to increase.

The limited amount of time an aircraft would be over any specific location, combined with sparsely populated areas under the proposed Vance 1E Low MOA and existing Vance 1A, 1C, and 1D MOAs and ATCAA, including limited areas that would be crossed by existing MTRs (IR-145, IR-146, IR-175, IR-185, VR-119, VR-138, SR-235 and SR-253; see **Figure 3.3-5**), would minimize the probability that an aircraft mishap would occur over a populated area. All MOA flight operations would continue to be conducted in accordance with procedures established in the applicable DAF regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. DAFMAN 13-201 addresses participation in the Midair Collision Avoidance Program, which helps inform the local civil aviation community of mission flight activities and the locations and times when those activities occur. Such ongoing interactions help promote a safe flying environment for both military and civil aviation pilots. Strict control and use of established safety procedures would minimize the potential for aircraft mishaps and safety risks in general and would ensure that any potential adverse impacts would not be significant.

Bird/Wildlife-Aircraft Strike Hazards

Military aircrews operating within the proposed Vance 1E Low MOA and existing Vance 1A, 1C, and 1D MOAs and ATCAA would continue to follow applicable procedures outlined in the *Vance AFB BASH Plan 91-2* (Vance AFB, 2024). General flight safety risks and BASH risks would be assessed for flights lower than 1,000 feet AGL, and additional avoidance procedures outlined in the *Vance AFB BASH Plan* would be followed during low-altitude training as applicable. Continued adherence to current safety procedures, and taking preventive action when BASH risk increases, would ensure that potential impacts from BASH under Alternative 1 would not be significant.

Obstructions to Flight

Under Alternative 1, with the establishment of the proposed Vance 1E Low MOA and implementation of low altitude flying as low as 500 feet AGL, pilots would exercise "see and avoid" actions during visual conditions to avoid potential obstructions in accordance with all applicable DAF procedures and requirements. As such, potential adverse impacts on safety from flight obstructions under Alternative 1 would not be significant.

All MOA flight operations would continue to be conducted in accordance with procedures established in the applicable DAF regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. Therefore, Alternative 1 would have no adverse impacts on flight safety.

3.9.3.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained and existing conditions would continue. Flight training operations would continue in the existing Vance 1A, 1C, and 1D MOAs and ATCAA in accordance with all applicable safety requirements. The No Action Alternative would have no adverse impacts on safety.

3.9.3.4 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Except for the proposed recapitalization of T-7As at Vance AFB (DAF, 2024a), none of the reasonably foreseeable future actions listed in **Appendix B** would have the potential to contribute to significant adverse impacts on flight safety in the ROI. The proposed T-7A recapitalization would involve a period where T-7A aircraft are phased in to replace existing T-38C aircraft. At the end of the phase-in period, the number of T-7A aircraft would equal the number of T-38C aircraft, represented in the Proposed Action, and fly the same annual number of operations in the existing (high) and proposed (low) Vance MOAs.

Aircraft Mishaps

Under reasonably foreseeable future conditions, DAF pilots would utilize the proposed Vance 1E Low MOA, with vertical extents from 500 feet AGL up to, but not including 8,000 feet MSL possibly along with the existing Vance 1A, 1C, and 1D MOAs and ATCAA as described for Alternative 1. The primary difference would be the replacement of T-38C operations with T-7A operations; however, the FBF training syllabus would require that the T-7A fly similar low-level mission profiles and otherwise fly like the T-38C throughout the Vance low and high MOAs. Compared with the Proposed Action, the risk of aircraft mishaps would not be expected to change noticeably. Compared with the No Action Alternative, the risk of mishaps would likely increase for the reasons mentioned in **Section 3.9.3.2**, (i.e., due to the introduction of low-level flying, whereas flights are currently conducted at higher altitudes). However, the limited amount of time an aircraft would be over any specific location, combined with sparsely populated areas under the proposed Vance 1E Low MOA and existing Vance 1A, 1C, and 1D MOAs and ATCAA, would minimize the probability that an aircraft mishap would occur over a populated area. All MOA flight operations would continue to be conducted in accordance with procedures established in the applicable DAF regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. DAFMAN 13-201 addresses participation in the Midair

Collision Avoidance Program, which helps inform the local civil aviation community of mission flight activities and the locations and times when those activities occur. Such ongoing interactions help promote a safe flying environment for both military and civil aviation pilots. Strict control and use of established safety procedures would minimize the potential for aircraft mishaps and safety risks in general and would ensure that any potential adverse impacts would not be significant.

Bird/Wildlife-Aircraft Strike Hazards

With the introduction of T-7A low-altitude flights under reasonably foreseeable future conditions, military aircrews operating within the proposed Vance 1E Low MOA and existing Vance 1A, 1C, and 1D MOAs and ATCAA would continue to follow applicable procedures outlined in the *Vance AFB BASH Plan 91-2* (Vance AFB, 2024). General flight safety risks and BASH risks would be assessed for flights lower than 1,000 feet AGL, and additional avoidance procedures outlined in the *Vance AFB BASH Plan* would be followed during low-altitude training as applicable. Continued adherence to current safety procedures, and taking preventive action when BASH risk increases, would ensure that potential adverse impacts from BASH under reasonably foreseeable future conditions would not be significant.

Obstructions to Flight

When operating T-7As as low as 500 feet AGL in the proposed Vance 1E Low MOA under reasonably foreseeable future conditions, pilots would exercise "see and avoid" actions during visual flight conditions to avoid potential obstructions in accordance with all applicable DAF procedures and requirements. As such, potential adverse impacts on safety from flight obstructions would not be significant.

All MOA flight operations would continue to be conducted in accordance with procedures established in the applicable DAF regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. Therefore, the operation of T-7A in the existing and proposed Vance MOAs under reasonably foreseeable future conditions would not contribute to significant adverse impacts on flight safety.

3.10 Socioeconomics

Socioeconomic resources addressed in this section include regional demographics and economic activity. Demographics include the number, distribution, and composition of population and households. Economic activity is represented by the region’s major industries, employment, and income characteristics. Socioeconomic data are presented in this section at the county level. State-level data are provided for comparison.

E.O. 13045, Protection of Children from Environmental Health Risks and Safety Risks (April 21, 1997) states that each federal agency “(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.”

The socioeconomics ROI consists of the four counties in Oklahoma and Kansas under the proposed Vance 1E Low MOA: Alfalfa County and Woods County in Oklahoma and Barber County and Harper County in Kansas. These counties are shown on **Figure 3.10-1.** Socioeconomic data for the states of Oklahoma and Kansas are provided for comparison.

3.10.1 Affected Environment

3.10.1.1 Population and Economy

The population of the ROI and individual counties within the ROI, and population changes that occurred between 2020 and 2023, are presented in **Table 3.10-1**. Woods and Alfalfa Counties had the largest countywide populations in 2020 and 2023. Harper County had the smallest population whereas the county had the highest population per square mile in 2020. Between 2020 and 2023, the ROI population declined for each of the four counties with Barber County experiencing the largest rate of decline (-3.7 percent) while Alfalfa, Woods, and Harper declined -0.5, -0.7, and -1.0, respectively. These declines occurred while the state population of Oklahoma grew 2.4 percent, and the population of Kansas grew 1.0 percent during the same time period.

Table 3.10-1 Population Change in the ROI (2020 to 2023)

Counties in the ROI	2020 Population	2023 Population	Percent Change
Alfalfa, Oklahoma	5,699	5,673	-0.5
Woods, Oklahoma	8,624	8,564	-0.7
Barber, Kansas	4,228	4,071	-3.7
Harper, Kansas	5,485	5,435	-1.0
ROI	**24,036**	**23,743**	**-1.0**
Oklahoma	**3,959,353**	**4,053,824**	**2.4**
Kansas	**2,937,880**	**2,940,546**	**1.0**

Source: U.S. Census Bureau, 2024

The population per square mile and the change in population per square mile is shown in **Table 3.10-2**. Over the period from 2010 to 2020, the population per square mile remained relatively constant across all four counties. Overall, the ROI population for Oklahoma represents .004 percent of the total state population and the ROI population for Kansas represents .003 percent of the total state population.

Table 3.10-2 Population per Square Mile Change in the ROI (2010 to 2020)

Counties in the ROI	2010 Population/ Square Mile	2020 Population/ Square Mile	Percent Change
Alfalfa, Oklahoma	6.5	6.6	+1.0
Woods, Oklahoma	6.9	6.7	-1.0
Barber, Kansas	4.3	3.7	-1.2
Harper, Kansas	7.5	6.8	-1.0
ROI	**6.3**	**6.0**	**-1.0**
Oklahoma	**54.7**	**57.7**	**+1.0**
Kansas	**34.9**	**35.9**	**+1.0**

Source: U.S. Census Bureau, 2024

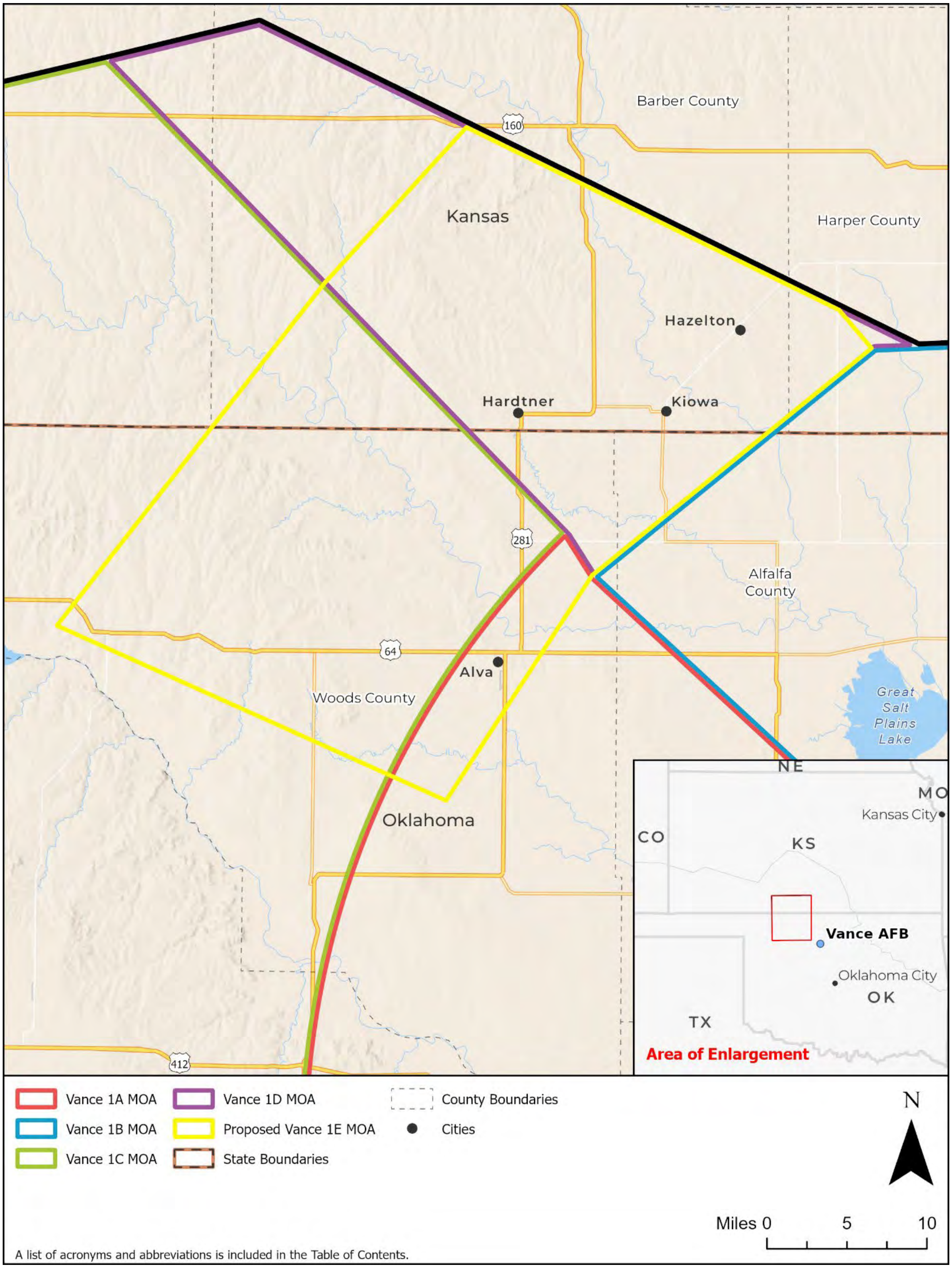


Figure 3.10-1 Oklahoma and Kansas Counties in the ROI

3.10.1.2 Race and Ethnicity

The percentage of the population identifying as White in the ROI is greater than 90 percent and exceeds the statewide percentage of 73 percent for Oklahoma and 86 percent for Kansas **(Table 3.10-3)**. The populations of all counties in the ROI are below the corresponding statewide percentages in Oklahoma and Kansas for persons identifying as Black or African American, Asian, Native Hawai’ian or Other Pacific Islander, and Two or More Races. The average percentage identifying as American Indian or Alaska Native in the ROI (2.8) is less than the corresponding statewide percentage for Oklahoma (9.5) and greater than the corresponding statewide percentage for Kansas (1.3). The percentage of persons identifying as Hispanic / Latino in the ROI and individual counties is less than the corresponding statewide percentages for Oklahoma (12.9) and Kansas (13.7).

Table 3.10-3 Race and Ethnicity as a Percent of the Total Population in the ROI

Counties in ROI	White Alone	Black or African American	American Indian or Alaska Native	Asian	Native Hawai’ian or Other Pacific Islander	Two or More Races	Hispanic / Latino[1]
Alfalfa, Oklahoma	85.2	5.9	4.4	0.7	0.1	3.7	6.6
Woods, Oklahoma	87.8	3.4	3.5	1.3	0.1	4.0	7.6
Barber, Kansas	94.4	1.1	1.5	0.7	Z	2.3	4.2
Harper, Kansas	93.9	1.0	1.8	0.6	0.2	2.5	7.9
ROI	**90.3**	**2.9**	**2.8**	**0.8**	**0.1**	**3.1**	**6.6**
Oklahoma	**72.9**	**7.9**	**9.5**	**2.6**	**0.3**	**6.8**	**12.9**
Kansas	**85.9**	**6.2**	**1.3**	**3.2**	**0.2**	**3.3**	**13.7**

Notes:
Source: U.S. Census Bureau, 2024
[1]Persons identifying as Hispanic and Latino may be of any race and are included in the percentages of the other categories shown.
Z = Value greater than zero but less than half unit of measure shown

3.10.1.3 Age

Except for Harper County, the average percentage of persons younger than 18 years in the ROI (22.1 percent) is somewhat lower but generally comparable to the statewide percentages in Oklahoma (23.8 percent) and Kansas (23.6 percent) **(Table 3.10-4)**. The average percentage of persons 65 years and older in the ROI is more than 5 percentage points higher than the statewide percentages in Oklahoma and more than 4 percentage points higher than the statewide percentage in Kansas. This indicates the counties underlying the proposed MOA have higher concentrations of persons 65 years of age and older relative to the statewide populations of Oklahoma and Kansas.

Table 3.10-4 Percent of Persons Younger than 18 and Older than 65 Years in the ROI

Counties in ROI	Persons Younger Than 18 Years (percent)	Persons Older Than 65 Years (percent)
Alfalfa, Oklahoma	18.6	20.6
Woods, Oklahoma	20.9	18.0
Barber, Kansas	22.9	25.6
Harper, Kansas	26.1	22.4
ROI	22.1	21.7
Oklahoma	23.8	16.6
Kansas	23.6	17.5

Source: U.S. Census Bureau, 2024

3.10.1.4 Income and Poverty

Median household income and per capita income in the ROI are approximately $6,000 and $4,500 less, respectively, than the state of Oklahoma and approximately $15,000 and $5,000 less, respectively, than the state of Kansas **(Table 3.10-5)**. In the ROI, Alfalfa County has the highest median household income ($67,870) which is higher than the state of Oklahoma, while per capita income ($29,173) is over $5,000 less than the state. Woods County has the lowest median household income ($50,512) and the second lowest per capita income ($29,460) within the ROI.

Alfalfa County (19.8) and Woods County (18.0) both exceed the Oklahoma statewide percentage of persons in poverty (15.9) by 3.9 percent and 2.1 percent, respectively. Likewise, both Barber County (11.7) and Harper County (14.1) exceed the Kansas statewide percentage of persons in poverty (11.2) by 0.5 percent and 2.9 percent, respectively. On average, the percentage of persons in poverty in the ROI is the same as the Oklahoma statewide percentage and exceeds the Kansas statewide percentage by more than 4 percentage points. This indicates that economic conditions in the ROI are somewhat less prosperous relative to statewide conditions in Oklahoma and Kansas.

Table 3.10-5 Income and Poverty in the ROI

Counties in ROI	Median Household Income (dollars)	Per Capita Income in Past 12 Months (dollars)	Persons in Poverty (percent)
Alfalfa, Oklahoma	67,870	29,173	19.8
Woods, Oklahoma	50,512	29,460	18.0
Barber, Kansas	57,615	34,620	11.7
Harper, Kansas	55,417	28,555	14.1
ROI	**57,854**	**30,452**	**15.9**
Oklahoma	**6,3603**	**34,859**	**15.9**
Kansas	**72,639**	**39,638**	**11.2**

Source: U.S. Census Bureau, 2024

3.10.1.5 Economic Activity

The labor force in the ROI includes 11,340 employable persons, of whom 10,999 are employed **(Table 3.10-6)**. The unemployment rate in the ROI is 3.0 percent compared to 3.5 percent and 3.9 percent for Oklahoma and Kansas, respectively. Median household income in the existing ROI in 2022 was $57,854 and per capita income was $30,452, both of which are slightly lower than the state as a whole. Alfalfa County in Oklahoma had the highest median household income ($67,870) while Woods County in Oklahoma had the lowest ($50,512).

Table 3.10-6 Employment in the ROI

Counties in ROI	Number in Labor Force	Number Employed	Unemployment Rate (percent)
Alfalfa, Oklahoma	2,235	2,175	2.7
Woods, Oklahoma	4,337	4,221	2.7
Barber, Kansas	2,140	2,073	3.1
Harper, Kansas	2,628	2,530	3.7
ROI	**11,340**	**10,999**	**3.0**
Oklahoma	**1,990,149**	**1,921,108**	**3.5**
Kansas	**1,548,923**	**1,489,002**	**3.9**

Source: U.S. Bureau of Labor Statistics, 2025

3.10.1.6 Air Travel and Transport

According to the Oklahoma Aeronautics Commission (OAC, 2017), the Oklahoma aviation industry includes 135 airports. It consists of 4 commercial service airports and 131 general aviation airports. The aerospace and defense industry is the second largest and fastest growing industry in Oklahoma with over 206,000 jobs and a total of $44 billion in annual statewide economic activity. General aviation airports in Oklahoma support over 6,300 jobs and more than $693 million in total annual economic activity.

The Kansas aviation industry includes 384 public and private airports. Wichita, Kansas is recognized globally as the *Air Capital of the World* with a concentration of aviation and defense research, development, and manufacturing (Kansas Department of Commerce, 2021). Kansas airports contribute $9.0 billion annually to total economic impacts, while aerospace manufacturing accounts for 46 percent of this output to state and local economies. Overall, the aviation and aerospace industry contributes $7 billion to the Kansas Gross Domestic Product, $2.25 billion in annual aerospace exports, and supports 34,000 jobs (Kansas DOT, 2017).

At least three general aviation airports are within the ROI (TollFreeAirline.com, 2024):

- AVK, Woods County, Oklahoma
- 42KS, Barber County, Kansas
- 4KS, Barber County, Kansas

Additional information about these airports is provided in **Section 3.4**.

3.10.2 Environmental Consequences

3.10.2.1 Evaluation Criteria

Impacts on socioeconomics would be considered significant if they resulted in either substantial changes in the local or regional population, housing, community general services (health, police, and fire services), or social conditions from the demands of additional population/population shifts (e.g., local or regional economy, employment, or spending or earning patterns).

3.10.2.2 Alternative 1

Alternative 1 consists entirely of activities that would occur in airspace above the earth's surface and would not involve changes to the number of personnel assigned to any DoD or DAF installation; construction, demolition, or other ground-disturbing activities in the ROI; or any other associated activities that could result in changes in population, employment, income, or other social or economic activity in the ROI. Sustained aircraft noise levels associated with Alternative 1 would not exceed 65 dBA in any given location in the ROI **(Section 3.4.3.2)** and as such, would be unlikely to prevent the continued occupation or use of existing or planned land uses in the ROI, including private residences.

Increased noise levels from aircraft operating at lower altitudes in the proposed Vance 1E Low MOA would be comparable to existing conditions and not frequent enough, or loud enough, in the ROI to permanently impede or prevent the continued operation of existing businesses or other economic activities, prevent the establishment of new businesses in the ROI, or adversely affect property values or the continued occupation or operation of underlying land uses, including those where concentrations of persons under the age of 18 or over 65 years of age could be present.

Civilian and commercial flights from airports in the ROI could be delayed slightly or be required to deviate for avoidance of military training activities in the airspace. However, during times when the proposed Vance 1E Low MOA would be active, Vance AFB ATC would implement and adhere to applicable airspace deconfliction procedures in accordance with its FAA-delegated ATC authority to ensure the safe operation and transit or avoidance of the airspace by commercial and general aviation aircraft. Vance AFB pilots would also continue to observe established avoidance areas around airports in the ROI to prevent disruptions to ongoing operations at those facilities. As such, Alternative 1 would not affect the economic activity or output of municipal and regional airfields or notably impede the movement of people and goods. Therefore, impacts on socioeconomics from Alternative 1 would not be significant.

3.10.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained, and existing conditions would continue. This would have no impact on socioeconomics.

3.10.2.4 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Reasonably foreseeable future actions summarized in **Appendix B** would have the potential to affect socioeconomic conditions in the ROI. It is anticipated that any potentially adverse effects on socioeconomics would be identified during project planning and avoided or minimized through coordination with local and regional agencies and authorities, and adherence to applicable permitting requirements. Therefore, when considered with the reasonably foreseeable future actions summarized in **Appendix B**, the Proposed Action would not contribute to significant adverse effects on socioeconomics.

3.11 Visual Resources

3.11.1 Definition of Resource

The assessment of visual effects broadly addresses the extent to which a proposed action would either 1) produce light emissions that create annoyance or interfere with activities or 2) contrast with, or detract from, the visual resources and/or the visual character of the existing environment. Light emissions are defined as "any light that emanates from a light source into the surrounding environment." Visual resources include buildings, sites, traditional cultural properties, and other natural or manmade landscape features that are visually important or have unique characteristics. Visual resources may include structures or objects that obscure or block other landscape features. In addition, visual resources can include the cohesive collection of various individual visual resources that can be viewed at once or in concert from the area surrounding the site of the proposed action or alternative(s). In some circumstances, the nighttime sky may be considered a visual resource.

Visual character refers to the overall visual makeup of the existing environment where a proposed action would occur. For example, areas near densely populated areas generally have a visual character that could be defined as urban, whereas less developed areas could have a visual character defined by the surrounding landscape features, such as open grass fields, forests, mountains, or deserts. The assessment of visual effects involves subjectivity (FAA, 2023c). For simplicity, the term "visual resources" is used to refer to both visual resources and visual character in this analysis and is inclusive of both of those terms as described above.

Potential effects on visual resources are evaluated in this EA in accordance with FAA Order JO 1050.1. The ROI for the analysis of visual resources consists of airspace within, above, and below the proposed Vance 1E Low MOA; lands directly below the proposed Vance 1E Low MOA in portions of Alfalfa and Woods Counties in Oklahoma and Barber and Harper Counties in Kansas; and adjacent lands where viewers may observe aircraft activity within the proposed MOA. Light emissions are not considered in this analysis because no nighttime aircraft operations are included in the Proposed Action, nor does the Proposed Action include any other activities that would have the potential to temporarily or permanently emit light during nighttime hours in the ROI.

3.11.2 Affected Environment

The visual character of the ROI is characterized by flat or nearly flat topography, agricultural fields, and extensive grasslands. The landscape contains small clusters of trees and rural communities. Transportation and utility infrastructure is widely distributed within the ROI and primarily consists of paved, two-lane roads such as U.S. Highway 281 and U.S. Highway 64, railroad tracks, and utility lines supported by wooden, concrete, or metal poles and towers adjacent to road and rail rights-of-way. Agricultural structures, such as barns and sheds, are scattered throughout the ROI, along with occasional rural homes. Although small towns and urbanized areas such as the cities of Alva, Oklahoma and Kiowa, Kansas are present within the ROI, much of the land can primarily be characterized as rural and sparsely developed.

The ROI generally has excellent visibility, particularly in less developed areas, where open fields and low elevation provide unobstructed views. During clear weather, visibility can extend for several miles in any direction. No national or state parks or other designated natural areas are present within the ROI. Local, municipal, or county-maintained parks in the ROI include those associated with larger areas of development, such as the cities of Alva, Oklahoma and Hardtner and Kiowa in Kansas. These parks primarily offer passive and active recreational facilities in a semi-urbanized setting rather than focusing on the preservation of native vegetation and wildlife habitat.

Military training operations in airspace in the ROI have occurred on a nearly continuous basis since Vance AFB was established in 1941 **(Section 1.2.2).** Most of these operations take place during daytime hours, contributing to the visual landscape by briefly altering the sky's appearance during the passage of aircraft through the airspace. More than 63,500 aircraft operations occurred in airspace in the ROI between August 2023 and July 2024 **(Section 3.3.2)**. Of these total operations, 61 percent consisted of military aircraft, with the remainder consisting of either civilian operators or aircraft of unknown origin. Ninety-one percent of all operations in the ROI occurred at altitudes above 8,000 feet MSL (the floor of the existing Vance 1A/1C/1D MOAs), while the remaining 9 percent occurred below 8,000 feet MSL. Operations below 8,000 feet MSL included aircraft operating in the existing MTRs that are authorized to fly as low as 100 feet AGL in VR-

119 and 500 feet AGL in the other MTRs (although most aircraft in VR-119 do not operate below 500 feet AGL) **(Section 3.3.2.7)**.

Given the size of the geographic area within the ROI (approximately 1,051 square miles), its comparatively low population density (approximately 6 persons per square mile [U.S. Census Bureau, 2025]), and the distribution of aircraft operations throughout the airspace, it is likely that aircraft operating in the ROI are observed by a limited number of people at any given time, particularly aircraft operating at 8,000 feet MSL and higher. Wildlife and domestic animals in the region have likely adapted to the presence of military aircraft operating in the airspace. Overall, aircraft operating in airspace in the ROI have been a consistent part of the visual landscape for decades.

3.11.3 Environmental Consequences

3.11.3.1 Evaluation Criteria

The FAA has not established a significance threshold for visual resources. However, factors considered in determining whether effects on visual resources from the Proposed Action would be considered significant include the following:

- The Proposed Action would affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources.
- The Proposed Action would contrast with the visual resources and/or visual character in the ROI.
- The Proposed Action would block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations.

3.11.3.2 Alternative 1 – Proposed Vance 1E Low MOA

Alternative 1 does not involve construction, demolition, or other earth-disturbing activities and therefore, would not introduce new permanent or temporary buildings, structures, or other constructed, inanimate features that would alter or block visual resources in the existing visual landscape of the ROI. Additionally, Alternative 1 would not change, modify, remove, or otherwise alter existing topography, vegetation, or other naturally occurring features. Therefore, Alternative 1 would have no permanent impacts on visual resources in the ROI.

Aircraft operating in the proposed airspace at altitudes as low as 500 feet AGL would likely be visible to viewers in the ROI, given the relatively clear weather conditions that occur most days in the area; however, these operations would consist of jet aircraft traveling at hundreds of miles per hour and their appearance in the overlying airspace would be brief (likely less than a few minutes) at any given time as observed from a particular location. Given the need for pilots to adjust their flight patterns to prevent unintentional “spill outs” of the proposed airspace boundaries **(Section 3.4.2.2, Section 3.4.3.2)**, most aircraft operations would likely only be observable for a few moments by viewers in lands adjacent to the proposed Vance 1E Low MOA. The distribution of proposed low-altitude aircraft operations throughout an approximately 1,051-square mile area, combined with the low population density of the ROI, would further minimize the potential for repeated observations of aircraft to occur at a single location. Additionally, aircraft overflights in the proposed MOA would not contribute to visual impacts on national or state parks, wildlife management areas, or other natural areas because no such areas are present in the ROI.

Aircraft operations at altitudes ranging from 100 feet AGL to 8,000 feet MSL are already a common occurrence throughout the year in the proposed airspace. In addition to existing aircraft operations (see **Section 3.3.2.1**), segments of six existing MTRs with floors of 100 feet AGL and 500 feet AGL cross the proposed airspace (see **Section 3.3.2.8** and **Figure 3.3-5**). Therefore, aircraft passing overhead are already part of the existing visual landscape in the ROI, and aircraft operations under Alternative 1 would not introduce a new visual element that is not already commonly observed within the affected environment. Wildlife and domestic animals in the ROI are likely conditioned to the presence of aircraft transiting the airspace. In the event that the visual appearance of an aircraft in the proposed airspace elicited a startle response in animals within the ROI, it is anticipated that they would quickly resume typical behaviors within a few minutes of the aircraft's passing. Therefore, effects on visual resources from Alternative 1 would not be significant.

Aircraft operations under Alternative 1 would have no effect on traditional cultural places or Indian sacred sites, as no such properties or sites have been identified in the APE. The DAF has determined that the Proposed Action and Alternatives would have no adverse effect on historic properties, including archaeological sites. In a response dated March 11, 2025, the Oklahoma SHPO stated that there are no historic properties affected by the Proposed Action. The Kansas SHPO's concurrence with the DAF's determination is pending **(Appendix A)**.

For these reasons, adverse impacts on visual resources in the ROI from Alternative 1 would not be significant.

3.11.3.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained, and existing conditions would continue. This would have no effect on visual resources.

3.11.3.4 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Other reasonably foreseeable future actions listed in **Appendix B** would have the potential to temporarily or permanently introduce visual elements that could result in short-term or long-term impacts on visual resources in the ROI. Such impacts on sensitive resources, such as historic properties and traditional cultural properties or Indian sacred sites, would be avoided or minimized through coordination with the Oklahoma and Kansas SHPOs, relevant Native American tribes, and other relevant federal, state, and local agencies and organizations. Therefore, when considered with other reasonably foreseeable future actions listed in **Appendix B**, the Proposed Action would not contribute to significant adverse impacts on visual resources.

4 References

ACAM. 2024. Air Conformity Applicability Model. Air Impact Modeling Software by Solutio Environmental, Inc. for U.S. Air Force Civil Engineering Center (AFCEC/CZTQ), Version 5.0.24a.

ACHP. 2018. Advisory Council on Historic Preservation. The Relationship Between Executive Order 13007 Regarding Indian Sacred Sites and Section 106. https://www.achp.gov/digital-library-section-106-landing/relationship-between-executive-order-13007-regarding-indian. Accessed February 2025.

AETC. 2024. Air Education and Training Command. Email Correspondence from AETC to Versar Global Solutions, Dated December 2, 2024.

Air Force. 2020. Air Force Air Quality EIAP Guide, Volume II - Advanced Assessments. July.

Air Force Safety Center. 2016. USAF Wildlife Strikes by Altitude (AGL) FY 1995-2016. https://www.safety.af.mil/Portals/71/documents/Aviation/BASH%20Statistics/USAF%20Wildlife%20Strikes%20by%20Altitude.pdf. Accessed 25 September 2023.

Air Force Safety Center. 2021a. T-38 Flight Mishap History, 28 December 2021, https://www.safety.af.mil/Portals/71/documents/Aviation/Aircraft%20Statistics/T-38.pdf. Accessed 9 May 2023.

Air Force Safety Center. 2021b. F-16 Flight Mishap History, 28 December 2021, https://www.safety.af.mil/Portals/71/documents/Aviation/Aircraft%20Statistics/F-16.pdf. Accessed 9 May 2023.

AirNav. 2025a. Alva Regional Airport (KAVK). https://www.airnav.com/airport/KAVK. Accessed February 5, 2025.

AirNav. 2025b. Farney Field Airport (42KS). https://www.airnav.com/airport/42KS. Accessed February 5, 2025.

AirNav. 2025c. Walz Airport (4KS). https://www.airnav.com/airport/4KS. Accessed February 5, 2025.

Alva Chamber of Commerce. 2022. 2022 Chamber of Commerce Guide. https://www.alvaok.net/post/2022-alva-chamber-community-guide-out-now. Accessed February 5, 2025.

ATAC. 2025. Final Report for Airspace Analysis in Support of the Environmental Impact Analysis Process for Vance 1E Low MOA, Oklahoma. Prepared for Department of the Air Force. April 2025.

Audubon. 2025. Eagle Watch Nest Locator. https://audubon.maps.arcgis.com/home/webmap/viewer.html?webmap=104e54b905484c6cb92d2affaed80116. Accessed January 30, 2025.

BIA. 2016. Bureau of Indian Affairs. Indian Lands of Federally Recognized Tribes of the United States. Department of the Interior, Bureau of Indian Affairs, Office of Trust Services. https://www.bia.gov/sites/default/files/dup/assets/bia/ots/webteam/pdf/idc1-028635.pdf. Accessed December 2024.

BirdCast. 2025. Migration Dashboard. https://birdcast.info/migration-tools/migration-dashboard/. Accessed January 29, 2025.

Bowles, A. E. 1995. Responses of Wildlife to Noise. Pages 109-156 in R. L. Knight, and K. J. Gutzwiller, Eds. Wildlife and Recreationists: Coexistence through Management and Research. Island Press, Covelo, California.

Branson, C. and K. Johnson. 1972. Generalized Geologic Map of Oklahoma. Oklahoma Geological Survey, Education Publication Number 1. http://ogs.ou.edu/docs/educationalpublications/EP1.pdf. Accessed December 2024

Campbell, L. 2003. Endangered and Threatened Animals of Texas. Texas Parks and Wildlife, Resource Protection Division, Endangered Resources Branch, Austin. 127 pp.

CEC. 2011. Commission for Environmental Cooperation. Wiken, Ed, Francisco Jiménez Nava, and Glenn Griffith. North American Terrestrial Ecoregions - Level III. Commission for Environmental Cooperation (CEC), Montreal, Canada. https://www.epa.gov/eco-research/ecoregions-north-america. Accessed January 24, 2025

City of Alva. 2025. Alva Regional Airport. https://www.alvaok.org/page/alva-regional-airport. Accessed February 5, 2025.

Czech, J.J., and K.J. Plotkin. 1998. NMAP 7.0 User's Manual. Wyle Research Report WR 98-13. Wyle Laboratories, Inc. November.

DAF. 2020. Department of the Air Force. Air Force Instruction 91-202. 2015. Safety, The Department of the Air Force (DAF) Mishap Prevention Program, 24 June 2015, Incorporating Change 1, 12 March

DAF. 2022. Department of the Air Force Manual 13-201, Air Force Special Operations Command Supplement, Nuclear, Space, Missile, Command and Control – Airspace Management. January. https://static.e-publishing.af.mil/production/1/afsoc/publication/dafman13-201_afsocsup/dafman13-201_afsocsup.pdf. Accessed September 13, 2024.

DAF. 2024a. T-7A Recapitalization Environmental Impact Statement, Vance Air Force Base, Oklahoma. https://www.vance.t-7anepadocuments.com/. Accessed September 13, 2024.

DAF. 2024b. T-1A Jayhawk. https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104542/t-1a-jayhawk/. Accessed September 13, 2024.

DAF. 2024c. T-6A Texan II. https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104548/t-6a-texan-ii/. Accessed September 13, 2024.

DAF. 2024d. Vance AFB Data Validation Package (pending).

DAF. 2025. "Low-Altitude Flying Training" https://www.af.mil/AboutUs/FactSheets/Display/Article/104591/low-altitude-flying-training/. Accessed January 3, 2025.

DoD. 2024. Department of Defense. Flight Information Publication AP/1A, Area Planning Special Use Airspace, North and South America. Published by National Geospatial-Intelligence Agency. September.

FAA. 2023a. Federal Aviation Administration. Chapter 15, "Airspace" in Pilot's Handbook of Aeronautical Knowledge. https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak. Accessed May 25, 2023.

FAA. 2023b. FAA Aeronautical Information Manual. Official Guide to Basic Flight Information and ATC Procedures. April.

FAA. 2023c. 1050.1 Desk Reference. Version 3. https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref.

FAA. 2025a. FAA Order JO 7400 – Procedures for Handling Airspace Matters. April. https://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.current/documentNumber/7400.2. Accessed April 9, 2025.

FAA. 2025b. FAA CDM International Online Workshop. https://tfmlearning.faa.gov/tfm-training/atfm-basics/cdm-t1-lesson5b.html. Accessed April 14, 2025.

FICAN. 1997. Federal Interagency Committee on Aviation Noise. Effects of Aviation Noise on Awakenings from Sleep. June.

Fritts, Rachel. 2022. Avian Superhighways: The Four Flyways of North America. American Bird Conservancy. https://abcbirds.org/blog/north-american-bird-flyways/. Accessed January 30, 2025.

Gladwin, D. N., D. A. Asherin, and K. M. Manci. 1988. Effects of Aircraft Noise and Sonic Booms on Domesticated Animals and Wildlife: Bibliographic Abstracts. NERC-88/32. USFWS, National Ecology Research Center, Fort Collins, Colorado.

HQ AFSEC. 2023a. Headquarters Air Force Safety Center. Department of the Air Force. Aviation Class A Mishap Summary by Fiscal Year, 5 September.

HQ AFSEC. 2023b. Department of the Air Force. Aviation Class B Mishap Summary by Fiscal Year, 25 September.

Ikelheimer, B. and M. Downing. 2013. MR_NMap Noise Model Improvements. Blue Ridge Research and Consulting Technical Report. August.

iNaturalist. 2025. Observations list for southern Kansas and northern Oklahoma within Vance 1E Low MOA study area. https://www.inaturalist.org/observations?lat=36.89295939409071&lng=98.78692200426592&page=12&radius=41.60312367204901&subview=map&iconic_taxa=Aves,Amphibia,Reptilia,Mammalia,Actinopterygii. Accessed January 27, 2025.

Job, Jacob. 2023. Scientific American Podcast Series: They Tap Into the Magical, Hidden Pulse of the Planet, but What is the Nighttime Bird Surveillance Network? https://www.scientificamerican.com/podcast/episode/they-tap-into-the-magical-hidden-pulse-of-the-planet-but-what-is-the-nighttime-bird-surveillance-network/. Accessed January 30, 2025.

Kansas Department of Commerce. 2021. https://www.kansascommerce.gov/industry/aerospace/. Accessed January 30, 2025.

Kansas Geoportal. 2024. Oil and Gas Wells Download, February 2024. https://hub.kansasgis.org/search?tags=energy%2Cutilities. Accessed February 6, 2025.

KDWP. 2022. Kansas Department of Wildlife and Parks. Arkansas River Shiner species profile. https://ksoutdoors.com/Services/Threatened-and-Endangered-Wildlife/All-Threatened-and-Endangered-Species/ARKANSAS-RIVER-SHINER, Accessed January 30, 2025.

Krausman, P. R., M. C. Wallace, D. W. DeYoung, M. E. Weisenberger, and C. L. Hayes. 1999. The Effects of Low-Altitude Jet Aircraft on Desert Ungulates. International Congress: Noise as a Public Health Problem 6:471-478.

KSU. 2025. Kansas State University. Cumulative observed rainfall, based on NOAA/NWA data. https://mesonet.k-state.edu/climate/precip/county/. Accessed January 29, 2025.

Larkin, Ronald P. 1994. Effects of military noise on wildlife: a literature review. Center for Wildlife Ecology, Illinois Natural History Survey. https://www.leg.mn.gov/docs/2015/other/150681/PFEISref_1/Larkin%201994.pdf. Accessed January 10, 2024.

League of Kansas Municipalities. 2024a. City of Hazelton. https://www.lkm.org/members/?id=41260757. Accessed February 7, 2025.

League of Kansas Municipalities. 2024b. City of Kiowa. https://www.lkm.org/members/Default.asp?id=41260803. Accessed February 7, 2025.

League of Kansas Municipalities. 2024c. City of Hardtner. https://www.lkm.org/members/Default.asp?id=41260746. Accessed February 7, 2025.

Lucas, Michael J., and Paul T. Calamia. 1997. Military Operating Area and Range Noise Model MR_NMAP User's Manual. Wyle Research Report WR 94-12-R. Wyle Laboratories, Inc. March.

National Geospatial-Intelligence Agency. 2024. DoD Flight Information Publication AP/1A, Area Planning, Special Use Airspace, North and South America, Effective 0001L 5 September 2024 – 0001L 31 October. https://www.daip.jcs.mil/pdf/ap1a.pdf. Accessed September 5, 2024.

Nicoletta, Rachael Ann. 2022. CAFOs in the U.S. https://storymaps.arcgis.com/stories/d9db6d31a8534aa38b3f94e8a3cacaa0. Accessed January 23, 2025.

NPS. 1994. National Park Service. Report on Effects of Aircraft Overflights on the National Park System. Report to Congress. https://www.nonoise.org/library/npreport/intro.htm. Accessed February 17, 2025.

NPS. 2024a. Identifying, Evaluating, and Documenting Traditional Cultural Places. https://irma.nps.gov/DataStore/DownloadFile/713282. Accessed 10 February 2025.

NPS. 2024b. National Park Service. Native American Graves Protection and Repatriation Act. https://www.nps.gov/subjects/nagpra/index.htm. Accessed December 2024.

NPS. 2024c. National Register of Historic Places (NRHP) Data Downloads. https://irma.nps.gov/DataStore/Reference/Profile/2210280. Accessed December 2024.

OAC. 2017. Oklahoma Aeronautics Commission. Aviation and Aerospace Impact Study. Facts on the Economic Impact of Aviation & Aerospace in Oklahoma. https://oklahoma.gov/aerospace/aerospace-industry/economic-impact.html. Accessed January 2, 2025

OCC. 2025. Oklahoma Corporation Commission. Oil and Gas Data Files. https://oklahoma.gov/occ/divisions/oil-gas/oil-gas-data.html. Accessed February 5, 2024.

OCS. 2021. Oklahoma Climatological Survey. Normal Annual Precipitation, 1991-2020. NOAA/National Weather Service data. https://www.mesonet.org/past-data/precipitation-normals/normal-annual-precipitation. Accessed January 29, 2025.

ODWC. 2025a. Oklahoma Department of Wildlife Conservation. Arkansas River Shiner species profile. https://www.wildlifedepartment.com/wildlife/field-guide/fish/arkansas-river-shiner. Accessed January 30, 2025.

ODWC. 2025b. Bald Eagle species summary. https://www.wildlifedepartment.com/wildlife/field-guide/birds/bald-eagle. Accessed January 30, 2025.

Oklahoma SHPO. 2024. Oklahoma Interactive National Register Map https://www.arcgis.com/home/item.html?id=abda0e849b874bb29587f7c22f653517. Accessed December 2024.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Home Experiment. Wyle Laboratories Research Report WR 92-3, March.

TNC. 2025. The Nature Conservancy: Red Hills Initiative. https://www.nature.org/en-us/get-involved/how-to-help/places-we-protect/red-hills-initiative/. Accessed January 30, 2025.

TollFreeAirline.com. 2024. Kansas and Oklahoma Airports by County. https://www.tollfreeairline.com/. Accessed December 31, 2024.

U.S. Bureau of Labor Statistics. 2025. Local Area Unemployment Statistics. https://data.bls.gov/PDQWeb/la. Accessed April 15, 2025.

U.S. Census Bureau. 2025. Quick Facts: Alfalfa County, Woods County, Barber County, Harper County. https://www.census.gov/quickfacts/fact/table/barbercountykansas, harpercountykansas,alfalfacountyoklahoma,woodscountyoklahoma,US/PST045223..S.

U.S. Navy. 2018. U.S. Department of the Navy (Environmental Impact Statement for EA-18G “Growler” Airfield Operations at Naval Air Station Whidbey Island Complex, Appendix A1 https://media.defense.gov/2019/Feb/04/2002085739/-1/-1/1/APPENDIX%20A%20NOISE%20STUDY_MAIN%20BODY.PDF Accessed December 2024.

USDA. 2023. U.S. Department of Agriculture. National Agricultural Statistics Service. https://www.nass.usda.gov/. Accessed February 17, 2025.

USDOE. 2023. U.S. Department of Energy. Wind Power Resource at 100-Meter Hub Height. https://windexchange.energy.gov/maps-data/324. Updated January 9, 2023. Accessed April 10, 2025.

USEIA. 2024. U.S. Energy Information Administration. Wind explained: Where wind power is harnessed. https://www.eia.gov/energyexplained/wind/where-wind-power-is-harnessed.php. Updated June 12, 2024. Accessed April 3, 2025.

USEPA. 2023. U.S. Environmental Protection Agency. NPDES CAFO Rule Implementation Status – National Summary, Endyear 2023. https://www.epa.gov/system/files/documents/2024-06/cafo-status-report-2023.pdf, Accessed January 25, 2025.

USEPA. 2024. Ecoregions of North America. https://www.epa.gov/eco-research/ecoregions-north-america. Accessed January 23, 2025

USFS. U.S. Forest Service. 1992. Report to Congress: Potential Impacts of Aircraft Overflights of National Forest System Wilderness. U. S. Government Printing Office 1992-0-685-234/61004. Washington, D. C.

USFWS. 2017. U.S. Fish and Wildlife Service. USFWS. 2017a. ESA Basics, 40 Years of Conserving Endangered Species. Endangered Species Program. Arlington, VA. January.

https://www.fws.gov/sites/default/files/documents/endangered-species-act-basics.pdf. Accessed February 17, 2025.

USFWS. 2020a. Press Release: Service Proposes Endangered Status and Designation of Critical Habitat for Peppered Chub. Accessed January 30, 2025.

USFWS. 2020b. 2020 Bald Eagle Population Survey Summary. https://www.fws.gov/sites/default/files/documents/Bald%20Eagles%202020%20Population%20Report%20FAQs%20Final-508v.pdf. Accessed February 17, 2025.

USFWS. 2022. USFWS: Lesser Prairie Chicken Species Status Assessment Report. https://www.fws.gov/sites/default/files/documents/LPC_SSA_Report_v2.3_March2022%20%282%29.pdf. Accessed April 1, 2025.

USFWS. 2025a. Information Planning and Consultation Official Species List. Accessed on January 22, 2025.

USFWS. 2025b. Whooping Crane Species Profile. https://www.fws.gov/species/whooping-crane-grus-americana. Accessed January 30, 2025.

USGS. 2024. U.S. Geological Survey. National Land Cover Database. https://www.usgs.gov/data/annual-national-land-cover-database-nlcd-collection-1-products. Accessed January 30, 2024.

USGS. 2025a. U.S. Wind Turbine Database GIS Data. https://energy.usgs.gov/uswtdb/data/. Accessed April 10, 2025.

USGS. 2025b. National Map GIS. https://apps.nationalmap.gov/viewer/. Accessed January 29, 2025

Vance AFB. 2018. Vance Air Force Base Mishap Response Plan 91-1. 71st Flying Training Wing. December.

Vance AFB. 2022. Air Installations Compatible Use Zones Study. https://www.vance.af.mil/Portals/61/Docs/1_Vance%20AFB%20AICUZ%20Study%202022%20Report%20Reader%20Spreads.pdf. Accessed September 13, 2024.

Vance AFB. 2024. Vance Air Force Base Bird/Wildlife Strike Hazard Plan 91-2, 71st Flying Training Wing (AETC).

Wasmer, F. and F. Maunsell. 2024a. BaseOps 7.370 User’s Guide. Wasmer Consulting.

Wasmer, F. and F. Maunsell. 2024b. NMPlot 4.975 User’s Guide. Wasmer Consulting.

WAWFA. 2013. Western Association of Fish and Wildlife Agencies. The Lesser Prairie-Chicken Range-wide Conservation Plan. https://wafwa.org/wpcontent/uploads/2013/10/LesserPrairieChicken_RangeWideConservationPlan_2013.pdf. Accessed April 8, 2025.

Weatherbase. 2024. Climate Summary, Alva, Oklahoma. https://www.weatherbase.com/weather/weathersummary.php3?s=23837&cityname=Alva%2C+Oklahoma%2C+United+States+of+America&units=. Accessed December 9, 2024.

Weatherspark. 2024. Climate and Average Weather Year Round in Alva Oklahoma, United States. https://weatherspark.com/y/7221/Average-Weather-in-Alva-Oklahoma-United-States-Year-Round. Accessed December 9, 2024.

Weisenberger, ME., P. R. Krausman, M. C. Wallace, D. W. DeYoung, and O. E. Maughan. 1996. Effects of Simulated Jet Aircraft Noise on Heart Rate and Behavior of Desert Ungulates. Journal of Wildlife Management 60:52-61.

APPENDICES

This page intentionally left blank

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDIX A
INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

APPENDIX A
Interagency and Intergovernmental Coordination and Consultations

A.1 Introduction

Scoping is an early and open process for developing the breadth of issues to be addressed in an Environmental Assessment (EA) and for identifying significant concerns related to an action. Per the requirements of Executive Order (E.O.) 12372, Intergovernmental Review of Federal Programs, as amended by E.O. 12416, federal, state, and local agencies with jurisdiction that could potentially be affected by the Proposed Action or alternatives were notified during the development of this EA.

The Intergovernmental Coordination Act and E.O. 12372 require federal agencies to cooperate with and consider state and local views in implementing a federal proposal. Through the coordination process, potentially interested and affected government agencies, government representatives, elected officials, and interested parties that could be affected by the Proposed Action and alternatives were notified during the development of this EA. The recipient mailing list and agency and intergovernmental coordination letters and responses are included in this appendix.

A.1.1 Agency Consultations

Implementation of the Proposed Action involves coordination with several organizations and agencies. Compliance with Section 7 of the Endangered Species Act and implementing regulations (50 Code of Federal Regulations [CFR] Part 402), requires communication with the U.S. Fish and Wildlife Service in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this consultation is to identify such species that are known or have potential to occur in the project area. The Department of the Air Force (DAF) would then make a determination of potential adverse impacts on species known or having potential to be present.

The National Historic Preservation Act (NHPA) of 1966 (54 United States Code [U.S.C.] 300101 et seq.) established the National Register of Historic Places (NRHP) and outlines procedures for managing cultural resources on federal property. The NHPA requires federal agencies to consider the potential impacts of federal undertakings on historic properties that are listed, nominated to, or eligible for listing in the NRHP; designated as a National Historic Landmark; or valued by modern American Indians for maintaining their traditional culture. Section 106 of the NHPA requires federal agencies to consult with State Historic Preservation Officers, and others, if their undertakings have the potential to adversely affect historic properties and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings.

A.1.2 Government-to-Government Consultation

Consistent with the NHPA's implementing regulations (36 CFR Part 800), DoD Instruction 4710.02, DoD Interactions with Federally Recognized Tribes, Department of the Air Force

Instruction 90-2002, Interactions with Federally Recognized Tribes, and Air Force Manual 32-7003, Environmental Conservation, the DAF has a responsibility to consult in good faith with federally recognized tribes who have a documented interest in DAF lands and activities, even though the tribe may not be geographically located near the installation or its airspace, regarding a proposed action's potential to affect properties of cultural, historical, or religious significance to the tribes. The tribal coordination process is distinct from NEPA consultation and the intergovernmental coordination processes and requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of intergovernmental consultations. The installation commander's role in tribal government-to-government consultation is similar to the commander's role with an ambassador. The installation commander may also designate a civilian government employee as the Installation Tribal Liaison Officer. The Installation Tribal Liaison Officer must be a high-level civilian who is able to interact directly with base leaders and is allowed access to the installation commander without multiple chain of command impediments.

Government-to-government consultation is included in this appendix.

A.2 Public and Agency Review of Environmental Assessment

A Notice of Availability for the Draft EA and proposed Finding of No Significant Impact (FONSI) was published in the Enid Daily News and Eagle, Alva Review Courier, and Kiowa Tri-County Tribune. Publication of the Notice of Availability initiated the 30-day public review period and invited the public to review and comment on the Draft EA and proposed FONSI.

Printed copies of the Draft EA and proposed FONSI were available for review at the following public libraries:

- Enid Public Library, 120 West Maine, Enid, Oklahoma 73701
- Alva Public Library, 504 7th Street, Alva, Oklahoma 73717

The Draft EA and proposed FONSI could also be accessed online on Vance AFB's website at: www.vance.af.mil. Comments received during the 30-day public review period will be considered in the Final EA and FONSI, as applicable.

A.3 Intergovernmental and Stakeholder Coordination

A.3.1 Sample Agency / General Scoping Letter

DEPARTMENT OF THE AIR FORCE
71ST FLYING TRAINING WING
VANCE AIR FORCE BASE OKLAHOMA

11 March 2025

Colonel Charles D. Throckmorton IV
Commander, 71st Flying Training Wing
246 Brown Parkway, Suite 224
Vance AFB OK 73705-5015

Meg McCollister
Regional Administrator / U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa KS 66219

Dear Meg McCollister

The United States Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 71st Flying Training Wing (71 FTW) at Vance Air Force Base (AFB), Oklahoma to support Fighter Bomber Fundamentals pilot training syllabus requirements. Vance AFB is located in Garfield County, Oklahoma immediately south of the city of Enid and approximately 90 miles north-northwest of Oklahoma City (Figure 1). The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (40 Code of Federal Regulations [CFR] Parts 1500-1508) and the DAF Environmental Impact Analysis Process (32 CFR Part 989). The Federal Aviation Administration (FAA) is serving as a cooperating agency during the NEPA process for the Proposed Action.

The proposed low-altitude airspace would need to have a floor of 500 feet above ground level and a ceiling of up to 7,999 feet mean sea level (MSL). Up to 1,170 aircraft operations would occur in the proposed airspace annually and would primarily be performed by 71 FTW pilots flying the T-38C, a high-speed, highly maneuverable jet trainer. Operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace. The proposed airspace would be managed and scheduled by the 71 FTW.

None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). Aircraft would not exceed supersonic speeds while operating within the proposed airspace. The Proposed Action does not include changes to the existing boundaries of Vance AFB, the lateral boundaries of existing MOAs in the Vance Airspace Complex, the number and types of personnel and aircraft assigned to Vance AFB, or the number of aircraft operations occurring at the base. No

DELIVER, DEVELOP, DEPLOY, DEMONSTRATE

construction, demolition, or other ground-disturbing activities would occur at Vance AFB or on lands underlying the proposed airspace as part of the Proposed Action.

The DAF is considering an alternative to implement the Proposed Action whereby the DAF would request FAA to establish the proposed low-altitude airspace under a portion of the existing Vance Airspace Complex, which encompasses approximately 11,121 square miles of airspace in northern Oklahoma and southern Kansas. The Vance Airspace Complex is subdivided into four Military Operations Areas (MOAs); currently, military aircraft training operations are not permitted in the Vance Airspace Complex below 7,000 feet above MSL. If established under this alternative, the proposed airspace would be designated as the Vance 1E MOA. The Vance Airspace Complex, existing MOAs, and the proposed Vance 1E MOA are shown on Figure 1. Other alternatives for implementing the Proposed Action will be addressed in the EA.

To support the NEPA process, the DAF requests your input on general or specific resources or conditions that you feel should be considered in the EA. Your comments, questions, or requests for additional information about the Proposed Action should be sent to Mr. Christopher Wheeler, Lead CE COR, 71 ISS/CE at christopher.wheeler.18@us.af.mil. Your comments are requested within 30 days of receiving this letter to allow sufficient time to consider them during preparation of the Draft EA. Thank you for your assistance.

Sincerely

CHARLES D. THROCKMORTON IV, Col, USAF
Commander

Attachment:
1. Figure 1 – Location of Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA

DELIVER, DEVELOP, DEPLOY, DEMONSTRATE

3

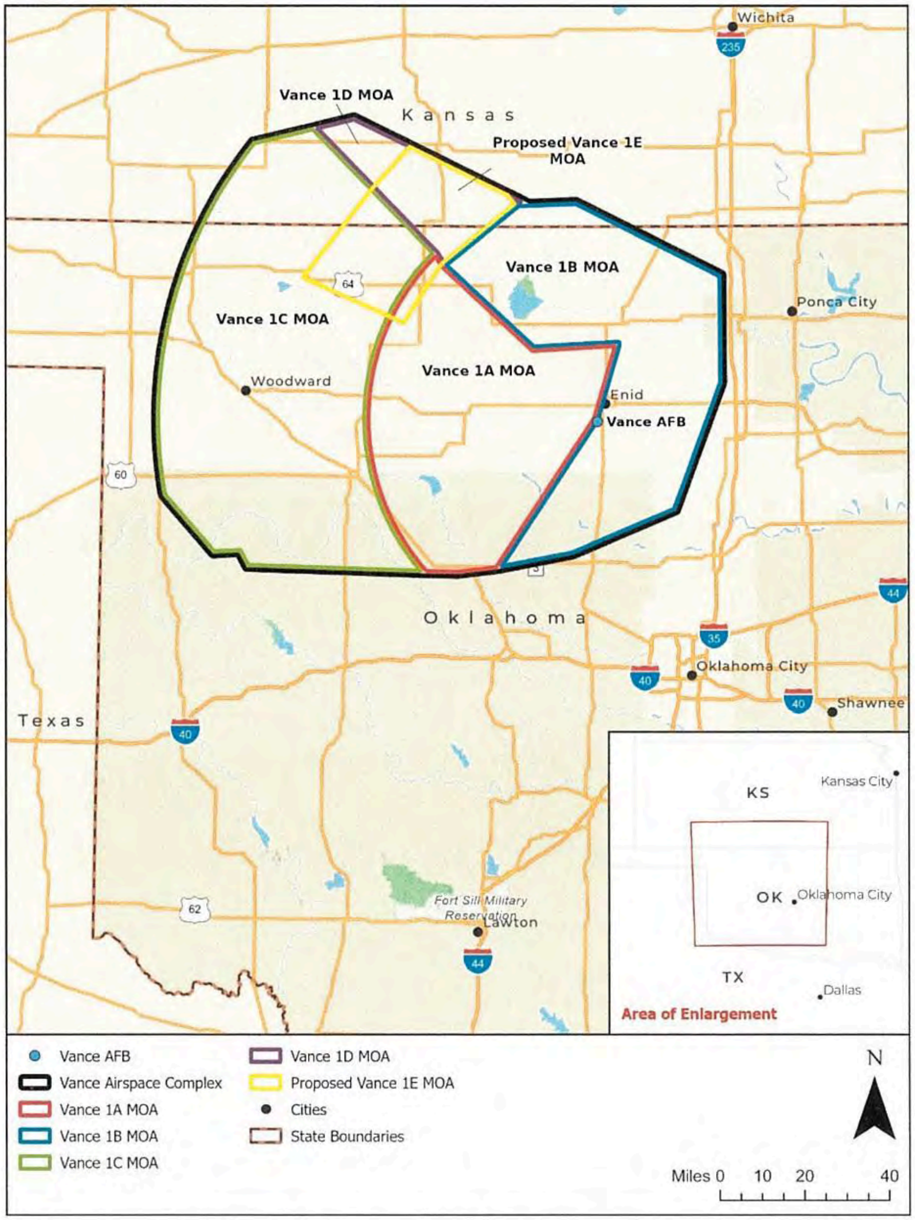


Figure 1 – Location of Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA

A.3.2 Representative Government-to-Government Scoping Letter

DEPARTMENT OF THE AIR FORCE
71ST FLYING TRAINING WING
VANCE AIR FORCE BASE OKLAHOMA

11 March 2025

Colonel Charles D. Throckmorton IV
Commander, 71st Flying Training Wing
246 Brown Parkway, Suite 224
Vance AFB OK 73705-5015

Andrea Hunter
Director and THPO / Osage Nation
100 W. Main
Pawhuska OK 74056

Dear Andrea Hunter

The United States Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 71st Flying Training Wing (71 FTW) at Vance Air Force Base (AFB), Oklahoma to support Fighter Bomber Fundamentals pilot training syllabus requirements. Vance AFB is located in Garfield County, Oklahoma immediately south of the city of Enid and approximately 90 miles north-northwest of Oklahoma City (Figure 1). The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (40 Code of Federal Regulations [CFR] Parts 1500-1508) and the DAF Environmental Impact Analysis Process (32 CFR Part 989). The Federal Aviation Administration (FAA) is serving as a cooperating agency during the NEPA process for the Proposed Action.

The Proposed Action is considered an undertaking under Section 106 of the National Historic Preservation Act (NHPA). Therefore, the purpose of this letter is to initiate government-to-government consultation pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and DoD Instruction 4710.02, *DoD Interactions with Federally Recognized Tribes*. The DAF also requests information on any properties of historic, religious, or cultural significance that could potentially be affected by the proposed undertaking.

The proposed low-altitude airspace would need to have a floor of 500 feet above ground level and a ceiling of up to 7,999 feet mean sea level (MSL). Up to 1,170 aircraft operations would occur in the proposed airspace annually and would primarily be performed by 71 FTW pilots flying the T-38C, a high-speed, highly maneuverable jet trainer. Operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace. The proposed airspace would be managed and scheduled by the 71 FTW.

DELIVER, DEVELOP, DEPLOY, DEMONSTRATE

None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). Aircraft would not exceed supersonic speeds while operating within the proposed airspace. The proposed undertaking does not include changes to the existing boundaries of Vance AFB, the lateral boundaries of the existing MOAs in the Vance Airspace Complex, the number and types of personnel and aircraft assigned to Vance AFB, or the number of aircraft operations occurring at the base. No construction, demolition, or other ground-disturbing activities would occur at Vance AFB or on lands underlying the proposed airspace as part of the proposed undertaking.

The DAF is considering an alternative to implement the Proposed Action whereby the DAF would request FAA to establish the proposed low-altitude airspace under a portion of the existing Vance Airspace Complex, which encompasses approximately 11,121 square miles of airspace in northern Oklahoma and southern Kansas. The Vance Airspace Complex is subdivided into four Military Operations Areas (MOAs); currently, military aircraft training operations are not permitted in the Vance Airspace Complex below 7,000 feet above MSL. If established under this alternative, the proposed airspace would be designated as the Vance 1E MOA. The Vance Airspace Complex, existing MOAs, and the proposed Vance 1E MOA are shown on Figure 1. Other alternatives for implementing the proposed undertaking will be addressed in the EA.

The inadvertent discovery of archaeological resources or human remains during the proposed undertaking is not anticipated because no ground-disturbing activities are proposed. However, in the event such a discovery occurs during the proposed undertaking you will be immediately informed by the DAF, regardless of whether you choose to participate in government-to-government consultation. In accordance with Section 106, the DAF is also consulting with other Native American tribes and the Oklahoma and Kansas State Historic Preservation Offices with respect to the proposed undertaking.

As part of the government-to-government consultation process, the DAF requests comments or information on properties of historic, religious, or cultural significance that could potentially be affected by the proposed undertaking. Your comments, questions, or requests for additional information should be sent to my designated point of contact, Mr. Christopher Wheeler, Lead CE COR, 71 ISS/CE at christopher.wheeler.18@us.af.mil, or by phone at 580-213-6248. We request your comments at your earliest convenience to allow sufficient time to consider them during preparation of the Draft EA. Thank you for your assistance.

Sincerely

CHARLES D. THROCKMORTON IV, Col, USAF
Commander

Attachment:
1. Figure 1 – Location of Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA

DELIVER, DEVELOP, DEPLOY, DEMONSTRATE

3

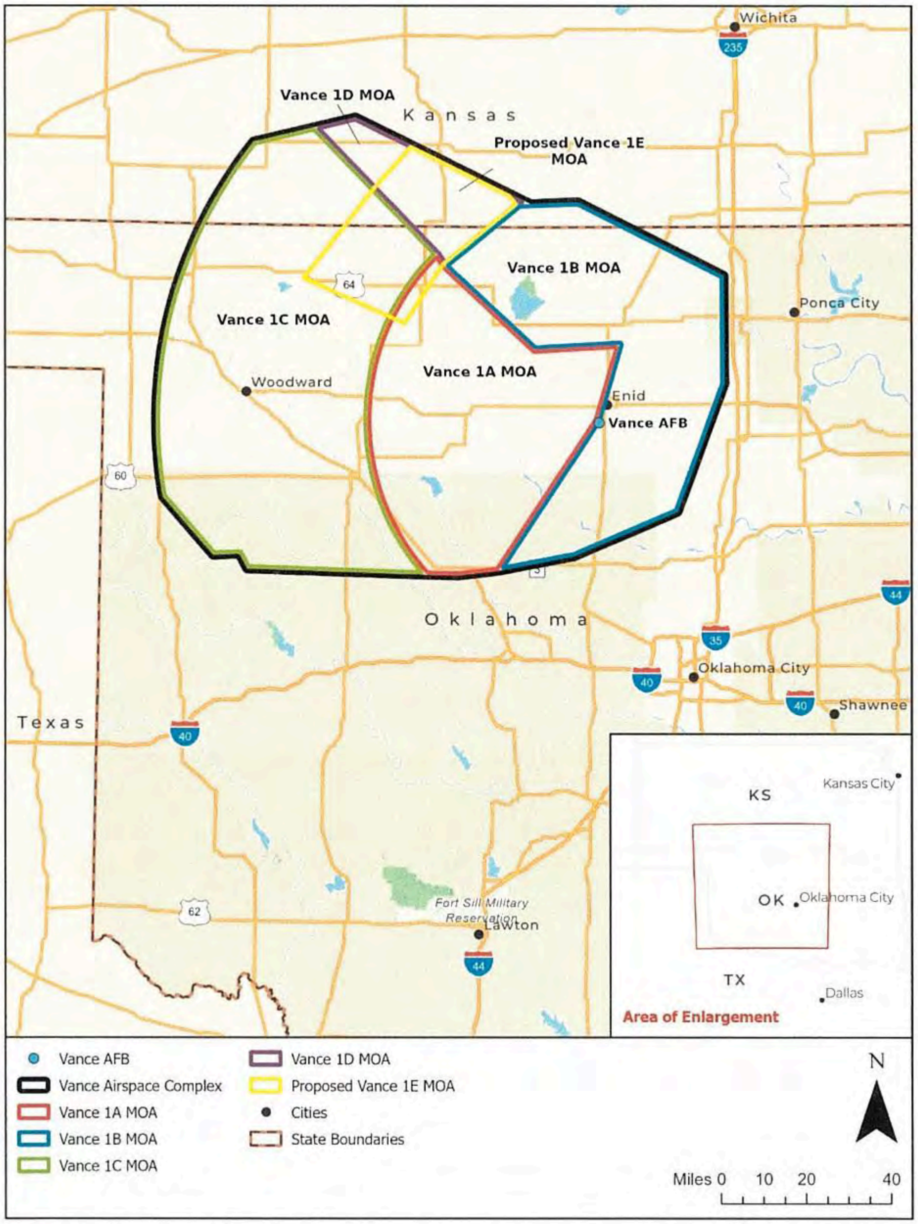


Figure 1 – Location of Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA

A.3.3 U.S. Fish and Wildlife Services (USFWS) Scoping Letter

The letter shown below was also sent to the USFWS Ecological Services Field Office in Kansas.

DEPARTMENT OF THE AIR FORCE
71ST FLYING TRAINING WING
VANCE AIR FORCE BASE OKLAHOMA

11 March 2025

Colonel Charles D. Throckmorton IV
71 FTW/CC
246 Brown Parkway, Suite 224
Vance AFB OK 73705-5015

U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa OK 74129-1428
Submitted online to OKProjectReview@fws.gov

Dear Sir or Madam

The United States Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 71st Flying Training Wing (71 FTW) at Vance Air Force Base (AFB), Oklahoma to support Fighter Bomber Fundamentals pilot training syllabus requirements. Vance AFB is located in Garfield County, Oklahoma immediately south of the city of Enid and approximately 90 miles north-northwest of Oklahoma City (Figure 1). The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (40 Code of Federal Regulations [CFR] Parts 1500-1508) and the DAF Environmental Impact Analysis Process (32 CFR Part 989). The Federal Aviation Administration (FAA) is serving as a cooperating agency during the NEPA process for the Proposed Action.

The purpose of this letter is to initiate informal consultation between the DAF and U.S. Fish and Wildlife Service (USFWS) for the Proposed Action in accordance with Section 7 of the Endangered Species Act (ESA). The DAF also requests information on federally listed threatened and endangered species and/or critical habitat that could potentially be affected by the Proposed Action. The DAF has also initiated informal Section 7 consultation with the Kansas Ecological Services Field Office.

The proposed low-altitude airspace would need to have a floor of 500 feet above ground level and a ceiling of up to 7,999 feet mean sea level (MSL). Up to 1,170 aircraft operations would occur in the proposed airspace annually and would primarily be performed by 71 FTW pilots flying the T-38C, a high-speed, highly maneuverable jet trainer. Operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace. The proposed airspace would be managed and scheduled by the 71 FTW.

DELIVER, DEVELOP, DEPLOY, DEMONSTRATE

None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). Aircraft would not exceed supersonic speeds while operating within the proposed airspace. The Proposed Action does not include changes to the existing boundaries of Vance AFB, the lateral boundaries of existing MOAs in the Vance Airspace Complex, the number and types of personnel and aircraft assigned to Vance AFB, or the number of aircraft operations occurring at the base. No construction, demolition, or other ground-disturbing activities would occur at Vance AFB or on lands underlying the proposed airspace as part of the Proposed Action.

The DAF is considering an alternative to implement the Proposed Action whereby the DAF would request FAA to establish the proposed low-altitude airspace under a portion of the existing Vance Airspace Complex, which encompasses approximately 11,121 square miles of airspace in northern Oklahoma and southern Kansas. The Vance Airspace Complex is subdivided into four Military Operations Areas (MOAs); currently, military aircraft training operations are not permitted in the Vance Airspace Complex below 7,000 feet above MSL. If established under this alternative, the proposed airspace would be designated as the Vance 1E MOA. The Vance Airspace Complex, existing MOAs, and the proposed Vance 1E MOA are shown on Figure 1. Other alternatives for implementing the Proposed Action will be addressed in the EA.

To support the NEPA process and compliance with Section 7 of the ESA, we request your input on federally listed threatened and endangered species and/or critical habitat that could potentially be affected by the Proposed Action. The DAF will also obtain an official species list from the USFWS Information for Planning and Consultation website to identify federally listed species and critical habitat known or having potential to occur in the project area. Please send your comments, questions, or requests for additional information about the Proposed Action to Mr. Christopher Wheeler, Lead CE COR, 71 ISS/CE at christopher.wheeler.18@us.af.mil. Your comments are requested within 30 days of receiving this letter to allow sufficient time to consider them during preparation of the Draft EA. When available, you will be provided with an opportunity to review the Draft EA and the DAF's determination of effects on federally listed species and critical habitat. Thank you for your assistance.

Sincerely

THROCKMORTON.CHARLES.D.IV.1065671952
Digitally signed by THROCKMORTON.CHARLES.D.IV.1065671952
Date: 2025.03.14 15:51:33 -05'00'

CHARLES D. THROCKMORTON IV, Col, USAF
Commander

Attachment:
1. Figure 1 – Location of Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA

DELIVER, DEVELOP, DEPLOY, DEMONSTRATE

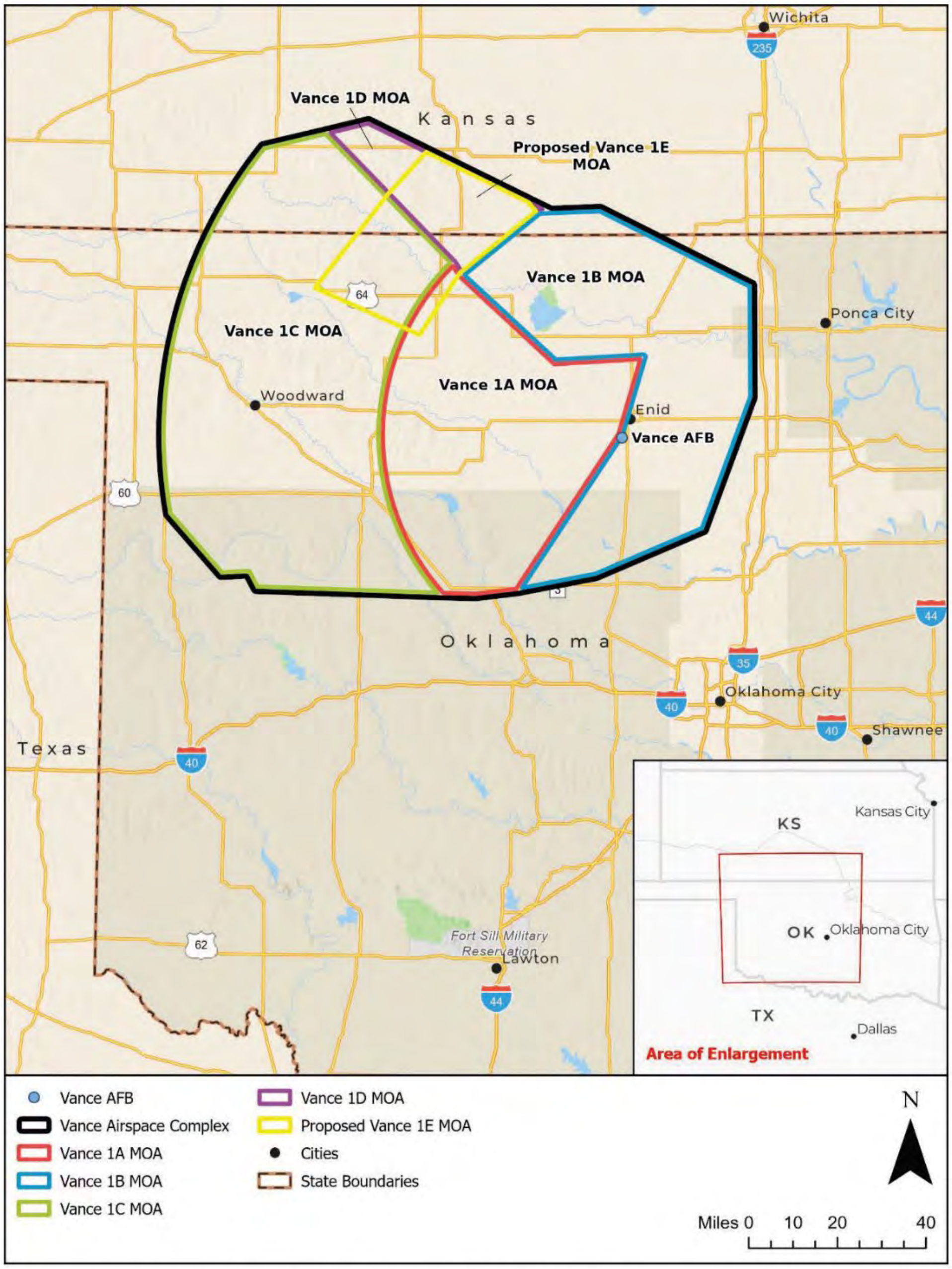


Figure 1 – Location of Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA

A.3.4 State Historic Preservation Office (SHPO) Scoping Letter

The letter shown below was also sent to the Kansas SHPO.

DEPARTMENT OF THE AIR FORCE
71ST FLYING TRAINING WING
VANCE AIR FORCE BASE OKLAHOMA

11 March 2025

Colonel Charles D. Throckmorton IV
Commander, 71st Flying Training Wing
246 Brown Parkway, Suite 224
Vance AFB OK 73705-5015

Trait Thompson
Executive Director
Oklahoma Historical Society
State Historic Preservation Officer
Oklahoma History Center
800 Nazih Zuhdi Drive
Oklahoma City OK 73105-7917

Dear Mr. Thompson

The United States Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 71st Flying Training Wing (71 FTW) at Vance Air Force Base (AFB), Oklahoma to support Fighter Bomber Fundamentals pilot training syllabus requirements. Vance AFB is located in Garfield County, Oklahoma immediately south of the city of Enid and approximately 90 miles north-northwest of Oklahoma City (Figure 1). The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (40 Code of Federal Regulations [CFR] Parts 1500-1508) and the DAF Environmental Impact Analysis Process (32 CFR Part 989). The Federal Aviation Administration (FAA) is serving as a cooperating agency during the NEPA process for the Proposed Action.

The Proposed Action is considered an undertaking under Section 106 of the National Historic Preservation Act (NHPA). Therefore, the purpose of this letter is to initiate Section 106 consultation between the DAF and Oklahoma State Historic Preservation Office (SHPO) and request information on historic properties that could potentially be affected by the proposed undertaking. The DAF also requests SHPO concurrence with the Area of Potential Effect (APE) for the proposed undertaking described below.

The proposed low-altitude airspace would need to have a floor of 500 feet above ground level and a ceiling of up to 7,999 feet mean sea level (MSL). Up to 1,170 aircraft operations would occur in the proposed airspace annually and would primarily be performed by 71 FTW pilots flying the T-38C, a high-speed, highly maneuverable jet trainer. Operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace. The proposed airspace would be managed and scheduled by the 71 FTW.

None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). Aircraft would not exceed supersonic speeds while operating within the proposed airspace. The proposed undertaking does not

DELIVER, DEVELOP, DEPLOY, DEMONSTRATE

include changes to the existing boundaries of Vance AFB, the lateral boundaries of existing MOAs in the Vance Airspace Complex, the number and types of personnel and aircraft assigned to Vance AFB, or the number of aircraft operations occurring at the base. No construction, demolition, or other ground-disturbing activities would occur at Vance AFB or on lands underlying the proposed airspace as part of the proposed undertaking.

The DAF is considering an alternative to implement the Proposed Action whereby the DAF would request FAA to establish the proposed low-altitude airspace under a portion of the existing Vance Airspace Complex, which encompasses approximately 11,121 square miles of airspace in northern Oklahoma and southern Kansas. The Vance Airspace Complex is subdivided into four Military Operations Areas (MOAs); currently, military aircraft training operations are not permitted in the Vance Airspace Complex below 7,000 feet above MSL. If established under this alternative, the proposed airspace would be designated as the Vance 1E MOA. The Vance Airspace Complex, existing MOAs, and the proposed Vance 1E MOA are shown on Figure 1. Other alternatives for implementing the proposed undertaking will be addressed in the EA.

The APE for the proposed undertaking is defined as lands underlying or intersected by the boundaries of the proposed Vance 1E MOA (see Figure 1). No ground-disturbing activities would occur within these boundaries under the proposed undertaking. In accordance with Section 106 of the NHPA, the DAF respectfully requests the Oklahoma SHPO's concurrence with the proposed APE. Information is also requested for historic properties in Oklahoma that could potentially be affected by the proposed undertaking (the DAF is consulting separately with the Kansas SHPO regarding potential effects on historic properties in Kansas). The DAF has initiated government-to-government consultation with Native American tribes regarding the proposed undertaking in accordance with Section 106, implementing regulations at 36 CFR Part 800, and DoD Instruction 4710.02, *DoD Interactions with Federally Recognized Tribes*.

Please send your response and any comments, questions, or requests for additional information to Mr. Christopher Wheeler, Lead CE COR, 71 ISS/CE at christopher.wheeler.18@us.af.mil, or by phone at 580-213-6248. Your response is requested within 30 days of receiving this letter to allow sufficient time for consideration of your comments during preparation of the Draft EA. When available, the Draft EA will be provided to your office for review and concurrence with the DAF's determination of effects on historic properties. Thank you for your assistance.

Sincerely

THROCKMORTON.CHARLES.D.IV.1065671952 Digitally signed by THROCKMORTON.CHARLES.D.IV.1065671952 Date: 2025.03.14 15:52:56 -05'00'

CHARLES D. THROCKMORTON IV, Col, USAF
Commander

Attachment:
1. Figure 1 – Location of Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA (Proposed APE)

DELIVER, DEVELOP, DEPLOY, DEMONSTRATE

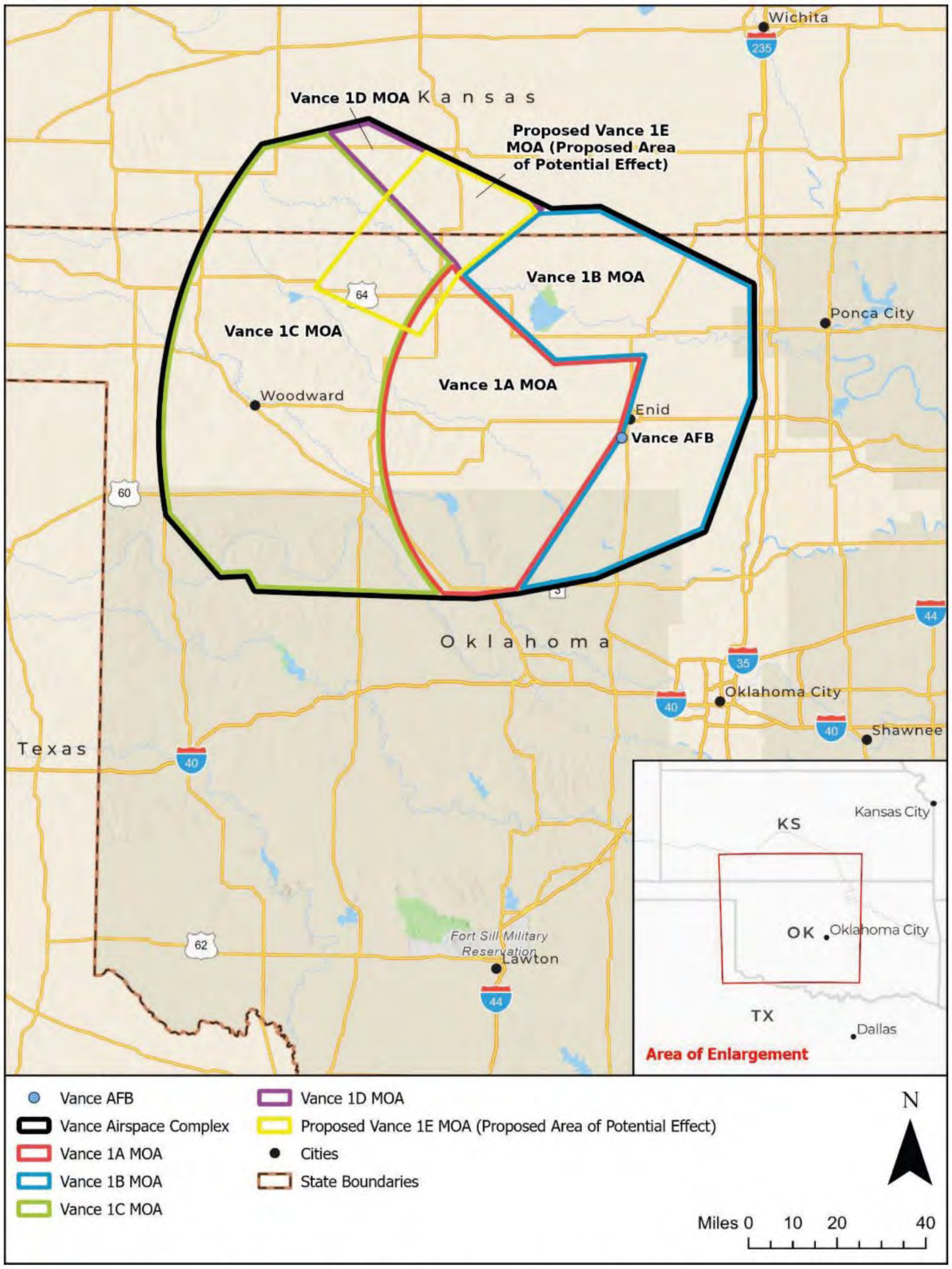


Figure 1 – Location of Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA (Proposed APE)

A.4 Stakeholder List

The following is the stakeholder list for correspondence associated with this Environmental Assessment.

Table A-1 Stakeholders List

Organization	Name	Title	City, State
General, Agency, and Other Interested Parties			
U.S. Environmental Protection Agency, Region 6	Earthea Nance	Regional Administrator	Dallas, TX
U.S. Environmental Protection Agency, Region 7	Meg McCollister	Regional Administrator	Lenexa, KS
Department of Environmental Quality	Scott Thompson	Executive Director	Oklahoma City, OK
Oklahoma Department of Wildlife Conservation	Wade Free	Interim Director	Oklahoma City, OK
Oklahoma Department of Wildlife Conservation	Kyle Johnson	Senior Wildlife Biologist – Private Lands/Energy Emphasis	Oklahoma City, OK
Heritage Program Coordinator	Priscilla Crawford	Conservation Biologist	Norman, OK
Kansas Department of Wildlife and Parks	Chris Kennedy	Secretary	Topeka, KS
Oklahoma Department of Aerospace and Aeronautics	Grayson Ardies	Executive Director	
Kansas Department of Transportation	Ray Seif	Director of Aviation	Norman, OK
Government-to Government Stakeholders			
Apache Tribe of Oklahoma	Durell Cooper	Chairman	Anadarko, OK
Apache Tribe of Oklahoma	Matthew Tselee	Chairman	Anadarko, OK
Cherokee Nation	Chuck Hoskin Jr.	Principal Chief	Tahlequah, OK
Cherokee Nation	Elizabeth Toombs	THPO	Tahlequah, OK
Cheyenne and Arapaho Tribes	Reggie Wassana	Governor	Concho, OK
Cheyenne and Arapaho Tribes	Max Bear	THPO	Concho, OK
Osage Nation	Andrea Hunter	Director and THPO	Pawhuska, OK
Osage Nation	Geoffrey Standing Bear	Principal Chief	Pawhuska, OK
Wichita and Affiliated Tribes (Wichita, Keechi, Waco, Tawakonie), Oklahoma	Amber Silverhorn-Wolfe	President	Anadarko, OK
Wichita and Affiliated Tribes (Wichita, Keechi, Waco, Tawakonie), Oklahoma	Gary McAdams	THPO	Anadarko, OK
Tonkawa Tribe of Oklahoma	Russell Martin	President	Tonkawa, OK
Tonkawa Tribe of Oklahoma	Lauren Norman-Brown	THPO	Tonkawa, OK
United Keetoowah Band of Cherokee Indians in Oklahoma	Joe Bunch	Chief	Tahlequah, OK
Otoe-Missouria Tribe of Oklahoma	John R. Shotton	Chairman	Red Rock, OK
Otoe-Missouria Tribe of Oklahoma	Elsie Whitehorn	THPO	Red Rock, OK

Table A-1 Stakeholders List

Organization	Name	Title	City, State
Comanche Nation	Forrest Tahdooahnippah	Chairman	Lawton, OK
Iowa Tribe of Oklahoma	Amy Roe	Executive Director	Perkins, OK
Jicarilla Apache Nation	Adrian Notsinneh	President	Dulce, NM
Kaw Nation	Kimberly Jenkins	Tribal Chair	Kaw City, OK
Kiowa Indian Tribe of Oklahoma	Lawrence SpottedBird	Chairman	Carnegie, OK
Ponca Tribe of Indians of Oklahoma	Oliver Littlecook	Chairman	Ponca City, OK
Quapaw Tribe of Indians	Wena Supernaw	Chairperson	Quapaw, OK

A.6 Agency and Tribal Comment Letters

March 27, 2025

Christopher Wheeler
Lead CE COR, 71 ISS/CE
U.S. Air Force
[redacted]
Vance AFB OK [redacted]

Subject: Draft EA for the Vance AFB, Vance Airspace Complex, and Proposed Vance 1E MOA

Dear Christopher Wheeler:

This letter is in response to the Department of the Air Force - Vance Air Force Base letter dated March 11, 2025, to the Oklahoma Department of Wildlife Conservation (ODWC) regarding any state resource concerns within or near the proposed Vance 1E MOA permanent low-altitude airspace for the 71st Flying Training Wing. This letter is provided to you as a courtesy of the Oklahoma Department of Wildlife Conservation as a form of technical assistance to help you site, plan and design this project in such a way as to avoid or minimize its potential negative impacts on fish and wildlife resources.

The Oklahoma Department of Wildlife Conservation has determined that no State-listed fish or wildlife species occur within the Proposed Vance 1E MOA. However, activities within the proposed Vance 1E MOA boundary may pose strike risks to migratory birds and bats potentially protected by the Endangered Species Act or Migratory Bird Treaty Act administered by the U.S. Fish and Wildlife Service. ODWC recommends consulting with the U.S. Fish and Wildlife Service, Ecological Services Field Office at [redacted], Tulsa, OK [redacted] for your draft EA. In addition, ODWC recommends contacting the Oklahoma Natural Heritage Inventory, [redacted] Norman, OK [redacted] for other sensitive species records within the proposed action area.

We appreciate the opportunity to view and to provide comments on the proposed project. If you have any questions regarding this letter, you can contact me at kyle.johnson@odwc.ok.gov.

Sincerely,

Kyle Johnson
Senior Wildlife Biologist – Private Lands/Energy Emphasis
Oklahoma Department of Wildlife Conservation
[redacted]

We manage and protect fish and wildlife, along with their habitats, while also growing our community of hunters and anglers, partnering with those who love the outdoors and fostering stewardship with those who care for the land.

P.O. Box 53465 Oklahoma City, OK 73152 (405) 521-3851

From: Echo-Hawk, Patricia [redacted]>
Sent: Tuesday, April 1, 2025 1:50 PM
To: WHEELER, CHRISTOPHER W CIV USAF AETC 71 ISS/CEY <[redacted]>
Cc: KansasES, FW6 <[redacted]>
Subject: [Non-DoD Source] Proposed action low altitude air space-Vance AFB

Good Afternoon Mr Wheeler.

I was given the hard copy of the letter regarding this project today. I'd like to note, that we did not receive the online submission at our okprojectreview@fws.gov inbox.

Although we would need to see the current species list in full for this project to determine all potential impacts, we do have concerns regarding impacts to whooping cranes and whooping crane critical habitat, especially at the altitudes mentioned in the letter.

We look forward to further coordination with our office

Thanks!

Patricia D. Echo-Hawk
Senior Fish and Wildlife Biologist
ODOT Liaison
Region 2 Dive Officer

U.S. Fish and Wildlife
Oklahoma Ecological Services Field Office
[redacted]
work phone # [redacted]

Only when the last tree has died, the last river poisoned and the last fish caught, will we realize we can't eat money. -Cree Proverb

Coincidence is God's way of remaining anonymous - Albert Einstein

OKLAHOMA BIOLOGICAL SURVEY
The UNIVERSITY of OKLAHOMA

DATE: 10 April 2025 ONHI REF: 2025-166-FED-VAF

TO: Christopher Wheeler
Vance Air Force Base - 71st Flying Training Wing
[redacted]

RE: Project Name: Low-Altitude Airspace for 71st Flying Training Wing
County: Garfield
Nearest Town: south of Enid, approx 90 miles N-NW of OKC

Regarding your request for information on the presence of endangered species or other elements of biological significance at the project referenced above, we have reviewed information currently in the Oklahoma Natural Heritage Inventory database.

We found NO occurrences of relevant species within the vicinity of the project locations.

Because the ONHI database is only as complete as the information that has been collected, we cannot say with certainty whether or not a given site harbors rare species or ecological communities.

If you have further questions regarding biological information within your project area, please contact us.

Priscilla Crawford, PhD
Oklahoma Natural Heritage Inventory, Coordinator
[redacted]

REGION 6
DALLAS, TX 75270

April 11, 2025

VIA Email Submission

Christopher Wheeler
Civil Engineer Flight Chief
71 ISS/CE
[redacted]

Re: EPA Scoping Comments for a New Low-Altitude Airspace for the 71st Flying Training Wing at Vance Air Force Base, Garfield County, Oklahoma

Dear Mr. Wheeler:

The Region 6 office of the U.S. Environmental Protection Agency (EPA) has reviewed the Department of the Air Force (DAF) letter dated March 11,2025, requesting comments on environmental issues for a new permanent low-altitude airspace for the 71st Flying Training Wing at Vance Air Force Base, Oklahoma. The proposed airspace would support Fighter Bomber Fundamental pilot training syllabus requirements. Vance AFB is located in Garfield County, Oklahoma, south of the city of Enid and approximately 90 miles northwest of Oklahoma City. The Proposed Action does not alter or increase the following: existing boundaries of Vance Air Force Base (AFB), lateral boundaries of existing Military Operations Areas in the Vance Airspace Complex, the number and types of personnel staffing and aircraft assigned or number of aircraft operations occuring at the base. No construction, demolition, or other ground disturbing activities would occur. The review is pursuant to the National Environmental Policy Act (NEPA), and our NEPA review authority under Section 309 of the Clean Air Act.

To assist in the scoping process for this project, EPA has identified significant areas for your attention and provides program specific comments for your consideration. EPA is most interested in the Air Quality impacts. We offer the following comments for your consideration.

Air Quality Comments
EPA asks that the environmental document provide a detailed discussion of ambient air conditions (baseline or existing conditions), National Ambient Air Quality Standards (NAAQS) and non-NAAQS pollutants, criteria pollutant nonattainment areas, and potential air quality impacts of the proposed project. Such an evaluation is necessary to understand the potential impacts from temporary, long-term, or cumulative degradation of air quality.

EPA recommends the environmental document describe and estimate air emissions from potential construction, maintenance, and operation activities, as well as proposed mitigation measures to minimize those emissions. We recommend an evaluation of the following measures to reduce emissions of criteria air pollutants and hazardous air pollutants (air toxics):

• Existing Conditions – We recommend the environmental document provide a detailed discussion of ambient air conditions, NAAQS, and criteria pollutant nonattainment areas in the vicinity of the project.

• Quantify Emissions – We recommend the environmental document estimate emissions of criteria and hazardous air pollutants (air toxics) from the proposed project and discuss the timeframe for release of these emissions over the lifespan of the project and describe and estimate emissions from potential construction activities, as well as proposed mitigation measures to minimize these emissions. The environmental document should also consider any expected air quality/visibility impacts to Class I Federal Areas identified in 40 CFR Part 81, Subpart D.

• Specify Emission Sources – We recommend the environmental document specify all emission sources by pollutant from mobile sources (on and off-road), stationary sources (including portable and temporary emission units), fugitive emission sources, area sources, and ground disturbance. This source specific information should be used to identify appropriate mitigation measures and areas in need of the greatest attention.

• Construction Emissions Mitigation Plan – We recommend the environmental document include a draft Construction Emissions Mitigation Plan and ultimately adopt this plan in the Findings of No Significant Impact or in the Record of Decision. We recommend all applicable local, state (e.g., coordination of land-clearing activities with the state air quality agency to determine air quality conditions such as atmospheric inversions prior to performing open burning activities), or Federal requirements (e.g., certification of non-road engines as in compliance with the EPA Tier 4 regulations found at 40 CFR Parts 89 and 1039) be included in the Construction Emissions Mitigation Plan in order to reduce impacts associated with emissions of particulate matter and other toxics from any potential construction-related activities.

We appreciate the opportunity to review this document. Please send a PDF copy of the environmental document by email to this office. If you have any questions, please contact Gabe Gruta, the project review lead, at [redacted] or [redacted]

Sincerely,

Houston, Robert
Digitally signed by Houston, Robert
Date: 2025.04.11 11:56:51 -05'00'

Robert Houston
Acting Branch Manager
Environmental Review Branch

2

COMANCHE NATION

Department of the Air Force
71st Flying Training Wing
Vance Air Force Base Oklahoma
Attn: Mr. Christopher Wheeler
[redacted]

April 23, 2025

Re: The United States Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action And Alternatives (Proposed Action) to obtain a new permanent ow-altitude airspace for The 71st Flying Wing (71 FTW) at Vance Air Force Base (AFB), Oklahoma to support Fighter Bomber Fundamentals pilot training syllabus requirements.

Dear Mr. Wheeler :

In response to your request, the above reference project has been reviewed by staff of this office to identify areas that may potentially contain prehistoric or historic archeological materials. The location of your project has been cross referenced with the Comanche Nation site files, where an indication of ***"No Properties"*** have been identified. (IAW 36 CFR 800.4(d)(1)).

Please contact this office at [redacted] if you require additional information on this project.

This review is performed in order to identify and preserve the Comanche Nation and State cultural heritage, in conjunction with the State Historic Preservation Office.

Regards
Theodore E. Villicana
Comanche Nation Historic Preservation Office
Theodore E. Villicana, Technician
[redacted]

COMANCHE NATION [redacted]

Oklahoma Historical Society
State Historic Preservation Office

March 11, 2025

Colonel Charles D. Throckmorton IV
Commander, 71st Flying Training Wing
[redacted]

RE: File #1123-25; Vance AFB Notice of New Airspace for 71st Flying Training Wing

Dear Colonel Throckmorton:

We have received and reviewed the documentation concerning the referenced project in Garfield County. Additionally, we have examined the information contained in the Oklahoma Landmarks Inventory (OLI) files and other materials on historic resources available in our office. We find that there are no historic properties affected by the referenced project.

Thank you for the opportunity to comment on this project. We look forward to working with you in the future.

If you have any questions, please contact Kristina Wyckoff, Historical Archaeologist, at [redacted]

Should further correspondence pertaining to this project be necessary, please reference the above underlined file number. Thank you.

Sincerely,

Lynda Ozan
Deputy State Historic
Preservation Officer

LO:jr

800 Nazih Zuhdi Drive, Oklahoma City, OK 73105-7917
405-521-6249 | Fax 405-522-0816 | www.okhistory.org/shpo

OKLAHOMA

APPENDIX B
REASONABLY FORESEEABLE FUTURE ACTIONS

This page intentionally left blank

APPENDIX B
Reasonably Foreseeable Future Actions

Table B-1 Reasonably Foreseeable Future Actions

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action
Proposed T-7A Recapitalization at Vance AFB	The DAF is proposing to replace all T-38C aircraft assigned to Vance AFB with up to 99 T-7A aircraft, the DAF's newest twin-engine jet trainer. If selected for implementation, the transition to the T-7A at Vance AFB would be expected to occur between 2032 and 20233. Basing of the T-7A at Vance AFB would include temporary changes to the number of personnel and dependents in the Vance AFB region, and construction and upgrade of operations, support, and maintenance facilities. Once the proposed transition to the T-7A is completed, all operations currently performed by Vance AFB pilots flying T-38Cs would be performed in T-7As, including operations in the proposed Vance 1E Low MOA, if implemented.	2032-2033	Project would overlap with implementation of the Proposed Action and occur within the project area.
Bridge Replacement, Harper County, KS	Replacement of the bridge on U.S. 160 over Sand Creek, about 2 miles east of north K-2/U.S. 160 junction, east of the city of Harper, KS. The project includes foundation work for the new bridge, substructure (piers and abutments, superstructure (deck and supports), and paving and railings.	June 2024-June 2025	Project overlaps with implementation of the Proposed Action and occurs within the project area.
Bridge Replacement, Barber County, KS	Replacement of the K-2 bridge over Little Mule Creek almost 2 miles east of U.S. 281. The project includes foundation work for the new bridge, substructure (piers and abutments), and superstructure (deck and supports), and paving and railings.	September 2025- May 2025	Project would overlap with implementation of the Proposed Action and occur within the project area.
Road Reconstruction, Alfalfa County, OK	Rehabilitation of 3.4 miles of Gavin Road. The project includes grading, drainage structures, subsurface drainage, placement of aggregate base and asphalt pavement, signing, guardrails, and other safety related features.	Spring-Fall 2027	Project would overlap with implementation of the Proposed Action and occur within the project area.

This page intentionally left blank.

APPENDIX C
FURTHER DEFINITIONS OF RESOURCE AREAS ANALYZED, METHODOLOGIES, AND MODELING

APPENDIX C
Further Definitions of Resource Areas Analyzed, Methodologies, and Modeling

C.1 Airspace Management and Use

C.1.1 Definition of the Resource

Airspace management involves the direction, control, and handling of flight operations in the airspace that overlies the borders of the United States and its territories. Under Title 49, United States Code § 40103, Sovereignty and use of airspace, and Public Law No. 103-272, the U.S. government has exclusive sovereignty over the nation's airspace. The Federal Aviation Administration (FAA) has the responsibility to plan, manage, and control the structure and use of all airspace over the United States. The FAA created the National Airspace System which is made up of a network of air navigation facilities, air traffic control (ATC) facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system and establish how and where aircraft may fly. Collectively, the FAA uses these rules and regulations to make airspace use as safe, effective, and compatible as possible for all types of civilian and military aircraft. The FAA has two categories of airspace or airspace areas: Regulatory (Class A, B, C, D, and E airspace areas, restricted and prohibited areas) and Nonregulatory (military operations areas [MOAs], warning areas, alert areas, controlled firing areas, and national security areas). These two categories are divided into four airspace types: Controlled, Uncontrolled, Special use, and Other airspace. These airspace categories and types are dictated by the complexity or density of aircraft movements, the nature of the operations conducted within the airspace, the level of safety required, and national and public interest in the airspace.

Class A. Generally, that airspace from 18,000 feet MSL up to and including flight level (FL) 600, including the airspace overlying the waters within 12 nautical miles (NM) off the coast of the 48 contiguous states and Alaska; and designated international airspace beyond 12 NM off the coast of the 48 contiguous states and Alaska within areas of domestic radio navigational signal or air traffic control radar coverage, and within which domestic procedures are applied. Unless otherwise authorized, all persons must operate their aircraft under Instrument Flight Rules (IFR).

Class B. Generally, that airspace from the surface to 10,000 feet mean sea level (MSL) surrounding the nation's busiest airports in terms of IFR operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers, and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are cleared receive separation services within the airspace. The cloud clearance requirement for visual flight rules (VFR) operations is "clear of clouds."

Class C. Generally, this is the airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a 5 NM radius core surface area that extends from the surface up to 4,000 feet above the airport elevation, and a 10 NM radius shelf area that extends no lower than 1,200 feet up to 4,000 feet above the airport elevation. Each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace.

Class D. Generally, Class D airspace extends upward from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Unless otherwise authorized, each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the Class D airspace.

Class E. Generally, if the airspace is not Class A, B, C, or D and is controlled airspace, then it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Also, in this class are federal airways, airspace beginning at either 700 or 1,200 feet above ground level (AGL) used to transition to and from the terminal or en route environment and en route domestic and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 feet MSL over the United States, including that airspace overlying the waters within 12 NM of the coast of the 48 contiguous states and Alaska, up to but not including 18,000 feet MSL, and the airspace above FL 600.

Class G. Uncontrolled airspace or Class G airspace is the portion of the airspace that has not been designated as Class A, B, C, D, or E. It is therefore designated uncontrolled airspace. Class G airspace extends from the surface to the base of the overlying Class E airspace. Although ATC has no authority or responsibility to control air traffic, pilots should remember there are VFR minimums that apply to Class G airspace.

Special use airspace (SUA) includes MOAs, Restricted Areas, Air Traffic Control Assigned Airspace (ATCAAs), and Warning Areas. A MOA is designated airspace outside of Class A airspace used to separate or segregate certain nonhazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted (14 CFR § 1.1). Activities in MOAs include, but are not limited to, air combat maneuvers, air intercepts, and low-altitude tactics. The defined vertical and lateral limits vary for each MOA. While MOAs generally extend from 1,200 feet AGL to 18,000 feet above MSL, the floor may extend below 1,200 feet AGL if there is a mission requirement and minimal adverse aeronautical effect. MOAs allow military aircraft to practice maneuvers and tactical flight training at airspeeds exceeding 250 knots indicated airspeed (approximately 285 miles per hour). The FAA requires publication of the hours of operation for any MOA so that all pilots, both military and civilian, are aware of when other aircraft could be in the airspace. Each military organization responsible for a MOA develops a daily use schedule. Although the FAA designates MOAs for military use, other pilots may transit the airspace under VFR. MOAs exist to notify civil pilots under VFR where heavy volumes of military training exist which increases the chance of conflict and are generally avoided by VFR traffic. Whenever a MOA is being used, nonparticipating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic. MOAs in the vicinity of busy airports may have specific avoidance procedures that also apply to small private and municipal airports. Such avoidance procedures are maintained for each MOA, and both civil and military aircrews build them into daily flight plans. Restricted areas are typically used by the military due to safety or security concerns. Hazards include the existence of unusual and often invisible threats from artillery use, aerial gunnery, or guided missiles. An ATCAA is an airspace of defined vertical/lateral limits assigned by FAA ATC for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic. Typically, these blocks of airspace start at flight level 180 or 18,000 feet MSL and, in some cases, are contoured to the dimensions of the MOAs beneath them. A Warning Area is airspace of defined dimensions that extends from 3 NM outward from the coast of the United States and may be over U.S. waters, international waters, or both. The purpose of Warning Areas is to warn nonparticipating pilots of potentially hazardous activity. Warning areas may be used for other purposes if released to the FAA during periods when not required for their intended purpose and are within areas in which the FAA has ATC authority.

Other airspace refers to most of the remaining airspace including, but not limited to, military training routes, temporary flight restrictions, published VFR routes, national security areas, and flight restricted zones (FAA, 2023). Military training routes are established by joint venture between the FAA and the DoD for use by the military for the purpose of conducting low-altitude, high-speed (exceeding 250 knots) training. The routes above 1,500 feet AGL are developed to be flown, to the maximum extent possible, under IFR. Routes at 1,500 feet AGL and below are developed to be flown under VFR using see-and-avoid flying.

Each military organization responsible for SUA develops a daily use schedule. Although the FAA designates SUA for military use, other pilots may transit the airspace. Avoidance procedures are maintained for each SUA, and military aircrews build them into daily flight plans.

C.1.2 References

Federal Aviation Administration (FAA). 2023. Aeronautical Information Manual. *Official Guide to Basic Flight Information and ATC Procedures*. https://www.faa.gov/air_traffic/publications/atpubs/aim_html. Accessed March 2023.

C.2 Noise

The following sections describe input data used in the noise modeling process.

C.2.1 Sound, Noise, and Potential Effects

C.2.1.1 Introduction

Section C.2.1 discusses sound and noise and their potential effects on the human and natural environment. **Section C.2.1.2** provides an overview of the basics of sound and noise. **Section C.2.1.3** defines and describes the different metrics used to describe noise. The largest section, **Section C.2.1.4**, reviews the potential effects of noise, focusing on effects on humans but also addressing effects on property values, terrain, structures, and animals. **Section C.2.6** contains the list of references cited. **Section C.2.2** contains data used in the noise modeling process. A number of noise metrics are defined and described in this appendix. Some metrics are included for the sake of completeness when discussing each metric and to provide a comparison of cumulative noise metrics.

C.2.1.2 Basics of Sound

Sound Waves and Decibels

Sound consists of minute vibrations in the air that travel through the air and are sensed by the human ear. **Figure C-1** is a sketch of sound waves from a tuning fork. The waves move outward as a series of crests where the air is compressed and troughs where the air is expanded. The height of the crests and the depth of the troughs are the amplitude or sound pressure of the wave. The pressure determines its energy or intensity. The number of crests or troughs that pass a given point each second is called the frequency of the sound wave.

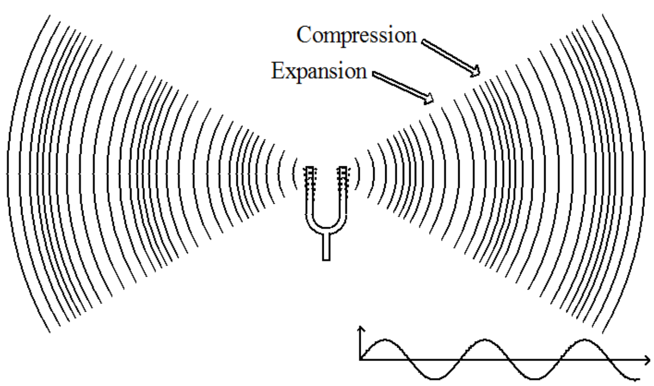


Figure C-1 Sound Waves from a Vibrating Tuning Fork

The measurement and human perception of sound involves three basic physical characteristics: intensity, frequency, and duration.

- Intensity is a measure of the acoustic energy of the sound and related to sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound.

- Frequency determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.
- Duration or the length of time the sound can be detected.

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated 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 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. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall, 1995).

As shown on **Figure C-1**, the sound from a tuning fork spreads out uniformly as it travels from the source. The spreading causes the sound's intensity to decrease with increasing distance from the source. For a source such as an aircraft in flight, the sound level will decrease by about 6 dB for every doubling of the distance. For a busy highway, the sound level will decrease by 3 to 4.5 dB for every doubling of distance.

As sound travels from the source, it also is absorbed by the air. The amount of absorption depends on the frequency composition of the sound, temperature, and humidity conditions. Sound with high frequency content gets absorbed by the air more than sound with low frequency content. More sound is absorbed in colder and drier conditions than in hot and wet conditions. Sound is also affected by wind and temperature gradients, terrain (elevation and ground cover), and structures.

Because of the logarithmic nature of the decibel unit, sound levels cannot simply be added or subtracted 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. For example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

Second, 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.

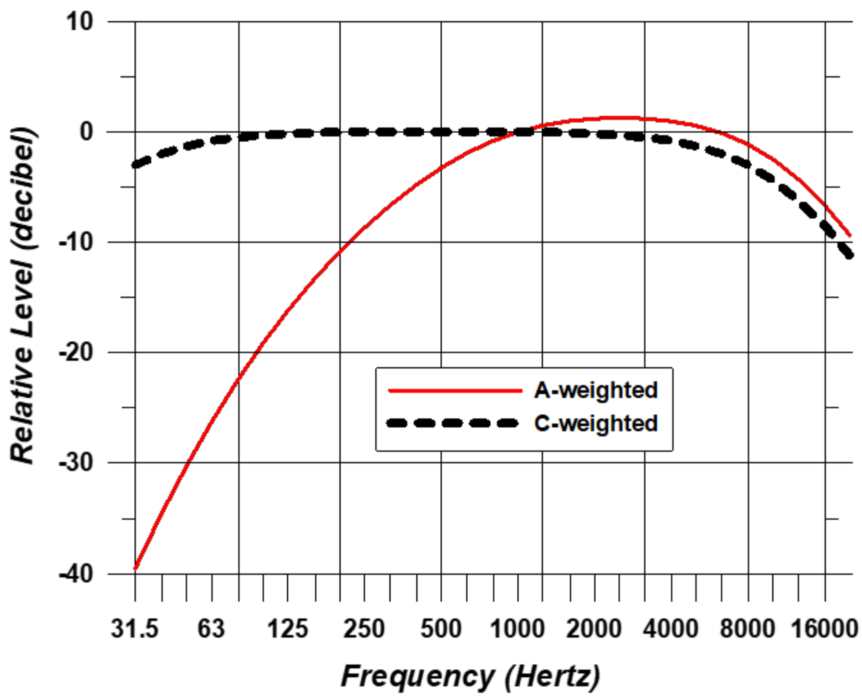
Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness. This relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because the human ear does not respond linearly.

Sound frequency is measured in terms of cycles per second or hertz (Hz). The normal ear of a young person can detect sounds that range in frequency from about 20 to 20,000 Hz. As we get older, we lose the ability to hear high frequency sounds. Not all sounds in this wide range of frequencies are heard equally. Human hearing is most sensitive to frequencies in the 1,000 to 4,000 Hz range. The notes on a piano range from just over 27 to 4,186 Hz, with middle C equal to 261.6 Hz. Most sounds (including a single note on a piano) are not simple pure tones like the tuning fork on **Figure C-1** but contain a mix, or spectrum, of many frequencies.

Sounds with different spectra are perceived differently even if the sound levels are the same. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting and C-weighting are the two most common weightings. These two curves, shown on **Figure C-2**, are adequate to quantify most environmental noises. A-weighting puts emphasis on the 1,000- to 4,000-Hz range where human hearing is most sensitive.

Very loud or impulsive sounds, such as explosions or sonic booms, can sometimes be felt and cause secondary effects, such as shaking of a structure or rattling of windows. These types of sounds can add to annoyance and are best measured by C-weighted sound levels, denoted dBC. C-weighting is nearly flat throughout the audible frequency range and includes low frequencies that may not be heard but cause shaking or rattling. C-weighting approximates the human ear's sensitivity to higher intensity sounds.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

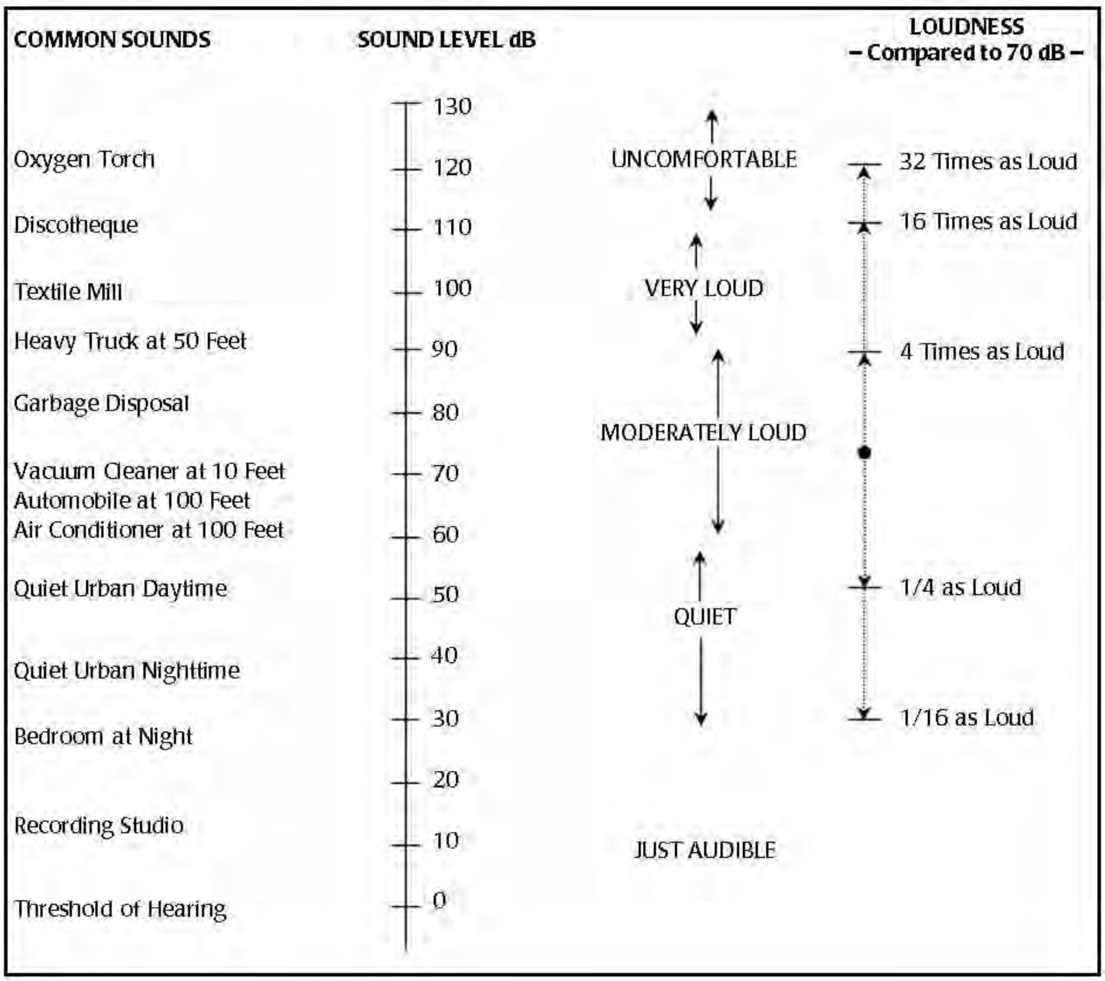
Figure C-2 Frequency Characteristics of A- and C-Weighting

Sound Levels and Types of Sounds

Most environmental sounds are measured using A-weighting. They are called A-weighted sound levels and sometimes use the unit dBA or dB(A), which stands for A-weighted decibel, rather than dB. The dBA is an expression of the relative loudness of sounds as perceived by the human ear and is used to better represent and characterize human perception of and sensitivity to sound. When the use of A-weighting is understood, the term "A-weighted" is often omitted and the unit dB is used. Unless otherwise stated, dB units refer to A-weighted sound levels.

Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is unwanted sound. Noise can become an issue when its level exceeds the ambient or background sound level. Ambient noise in urban areas typically varies from 60 to 70 dB but can be as high as 80 dB in the center of a large city. Quiet suburban neighborhoods experience ambient noise levels around 45 to 50 dB (U.S. Environmental Protection Agency [USEPA], 1978).

Figure C-3 shows A-weighted sound levels from common sources. Some sources, like the air conditioner and vacuum cleaner, are continuous sounds whose levels are constant for some time. Some sources, like the automobile and heavy truck, are the maximum sound during an intermittent event like a vehicle pass-by. Some sources like "urban daytime" and "urban nighttime" are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods. These are discussed in detail in **Section C.2.1.3**.



Source: Harris, 1979

Figure C-3 Typical A-weighted Sound Levels of Common Sounds

Aircraft noise consists of two major types of sound events: flight (including takeoffs, landings, and flyovers) and stationary, such as engine maintenance run-ups. The former is intermittent and the latter primarily continuous. Noise from aircraft overflights typically occurs beneath main approach and departure paths, in local air traffic patterns around the airfield, and in areas near aircraft parking ramps and staging areas. As aircraft climb, the noise received on the ground drops to lower levels, eventually fading into the background or ambient levels.

Impulsive noises are generally short, loud events. Their single-event duration is usually less than 1 second. Examples of impulsive noises are small-arms gunfire, hammering, pile driving, metal impacts during rail-yard shunting operations, and riveting. Examples of high-energy impulsive sounds are quarry/mining explosions, sonic booms, demolition, and industrial processes that use high explosives, military ordnance (e.g., armor, artillery and mortar fire, and bombs), explosive ignition of rockets and missiles, and any other explosive source where the equivalent mass of dynamite exceeds 25 grams (American National Standards Institute [ANSI], 1996).

C.2.1.3 Noise Metrics

Noise metrics quantify sounds so they can be compared with each other and, with their effects, in a standard way. There are a number of metrics that can be used to describe a range of situations, from a particular individual event to the cumulative effect of all noise events over a long time. This section describes the metrics relevant to environmental noise analysis.

C.2.1.3.1 Single Events

Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound changes with time is called the maximum A-weighted sound level or Maximum Sound Level and abbreviated L_{max}. The L_{max} is depicted for a sample event in **Figure C-4**.

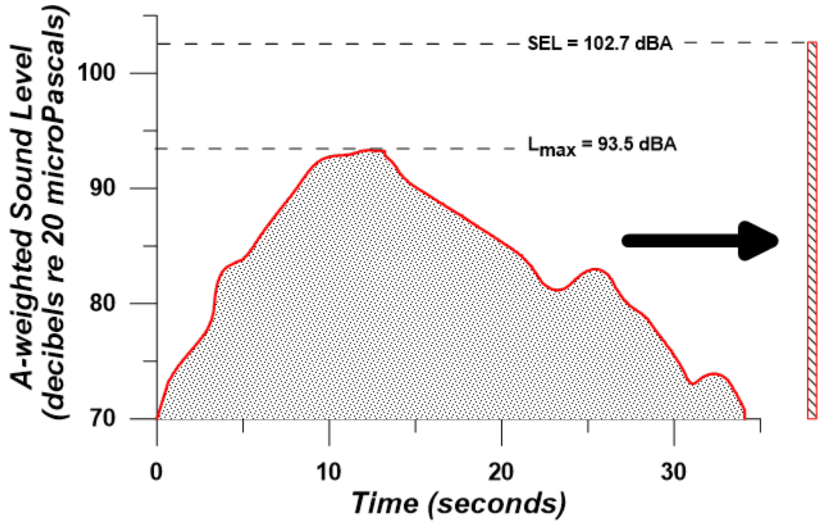
L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988). Slowly varying or steady sounds are generally measured over 1 second, denoted as "slow" response. L_{max} is important in judging if a noise event will interfere with conversation, television or radio listening, or other common activities. Although it provides some measure of the event, it does not fully describe the noise because it does not account for how long the sound is heard.

Peak Sound Pressure Level

The Peak Sound Pressure Level (L_{pk}) is the highest instantaneous level measured by a sound level measurement meter. L_{pk} is typically measured every 20 microseconds and usually based on unweighted or linear response of the meter. It is used to describe individual impulsive events such as blast noise. Because blast noise varies from shot to shot and varies with meteorological (weather) conditions, the DoD usually characterizes L_{pk} by the metric PK 15(met), which is the L_{pk} exceeded 15 percent of the time. The "met" notation refers to the metric accounting for varied meteorological or weather conditions.

Sound Exposure Level

Sound Exposure Level (SEL) combines both the intensity of a sound and its duration. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in the event. **Figure C-4** indicates the SEL for an example event, representing it as if all the sound energy were contained within 1 second.



Source: Wyle Laboratories

Figure C-4 Example Time History of Aircraft Noise Flyover

Aircraft noise varies with time. During an aircraft overflight, noise starts at the background level, rises to a maximum level as the aircraft flies close to the observer, then returns to the background as the aircraft recedes into the distance. This is sketched on **Figure C-4**, which also indicates two metrics (L_{max} and SEL) that are described above. Over time there can be a number of events, not all the same. Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

Overpressure

The single event metrics commonly used to assess supersonic noise from sonic booms are overpressure in pound(s) per square foot (psf) and C-Weighted Sound Exposure Level (CSEL). Overpressure is the peak pressure at any location within the sonic boom footprint. When sonic booms reach the ground, they impact an area that is referred to as a "carpet." The size of the carpet depends on the supersonic flight path and on atmospheric conditions. The width of the boom carpet beneath the aircraft is about 1 mile for each 1,000 feet of altitude (National Aeronautics and Space Administration [NASA], 2017). Sonic booms are loudest near the center of the carpet, under the flight path for steady, level flight conditions, having a sharp "bang-bang" sound. Near the edges, they are weak and have a rumbling sounding like distant thunder. The location of these booms will vary with changing flight paths and weather conditions, so it is unlikely that any given location will experience these undertrack levels more than once over multiple events. Public reaction is expected to occur with overpressures above 1 psf, and in rare instances, damage to structures have occurred at overpressures between 2 and 5 psf (NASA, 2017).

C-Weighted Sound Exposure Level

CSEL is SEL computed with C frequency weighting, which is similar to A-Weighting (see **Section C.2.1.2.2**) except that C-weighting places more emphasis on low frequencies below 1,000 Hz.

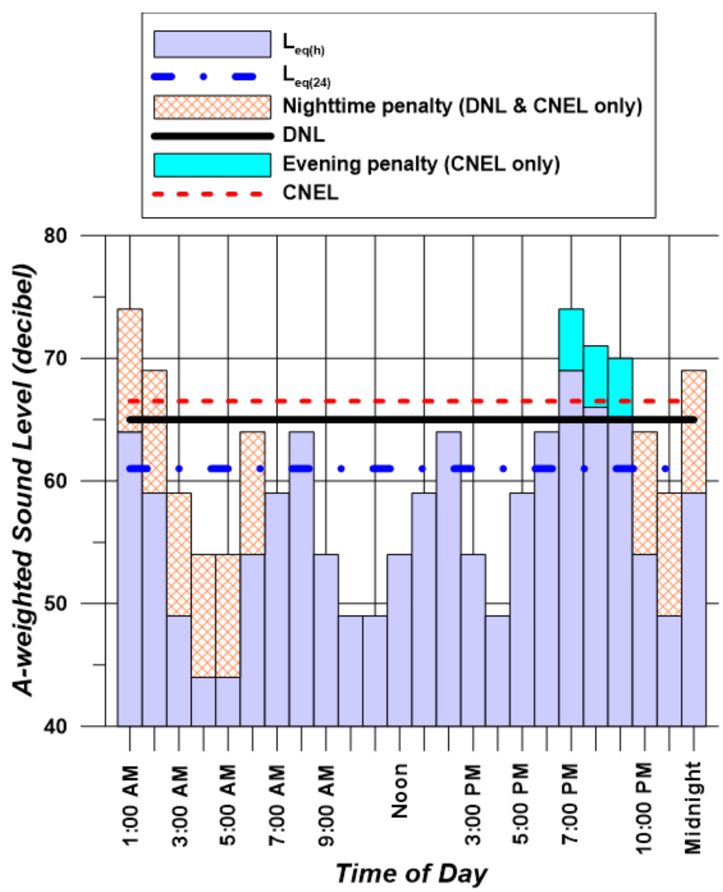
C.2.1.3.2 Cumulative Events

Equivalent Sound Level

Equivalent Sound Level (L_{eq}) is a "cumulative" metric that combines a series of noise events over a period of time. L_{eq} is the sound level that represents the decibel average SEL of all sounds in the time period. Just as SEL has proven to be a good measure of a single event, L_{eq} has proven to be a good measure of series of events during a given time period.

The time period of an L_{eq} measurement is usually related to some activity and given along with the value. The time period is often shown in parenthesis (e.g., L_{eq}[24] for 24 hours). The L_{eq} from 7:00 a.m. to 3:00 p.m. may give exposure of noise for a school day.

Figure C-5 gives an example of L_{eq}(24) using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. The L_{eq}(24) for this example is 61 dB.



Source: Wyle Laboratories

Figure C-5 Example of Equivalent Sound Level Over 24 Hours, DNL, and Community Noise Equivalent Level Computed from Hourly Equivalent Sound Levels

Day-Night Average Sound Level and Community Noise Equivalent Level

Day-Night Average Sound Level (DNL or L_{dn}) is a cumulative metric that accounts for all noise events in a 24-hour period. However, unlike L_{eq}(24), DNL contains a nighttime noise penalty. To account for our increased sensitivity to noise at night, DNL applies a 10-dB penalty to events during the nighttime period, defined as 10:00 p.m. to 7:00 a.m. The notations DNL and L_{dn} are both used for Day-Night Average Sound Level and are equivalent.

Community Noise Equivalent Level (CNEL) is a variation of DNL specified by law in California (California Code of Regulations Title 21, Public Works) (Wyle Laboratories, 1971). CNEL has the 10-dB nighttime penalty for events between 10:00 p.m. and 7:00 a.m. but also includes a 4.8-dB penalty for events during the evening period of 7:00 p.m. to 10:00 p.m. The evening penalty in CNEL accounts for the added intrusiveness of sounds during that period. For airports and military airfields, DNL and CNEL represent the average sound level for annual average daily aircraft events.

Figure C-5 gives an example of DNL and CNEL using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. Note the L_{eq}(h) for the hours between 10:00 p.m. and 7:00 a.m. have a 10-dB penalty assigned. For CNEL, the hours between 7:00 p.m. and 10:00 p.m. have a 4.8-dB penalty assigned. The DNL for this example is 65 dB. The CNEL for this example is 66 dB.

Figure C-6 shows the ranges of DNL or CNEL that occur in various types of communities. Under a flight path at a major airport, the DNL may exceed 80 dB while rural areas may experience DNL less than 45 dB. The decibel summation nature of these metrics causes the noise levels of the loudest events to control the 24-hour average. As a simple example, consider a case in which only one aircraft overflight occurs during the daytime over 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 65.9 dB. Assume, as a second example that 10 such 30-second overflights occur during 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 75.5 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.

A feature of the DNL metric is that a given DNL value could result from a very few noisy events or a large number of quieter events. For example, one overflight at 90 dB creates the same DNL as 10 overflights at 80 dB.

DNL or CNEL does not represent a level heard at any given time but represent long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (Schultz, 1978; USEPA, 1978).

Onset-Rate Adjusted Monthly Day-Night Average Sound Level and Onset-Rate Adjusted Monthly Community Noise Equivalent Level

Military aircraft utilizing SUA such as MTRs, MOAs, and restricted areas generate a noise environment that is somewhat different from that around airfields. Rather than regularly occurring operations like at airfields, activity in SUA is highly sporadic. It is often seasonal, ranging from 10 per hour to less than 1 per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset, with rates of up to 150 dB per second.

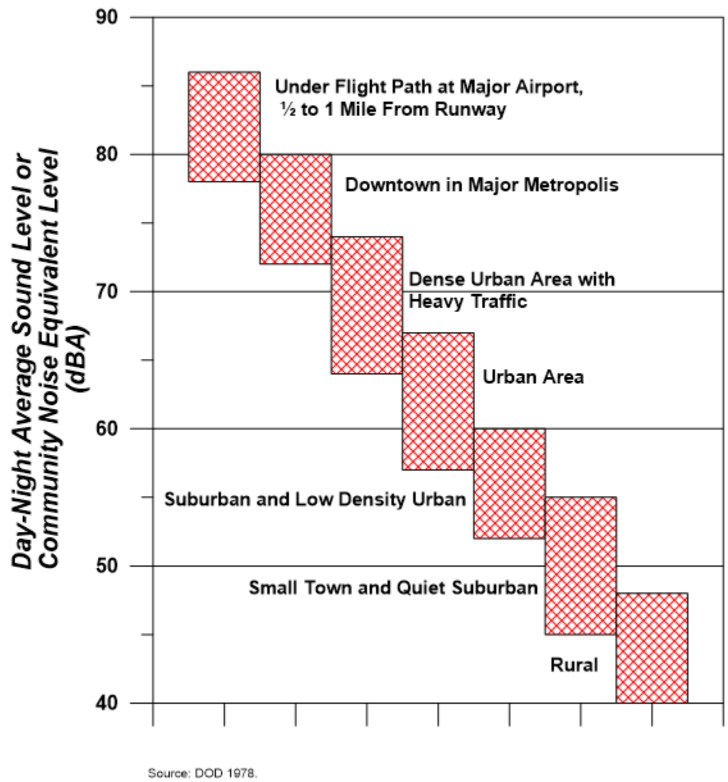


Figure C-6 Typical Day-Night Average Sound Level or Community Noise Equivalent Level Ranges in Various Types of Communities

The cumulative daily noise metric devised to account for the "surprise" effect of the sudden onset of aircraft noise events on humans and the sporadic nature of SUA activity is the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Onset rates between 15 and 150 dB per second require an adjustment of 0 to 11 dB to the event's SEL while onset rates below 15 dB per second require no adjustment to the event's SEL (Stusnick et al., 1992). The term 'monthly' in L_{dnmr} refers to the noise assessment being conducted for the month with the most operations or sorties -- the so-called busiest month.

In California, a variant of the L_{dnmr} includes a penalty for evening operations (7:00 p.m. to 10:00 p.m.) and is denoted Onset-Rate Adjusted Monthly Community Noise Equivalent Level ($CNEL_{mr}$).

C.2.1.3.3 Supplemental Metrics

Number-of-Events Above a Threshold Level

The Number-of-Events Above (NA) metric gives the total number of events that exceed a noise level threshold (L) during a specified period of time. Combined with the selected threshold, the metric is denoted NAL. The threshold can be either SEL or L_{max}, and it is important that this selection is shown in the nomenclature. When labeling a contour line or point of interest, NAL is followed by the number of events in parentheses. For example, where 10 events exceed an SEL of 90 dB over a given period of time, the nomenclature would be NA90SEL(10). Similarly, for L_{max} it would be NA90L_{max}(10). The period of time can be an average 24-hour day, daytime, nighttime, school day, or any other time period appropriate to the nature and application of the analysis.

NA is a supplemental metric valuable in helping to describe noise to the community. A threshold level and metric are selected that best meet the need for each situation. An L_{max} threshold is normally selected to analyze speech interference, while an SEL threshold is normally selected for analysis of sleep disturbance.

The NA metric is the only supplemental metric that combines single-event noise levels with the number of aircraft operations. In essence, it answers the question of how many aircraft (or range of aircraft) fly over a given location or area at or above a selected threshold noise level.

Time Above a Specified Level

The Time Above (TA) metric is the total time, in minutes, that the A-weighted noise level is at or above a threshold. Combined with the threshold level (L), it is denoted TAL. TA can be calculated over a full 24-hour annual average day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there is operational data for that time.

TA is a supplemental metric, used to help understand noise exposure. It is useful for describing the noise environment in schools, particularly when assessing classroom or other noise sensitive areas for various scenarios. TA can be shown as contours on a map similar to the way DNL contours are drawn.

TA helps describe the noise exposure of an individual event or many events occurring over a given time period. When computed for a full day, the TA can be compared alongside the DNL in order to determine the sound levels and total duration of events that contribute to the DNL. TA analysis is usually conducted along with NA analysis, so the results show not only how many events occur, but also the total duration of those events above the threshold.

C.2.1.4 Noise Effects

Noise is of concern because of potential adverse effects. The following subsections describe how noise can affect communities and the environment and how those effects are quantified. The specific topics discussed are:

- annoyance;
- speech interference;
- sleep disturbance;
- noise effects on children; and
- noise effects on domestic animals and wildlife.

C.2.1.4.1 Annoyance

With the introduction of jet aircraft in the 1950s, it became clear that aircraft noise annoyed people and was a significant problem around airports. Early studies, such as those of Rosenblith et al. (1953) and Stevens et al. (1953) showed that effects depended on the quality of the sound, its level, and the number of flights. Over the next 20 years considerable research was performed refining this understanding and setting guidelines for noise exposure. In the early 1970s, the USEPA published its “Levels Document” (USEPA, 1974) that reviewed the factors that affected communities. DNL (still known as L_{dn} at the time) was identified as an appropriate noise metric, and threshold criteria were recommended.

Threshold criteria for annoyance were identified from social surveys, where people exposed to noise were asked how noise affects them. Surveys provide direct real-world data on how noise affects actual residents.

Surveys in the early years had a range of designs and formats and needed some interpretation to find common ground. In 1978, Schultz showed that the common ground was the number of people “highly annoyed,” defined as the upper 28 percent range of whatever response scale a survey used (Schultz, 1978). With that definition, he was able to show a remarkable consistency among the majority of the surveys for which data were available. **Figure C-7** shows the result of his study relating DNL to individual annoyance measured by percent highly annoyed.

Schultz’s original synthesis included 161 data points. **Figure C-8** shows a comparison of the predicted response of the Schultz data set with an expanded set of 400 data points collected through 1989 (Finegold et al., 1994). The new form is the preferred form in the United States, endorsed by the Federal Interagency Committee on Aviation Noise (FICAN, 1997). Other forms have been proposed, such as that of Fidell and Silvati (2004) but have not gained widespread acceptance.

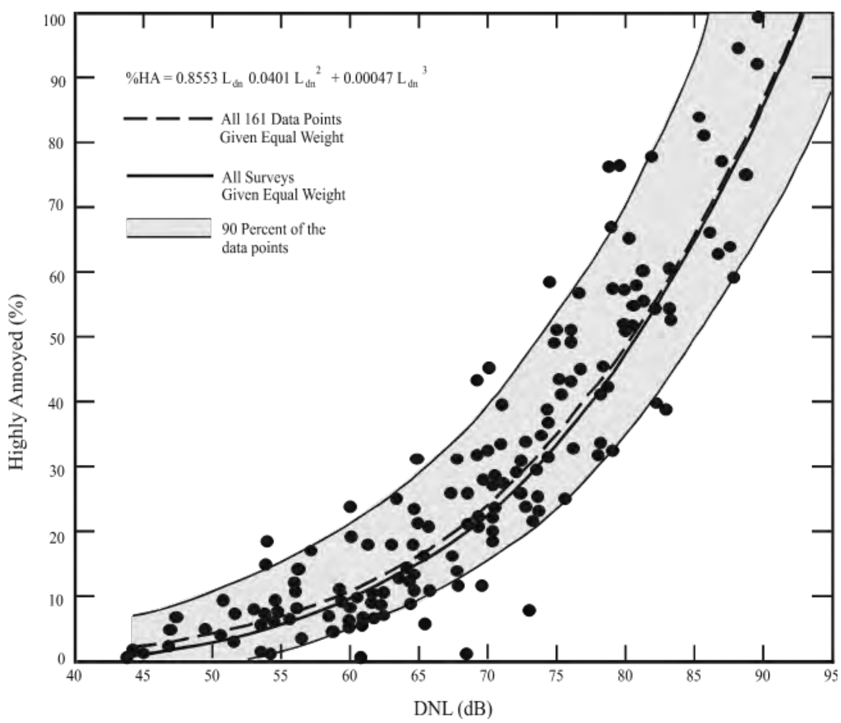


Figure C-7 Schultz Curve Relating Noise Annoyance to Day-Night Average Sound Level (Schultz, 1978)

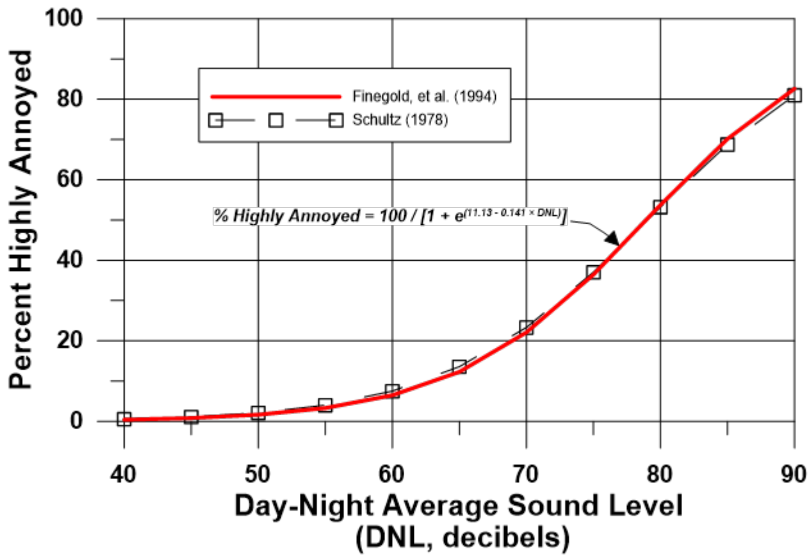


Figure C-8 Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al. (1994)

When the goodness of fit of the Schultz curve is examined, the correlation between groups of people is high, in the range of 85 to 90 percent; however, the correlation between individuals is much lower, at 50 percent or less. This is not surprising, given the personal differences between individuals. The surveys underlying the Schultz curve include results that show that annoyance to noise is also affected by non-acoustical factors. Newman and Beattie (1985) divided the non-acoustic factors into the emotional and physical variables shown in **Table C-5**.

Table C-1 Nonacoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables
Feeling about the necessity or preventability of the noise
Judgment of the importance and value of the activity that is producing the noise
Activity at the time an individual hears the noise
Attitude about the environment
General sensitivity to noise
Belief about the effect of noise on health
Feeling of fear associated with the noise

Physical Variables
Type of neighborhood
Time of day
Season
Predictability of the noise
Control over the noise source
Length of time individual is exposed to a noise

Schreckenberg and Schuemer (2010) recently examined the importance of some of these factors on short term annoyance. Attitudinal factors were identified as having an effect on annoyance. In formal regression analysis, however, sound level (L_{eq}) was found to be more important than attitude. A series of studies at three European airports showed that less than 20 percent of the variance in annoyance can be explained by noise alone (Márki, 2013).

A recent study by Plotkin et al. (2011) examined updating DNL to account for these factors. It was concluded that the data requirements for a general analysis were much greater than are available from most existing studies. It was noted that the most significant issue with DNL is that it is not readily understood by the public and that supplemental metrics such as TA and NA were valuable in addressing attitude when communicating noise analysis to communities (DoD, 2009a).

A factor that is partially non-acoustical is the source of the noise. Miedema and Vos (1998) presented synthesis curves for the relationship between DNL and percentage "Annoyed" and percentage "Highly Annoyed" for three transportation noise sources. Different curves were found for aircraft, road traffic, and railway noise. **Table C-6** summarizes their results. Comparing the updated Schultz curve suggests that the percentage of people highly annoyed by aircraft noise may be higher than previously thought. Miedema and Oudshoorn (2001) authors supplemented that investigation with further derivation of percent of population highly annoyed as a function of either DNL or DENL along with the corresponding 95 percent confidence intervals with similar results.

Table C-2 Percent Highly Annoyed for Different Transportation Noise Sources

Day-Night Average Sound Level (decibels)	Percent Highly Annoyed			
	Miedema and Vos			Schultz Combined
	Air	Road	Rail	
55	12	7	4	3
60	19	12	7	6
65	28	18	11	12
70	37	29	16	22
75	48	40	22	36

Source: Miedema and Vos, 1998

As noted by the World Health Organization (WHO), however, even though aircraft noise seems to produce a stronger annoyance response than road traffic, caution should be exercised when interpreting synthesized data from different studies (WHO, 1999).

Consistent with WHO's recommendations, the Federal Interagency Committee on Noise (FICON, 1992) considered the Schultz curve to be the best source of dose information to predict community response to noise but recommended further research to investigate the differences in perception of noise from different sources.

The International Standard (ISO 1996:1-2016) update introduced the concept of Community Tolerance Level (L_{ct}) as the day-night sound level at which 50 percent of the people in a particular community are predicted to be highly annoyed by noise exposure. L_{ct} accounts for differences between sources and/or communities when predicting the percentage highly annoyed by noise exposure. ISO also recommended a change to the adjustment range used when comparing aircraft noise to road noise. The previous edition suggested +3 to +6 dB for aircraft noise relative to road noise while the latest editions recommend an adjustment range of +5 to +8 dB. This adjustment range allows DNL to be correlated to consistent annoyance rates when originating from different noise sources (i.e., road traffic, aircraft, or railroad). This change to the adjustment range would increase the calculated percent highly annoyed at the 65-dB DNL by approximately 2 to 5 percent greater than the previous ISO definition. **Figure C-9** depicts the estimated percentage of people highly annoyed for a given DNL using both the ISO 1996-1 estimation and the older FICON 1992 method. The results suggest that the percentage of people highly annoyed may be greater than previous thought and reliance solely on DNL for impact analysis may be insufficient if utilizing the FICON 1992 method.

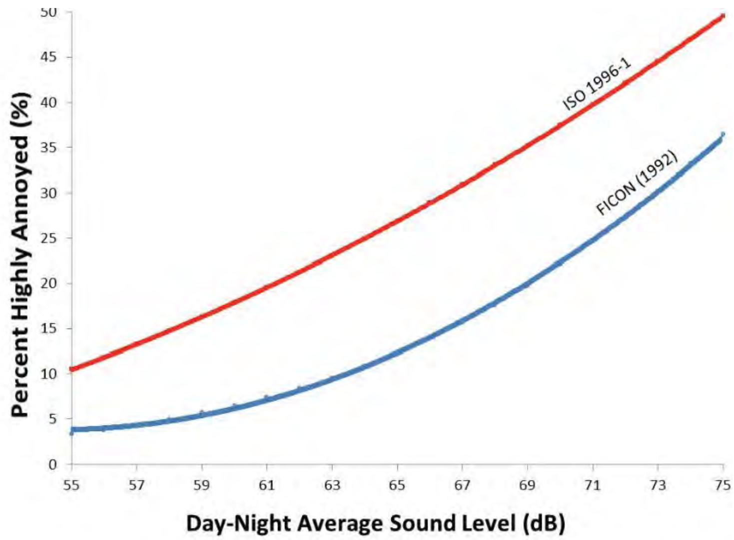


Figure C-9 Percent Highly Annoyed Comparison of International Standard 1996-1 to Federal Interagency Committee on Noise (1992)

C.2.1.4.2 Speech Interference

Speech interference from noise is a primary cause of annoyance for communities. Disruption of routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is important in classrooms and offices. In the workplace, speech interference from noise can cause fatigue and vocal strain in those who attempt to talk over the noise. In schools it can impair learning.

There are two measures of speech comprehension:

1. Word Intelligibility - the percent of words spoken and understood. This might be important for students in the lower grades who are learning the English language and particularly for students who have English as a Second Language.
2. Sentence Intelligibility – the percent of sentences spoken and understood. This might be important for high-school students and adults who are familiar with the language and who do not necessarily have to understand each word in order to understand sentences.

United States Federal Criteria for Interior Noise

In 1974, the USEPA identified a goal of an indoor L_{eq}(24) of 45 dB to minimize speech interference based on sentence intelligibility and the presence of steady noise (USEPA, 1974). **Figure C-10** shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background indoor sound levels of less than the 45-dB L_{eq} are expected to allow 100 percent sentence intelligibility.

The curve on **Figure C-10** shows 99 percent intelligibility at L_{eq} below 54 dB and less than 10 percent above 73 dB. Recalling that L_{eq} is dominated by louder noise events, the USEPA L_{eq}(24) goal of 45 dB generally ensures that sentence intelligibility will be high most of the time.

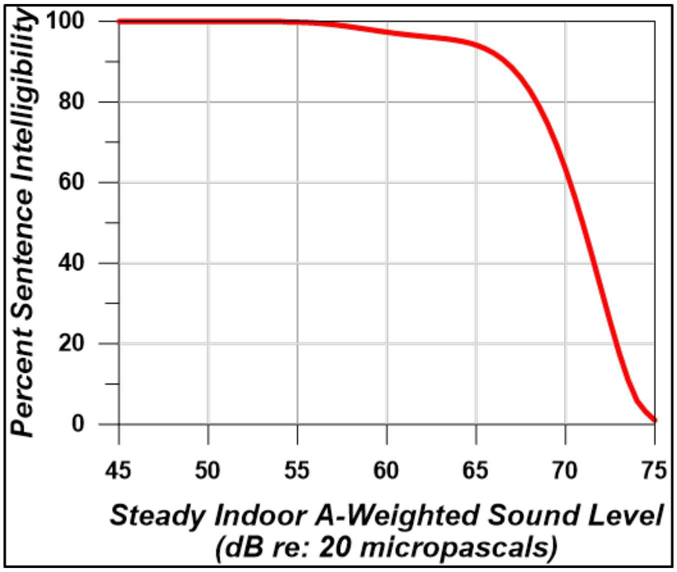


Figure C-10 Speech Intelligibility Curve

(digitized from USEPA, 1974)

Classroom Criteria

For teachers to be understood, their regular voice must be clear and uninterrupted. Background noise has to be below the teacher's voice level. Intermittent noise events that momentarily drown out the teacher's voice need to be kept to a minimum. It is therefore important to evaluate the steady background level, level of voice communication, and single-event level due to aircraft overflights that might interfere with speech.

Lazarus (1990) found that for listeners with normal hearing and fluency in the language, complete sentence intelligibility can be achieved when the signal-to-noise ratio (i.e., a comparison of the level of the sound to the level of background noise) is in the range of 15 to 18 dB. The initial ANSI (2002) classroom noise standard and American Speech-Language-Hearing Association (2005) guidelines concur, recommending at least a 15-dB signal-to-noise ratio in classrooms. If the teacher's voice level is at least 50 dB, the background noise level must not exceed an average of 35 dB. The National Research Council of Canada (Bradley, 1993) and WHO (1999) agree with this criterion for background noise.

For eligibility for noise insulation funding, the FAA guidelines state that the design objective for a classroom environment is the 45-dB L_{eq} during normal school hours (FAA, 1985).

Most aircraft noise is not continuous. It consists of individual events like the one sketched on **Figure C-4**. Since speech interference in the presence of aircraft noise is caused by individual aircraft flyover events, a time-averaged metric alone, such as L_{eq}, is not necessarily appropriate. In addition to the background level criteria described above, single-event criteria that account for those noisy events are also needed.

A 1984 study by Wyle for the Port Authority of New York and New Jersey recommended using Speech Interference Level (SIL) for classroom noise criteria (Sharp and Plotkin, 1984). SIL is based on the maximum sound levels in the frequency range that most affects speech communication (500 to 2,000 Hz). The study identified an SIL of 45 dB as the goal. This would provide 90 percent word intelligibility for the short time periods during aircraft overflights. While

SIL is technically the best metric for speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an A-weighted L_{max} of 50 dB for aircraft noise (Wesler, 1986).

Lind et al. (1998) also concluded that an L_{max} criterion of 50 dB would result in 90 percent word intelligibility. Bradley (1985) recommends SEL as a better indicator. His work indicates that 95 percent word intelligibility would be achieved when indoor SEL did not exceed 60 dB. For typical flyover noise, this corresponds to an L_{max} of 50 dB. While WHO (1999) only specifies a background L_{max} criterion, they also note the SIL frequencies, and that interference can begin at around 50 dB.

The United Kingdom Department for Education and Skills (UKDfES) established in its classroom acoustics guide a 30-minute time-averaged metric of L_{eq}(30min) for background levels and the metric of LA1,30min for intermittent noises, at thresholds of 30 to 35 dB and 55 dB, respectively. LA1,30min represents the A-weighted sound level that is exceeded 1 percent of the time (in this case, during a 30-minute teaching session) and is generally equivalent to the L_{max} metric (UKDfES, 2003).

Table C-7 summarizes the criteria discussed. Other than the FAA (1985) 45 dB L_{max} criterion, they are consistent with a limit on indoor background noise of 35 to 40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table C-3 Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
Federal Aviation Administration (1985)	$L_{eq(during\ school\ hours)}$ = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.
Lind et al. (1998), Sharp and Plotkin (1984), Wesler (1986)	L_{max} = 50 dB / Speech Interference Level 45	Single event level permissible in the classroom.
World Health Organization (1999)	L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.
American National Standards Institute (2010)	L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.
United Kingdom Department for Education and Skills (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.

C.2.1.4.3 Sleep Disturbance

Sleep disturbance is a major concern for communities exposed to aircraft noise at night. A number of studies have attempted to quantify the effects of noise on sleep. This section provides an overview of the major noise-induced sleep disturbance studies. Emphasis is on studies that have influenced US federal noise policy. The studies have been separated into two groups:

1. Initial studies performed in the 1960s and 1970s, where the research was focused on sleep observations performed under laboratory conditions.
2. Later studies performed in the 1990s up to the present, where the research was focused on field observations.

Initial Studies

The relation between noise and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep and the noise level but also on the non-acoustic factors cited for annoyance. The easiest effect to measure is the number of arousals or awakenings from noise events. Much of the literature has therefore focused on predicting the percentage of the population that will be awakened at various noise levels.

FICON's 1992 review of airport noise issues (FICON, 1992) included an overview of relevant research conducted through the 1970s. Literature reviews and analyses were conducted from 1978 through 1989 using existing data (Griefahn, 1978; Lukas, 1978; Pearsons et al., 1989). Because of large variability in the data, FICON did not endorse the reliability of those results.

FICON did, however, recommend an interim dose-response curve, awaiting future research. That curve predicted the percent of the population expected to be awakened as a function of the exposure to SEL. This curve was based on research conducted for the US Air Force (Finegold, 1994). The data included most of the research performed up to that point and predicted a 10 percent probability of awakening when exposed to an interior SEL of 58 dB. The data used to derive this curve were primarily from controlled laboratory studies.

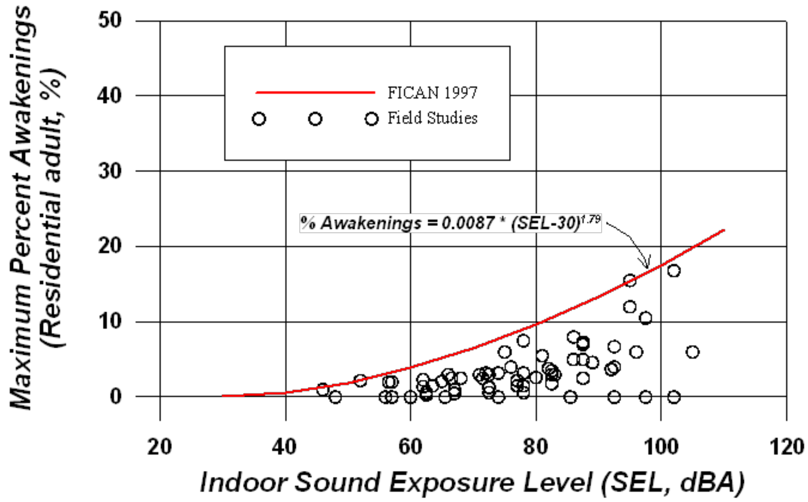
Recent Sleep Disturbance Research ‑ Field and Laboratory Studies

It was noted that early sleep laboratory studies did not account for some important factors. These included habituation to the laboratory, previous exposure to noise, and awakenings from noise other than aircraft. In the early 1990s, field studies in people's homes were conducted to validate the earlier laboratory work conducted in the 1960s and 1970s. The field studies of the 1990s (e.g., Horne, 1994) found that 80 to 90 percent of sleep disturbances were not related to outdoor noise events but rather to indoor noises and non-noise factors. The results showed that, in real-life conditions, there was less of an effect of noise on sleep than had been previously reported from laboratory studies. Laboratory sleep studies tend to show more sleep disturbance than field studies because people who sleep in their own homes are used to their environment and, therefore, do not wake up as easily (FICAN, 1997).

FICAN

Based on this new information, in 1997 FICAN recommended a dose-response curve to use instead of the earlier 1992 FICON curve (FICAN, 1997). **Figure C-11** shows FICAN's curve, the red line, which is based on the results of three field studies shown in the figure (Ollerhead et al., 1992; Fidell et al., 1994, 1995a, 1995b), along with the data from six previous field studies.

The 1997 FICAN curve represents the upper envelope of the latest field data. It predicts the maximum percent awakened for a given residential population. According to this curve, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB. An indoor SEL of 58 dB is equivalent to an outdoor SEL of about 83 dB, with the windows closed (73 dB with windows open).



Source: FICAN 1997

Figure C-11 Federal Interagency Committee on Aviation Noise 1997 Recommended Sleep Disturbance Dose-Response Relationship

Number of Events and Awakenings

It is reasonable to expect that sleep disturbance is affected by the number of events. The German Aerospace Center (DLR Laboratory) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and related factors (Basner et al., 2004). The DLR Laboratory study was one of the largest studies to examine the link between aircraft noise and sleep disturbance. It involved both laboratory and in-home field research phases. The DLR Laboratory investigators developed a dose-response curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

Later studies by DLR Laboratory conducted in the laboratory comparing the probability of awakenings from different modes of transportation showed that aircraft noise led to significantly lower awakening probabilities than either road or rail noise (Basner et al., 2011). Furthermore, it was noted that the probability of awakening, per noise event, decreased as the number of noise events increased. The authors concluded that by far the majority of awakenings from noise events merely replaced awakenings that would have occurred spontaneously anyway.

A different approach was taken by an ANSI standards committee (ANSI, 2008). The committee used the average of the data shown on **Figure C-10** rather than the upper envelope to predict average awakening from one event. Probability theory is then used to project the awakening from multiple noise events.

Currently, there are no established criteria for evaluating sleep disturbance from aircraft noise although recent studies have suggested a benchmark of an outdoor SEL of 90 dB as an appropriate tentative criterion when comparing the effects of different operational alternatives. The corresponding indoor SEL would be approximately 25 dB lower (at 65 dB) with doors and windows closed and approximately 15 dB lower (at 75 dB) with doors or windows open. According to the ANSI (2008) standard, the probability of awakening from a single aircraft event at this level is between 1 and 2 percent for people habituated to the noise sleeping in bedrooms with windows closed and 2 to 3 percent with windows open. The probability of the exposed population awakening at least once from multiple aircraft events at the 90-dB SEL is shown in **Table C-8**.

Table C-4 Probability of Awakening from NA90SEL

Number of Aircraft Events at the 90-decibel Sound Exposure Level for Average 9-Hour Night	Minimum Probability of Awakening at Least Once	
	Windows Closed	Windows Open
1	1%	2%
3	4%	6%
5	7%	10%
9 (1 per hour)	12%	18%
18 (2 per hour)	22%	33%
27 (3 per hour)	32%	45%

Source: DoD, 2009b

In December 2008, FICAN recommended the use of this new standard. FICAN also recognized that more research is underway by various organizations and that work may result in changes to FICAN's position. Until that time, FICAN recommends the use of the ANSI (2008) standard (FICAN, 2008).

Summary

Sleep disturbance research still lacks the details to accurately estimate the population awakened for a given noise exposure. The procedure described in the ANSI (2008) Standard and endorsed by FICAN is based on probability calculations that have not yet been scientifically validated. While this procedure certainly provides a much better method for evaluating sleep awakenings from multiple aircraft noise events, the estimated probability of awakenings can only be considered approximate.

C.2.1.4.4 Noise Effects on Children

Recent studies on school children indicate a potential link between aircraft noise and both reading comprehension and learning motivation. The effects may be small but may be of particular concern for children who are already scholastically challenged.

Effects on Learning and Cognitive Abilities

Early studies in several countries (Cohen et al., 1973, 1980, 1981; Bronzaft and McCarthy, 1975; Green et al., 1982; Evans et al., 1998; Haines et al., 2002; Lercher et al., 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies, noise-exposed children were less likely to solve difficult puzzles or more likely to give up.

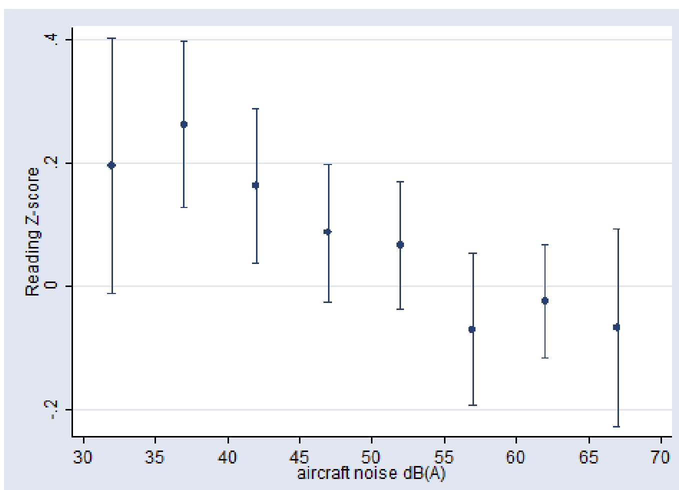
A longitudinal study reported by Evans et al. (1998), conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of the airport, these deficits disappeared, indicating that noise effects on cognition may be reversible if exposure to the noise ceases. Most convincing was the finding that deficits in memory and reading comprehension developed over the 2-year follow-up for children who became newly noise exposed near the new airport; deficits were also observed in speech perception for the newly noise-exposed children.

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Stansfeld et al., 2005; Clark et al., 2005) compared the effect of aircraft and road traffic noise on over 2,000 children in three countries. This was the first study to derive exposure-effect associations for a range of cognitive and health effects and was the first to compare effects across countries.

The study found a linear relation between chronic aircraft noise exposure and impaired reading comprehension and recognition memory. No associations were found between chronic road traffic noise exposure and cognition. Conceptual recall and information recall surprisingly showed better performance in high-road traffic noise areas. Neither aircraft noise nor road traffic noise affected attention or working memory (Stansfeld et al., 2005; Clark et al., 2005).

Figure C-12 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at L_{eq} greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.

An observation of the RANCH study was that children may be exposed to aircraft noise for many of their childhood years, and the consequences of long-term noise exposure were unknown. A follow-up study of the children in the RANCH project is being analyzed to examine the long-term effects on children's reading comprehension (Clark et al., 2009). Preliminary analysis indicated a trend for reading comprehension to be poorer at 15 to 16 years of age for children who attended noise-exposed primary schools. An additional study utilizing the same data set (Clark et al., 2012) investigated the effects of traffic-related air pollution and found little evidence that air pollution moderated the association of noise exposure on children's cognition.



Sources: Stansfeld et al. 2005; Clark et al. 2006

Figure C-12 Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) Study Reading Scores Varying with Equivalent Sound Level

There was also a trend for reading comprehension to be poorer in aircraft noise-exposed secondary schools. Significant differences in reading scores were found between primary school children in the two different classrooms at the same school (Bronzaft and McCarthy, 1975). One classroom was exposed to high levels of railway noise while the other classroom was quiet. The mean reading age of the noise-exposed children was 3 to 4 months behind that of the control children. Studies suggest that the evidence of the effects of noise on children's cognition has grown stronger over recent years (Stansfeld and Clark, 2015), but further analysis adjusting for confounding factors is ongoing and is needed to confirm these initial conclusions.

There was also a trend for reading comprehension to be poorer in aircraft noise-exposed secondary schools. Significant differences in reading scores were found between primary school children in the two different classrooms at the same school (Bronzaft and McCarthy, 1975). One classroom was exposed to high levels of railway noise while the other classroom was quiet. The mean reading age of the noise-exposed children was 3 to 4 months behind that of the control children. Studies suggest that the evidence of the effects of noise on children's cognition has grown stronger over recent years (Stansfeld and Clark, 2015), but further analysis adjusting for confounding factors is ongoing and is needed to confirm these initial conclusions.

Studies identified a range of linguistic and cognitive factors to be responsible for children´s unique difficulties with speech perception in noise. Children have lower stored phonological knowledge to reconstruct degraded speech reducing the probability of successfully matching incomplete speech input when compared with adults. Additionally, young children are less able than older children and adults to make use of contextual cues to reconstruct noise-masked words presented in sentential context (Klatte et al., 2013).

FICAN funded a pilot study to assess the relationship between aircraft noise reduction and standardized test scores (Eagan et al., 2004; FICAN, 2007). The study evaluated whether abrupt aircraft noise reduction within classrooms, from either airport closure or sound insulation, was associated with improvements in test scores. Data were collected in 35 public schools near three airports in Illinois and Texas. The study used several noise metrics. These were, however, all computed indoor levels, which makes it hard to compare with the outdoor levels used in most other studies.

The FICAN study found a significant association between noise reduction and a decrease in failure rates for high school students but not middle or elementary school students. There were some weaker associations between noise reduction and an increase in failure rates for middle and elementary schools. Overall, the study found that the associations observed were similar for children with or without learning difficulties and between verbal and math/science tests. As a pilot study, it was not expected to obtain final answers but provided useful indications (FICAN, 2007).

A recent study of the effect of aircraft noise on student learning (Sharp et al., 2014) examined student test scores at a total of 6,198 US elementary schools, 917 of which were exposed to aircraft noise at 46 airports with noise exposures exceeding the 55-dB DNL. The study found small but statistically significant associations between airport noise and student mathematics and reading test scores, after taking demographic and school factors into account. Associations were also observed for ambient noise and total noise on student mathematics and reading test scores, suggesting that noise levels per se, as well as from aircraft, might play a role in student achievement.

As part of the Noise-Related Annoyance, Cognition and Health study conducted at Frankfurt airport, reading tests were conducted on 1,209 school children at 29 primary schools. It was found that there was a small decrease in reading performance that corresponded to a 1-month reading delay; however, a recent study observing children at 11 schools surrounding Los Angeles

International Airport found that the majority of distractions to elementary age students were other students followed by themselves, which includes playing with various items and daydreaming. Less than 1 percent of distractions were caused by traffic noise.

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led WHO and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO, 2000; WHO, 1999). The awareness has also led to the classroom noise standard discussed earlier (ANSI, 2002).

C.2.1.4.5 Noise Effects on Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, have not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci et al. (1988) assert that the consequences that physiological effects may have on behavioral patterns are vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intraspecific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those studies that have focused on the observations of the behavioral effects that jet aircraft and sonic booms have on animals.

A great deal of research was conducted in the 1960s and 1970s on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and as a result of the introduction of supersonic jet aircraft. According to Manci et al. (1988), the foundation of information created from that focus does not necessarily correlate or provide information specific to the impacts to wildlife in areas overflown by aircraft at supersonic speed or at low altitudes. The ability to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci et al., 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on 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. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights.

Secondary effects may include nonauditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects and include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles, 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith et al., 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci et al., 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife “flight” due to noise. Animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith et al., 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci et al., 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature. Some reviewers have indicated that earlier studies, and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau, 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (National Park Service, 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock. This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci et al., 1988).

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects. The relationships between physiological effects and how species interact with their environments have not been thoroughly studied; therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese in one study. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise and sonic booms.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

C.2.2 Noise Models

This section summarizes analysis tools used to calculate the noise levels, as applicable to the Proposed Action evaluated in the EA.

C.2.2.1 NOISEMAP

Analyses of aircraft noise exposure and compatible land uses around DoD airfield-like facilities are normally accomplished using a group of computer-based programs, collectively called NOISEMAP (Czech and Plotkin, 1998; Wasmer and Maunsell, 2024a, 2024b). The core computational program of the NOISEMAP suite is NMAP. In this report NMAP Version 7.3 was used to analyze aircraft operations and to generate noise contours.

C.2.2.2 MR_NMAP

When the aircraft flight tracks are not well defined and are distributed over a wide area, such as in military training routes with wide corridors or MOAs, the Air Force uses the DoD-approved MR_NMAP program (Lucas and Calamia, 1997). In this report, MR_NMAP Version 3.2 (Ikelheimer, 2013) was used to model subsonic aircraft noise in SUA. For airspace environments where noise levels are calculated to be less than 35 dB, noise levels are stated as "<35 dB."

C.2.2.3 Military Training Routes in the Study Area

MTRs that cross the study area under the Vance MOAs, which were modeled as part of the noise analysis, include: SR-235, SR-253 (the reverse of SR-235), IR-175, IR-185 (the reverse of IR-175), IR-145**,** IR-146, VR-119 and VR-138. Aircraft operations and flight conditions for the active MTRs that cross the proposed 1E Low MOA, representing Existing Conditions and the Proposed Action, are shown in **Table C-5**.

These existing and proposed operations along with their associated average airspeeds, power settings, and altitude distributions were the inputs to the MTR noise models.

Table C-5 Existing Annual Flight Operations on MTR Segments Crossing the Vance 1E Low MOA

MTR	Segment	Aircraft	Airfield	Existing Floor (feet)	Existing Ceiling (feet)	Day Operations[1]	Night Operations[2]
IR-175	G-H	T-38C	Vance AFB	500	4,000	136	0
IR-175	G-H	T-1	Vance AFB	500	4,000	4	0
IR-185	B-D	T-38C	Vance AFB	500	4,000	194	0
IR-185	B-D	T-1	Vance AFB	500	4,000	64	0
VR-119	B-C	T-38C	Vance AFB	100	3,000	2	0
VR-119	B-C	T-1	Vance AFB	100	3,000	49	0
VR-119	B-C	T-6	Vance AFB	100	3,000	34	0
VR-119	B-C	F-16C	Tulsa OK ANG	100	3,000	4	0
SR-235	B-C	T-1	Vance AFB	500	N/A	24	0
SR-235	B-C	T-6	Vance AFB	500	N/A	19	0
SR-253	E-F	T-1	Vance AFB	500	N/A	22	0
SR-253	E-F	T-6	Vance AFB	500	N/A	38	0

Notes:
One annual operation is one sortie flying the route.
[1] Day Operations hours are 7:00 a.m. to 10:00 p.m. local
[2] Night Operations hours are 10:00 p.m. to 7:00 a.m. local

C.2.3 References

American Speech-Language-Hearing Association. 2005. *Guidelines for Addressing Acoustics in Educational Settings, ASHA Working Group on Classroom Acoustics*.

ANSI. 1985. *Specification for Sound Level Meters, ANSI S1.4A-1985 Amendment to ANSI S1.4-1983*.

ANSI. 1988. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 1, ANSI S12.9-1988.*

ANSI. 1996. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 4, ANSI S12.9-1996.*

ANSI. 2002. *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, ANSI S12.60-2002.*

ANSI. 2008. *Methods for Estimation of Awakenings with Outdoor Noise Events Heard in Homes, ANSI S12.9-2008/Part6.*

Basner, M., H. Buess, U. Miller, G. Platt, and A. Samuel. 2004. *Aircraft Noise Effects on Sleep: Final Results of DLR Laboratory and Field Studies of 2240 Polysomnographically Recorded Subject Nights.* Internoise 2004, The 33rd International Congress and Exposition on Noise Control Engineering, 22-25 August.

Basner M, U. Muller, and E.M. Elmenhorst. 2011. *Single and Combined Effects of Air, Road, and Rail Traffic Noise on Sleep and Recuperation*. Sleep 2011(34):11–23.

Berglund, B., and T. Lindvall, eds. 1995. *Community Noise*. Jannes Snabbtryck, Stockholm, Sweden.

Bowles, A.E. 1995. *Responses of Wildlife to Noise, In Wildlife and Recreationists: Coexistence through Management and Research*, R.L. Knight and K.J. Gutzwiller, eds. Island Press, Covelo, California, pp. 109-156.

Bradley J.S. 1985. *Uniform Derivation of Optimum Conditions for Speech in Rooms*. National Research Council, Building Research Note, BRN 239, Ottawa, Canada.

Bradley, J.S. 1993. *NRC-CNRC NEF Validation Study: Review of Aircraft Noise and its Effects*. National Research Council Canada and Transport Canada, Contract Report A-1505.5.

Bronzaft, A.L., and D.P. McCarthy. 1975. *The Effects of Elevated Train Noise on Reading Ability*. Journal Environment and Behavior 7:517-527.

Clark, C., R. Crombie, J. Head, I. van Kamp, E. van Kempen, and S.A. Stansfeld. 2012. *Does Traffic-Related Air Pollution Explain Associations of Aircraft and Road Traffic Noise Exposure on Children's Health and Cognition?* A Secondary Analysis of the United

Kingdom Sample from the RANCH Project. American Journal of Epidemiology 176(4):327–337.

Clark, C., R. Martin, E. van Kempen, T. Alfred, J. Head, H.W. Davies, M.M. Haines, I.L. Barrio, M. Matheson, and S.A. Stansfeld. 2005. *Exposure-Effect Relations Between Aircraft and Road Traffic Noise Exposure at School and Reading Comprehension: the RANCH Project*. American Journal of Epidemiology 163:27-37.

Clark, C., S.A. Stansfeld, and J. Head. 2009. *The Long-Term Effects of Aircraft Noise Exposure on Children's Cognition: Findings from the UK RANCH Follow-Up Study*. In Proceedings of the Euronoise Conference. Edinburgh, Scotland. October.

Cohen, S., D.C. Glass, and J.E. Singer. 1973. *Apartment Noise, Auditory Discrimination, and Reading Ability in Children*. Journal of Experimental Social Psychology 9:407-422.

Cohen, S., G.W. Evans, D.S. Krantz. 1980. *Physiological, Motivational, and Cognitive Effects of Aircraft Noise on Children: Moving from Laboratory to Field*. American Psychologist 35:231-243.

Cohen, S., G.W. Evans, D.S. Krantz. 1981. *Aircraft Noise and Children: Longitudinal and Cross-sectional Evidence on Adaptation to Noise and the Effectiveness of Noise Abatement*. Journal of Personality and Social Psychology 40:331-345.

Cottereau, P. 1978. *The Effect of Sonic Boom from Aircraft on Wildlife and Animal Husbandry, In Effects of Noise on Wildlife*, Academic Press, New York, New York, pp. 63-79.

Czech, J.J., and K.J. Plotkin. 1998. NMAP 7.0 User’s Manual. Wyle Research Report WR 98-13. Wyle Laboratories, Inc. November.

DoD. 2009a. *Improving Aviation Noise Planning, Analysis, and Public Communication with Supplemental Metrics*. Defense Noise Working Group Technical Bulletin, December.

DoD. 2009b. *Sleep Disturbance from Aviation Noise*. Defense Noise Working Group Technical Bulletin, December.

Eagan, M.E., G. Anderson, B. Nicholas, R. Horonjeff, and T. Tivnan. 2004. *Relation Between Aircraft Noise Reduction in Schools and Standardized Test Scores*. Washington, DC, FICAN.

Evans, G.W., M. Bullinger, and S. Hygge. 1998. *Chronic Noise Exposure and Physiological Response: A Prospective Study of Children Living under Environmental Stress*. Psychological Science 9:75-77.

FAA. 1985. *Airport Improvement Program (AIP) Handbook*. Order No. 100.38.

FICAN. 1997. *Effects of Aviation Noise on Awakenings from Sleep*. June.

FICAN. 2007. *Findings of the FICAN Pilot Study on the Relationship Between Aircraft Noise Reduction and Changes in Standardised Test Scores*. Washington, DC, FICAN.

FICAN. 2008. *FICAN Recommendation for use of ANSI Standard to Predict Awakenings from Aircraft Noise*. December.

FICON. 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*. August.

Fidell, S., and L. Silvati. 2004. *Parsimonious Alternatives to Regression Analysis for Characterizing Prevalence Rates of Aircraft Noise Annoyance.* Noise Control Engineering Journal 52:56–68.

Fidell, S., K. Pearsons, B. Tabachnick, R. Howe, L. Silvati, and D.S. Barber. 1995a. *Field Study of Noise-Induced Sleep Disturbance*. Journal of the Acoustical Society of America 98(2):1025-1033.

Fidell, S., K. Pearsons, R. Howe, B. Tabachnick, L. Silvati, and D.S. Barber. 1994. *Noise-Induced Sleep Disturbance in Residential Settings*. AL/OE-TR-1994-0131, Wright Patterson AFB, OH, Armstrong Laboratory, Occupational and Environmental Health Division.

Fidell, S., R. Howe, B. Tabachnick, K. Pearsons, and M. Sneddon. 1995b. *Noise-induced Sleep Disturbance in Residences near Two Civil Airports*. NASA Contractor Report 198252.

Finegold, L.S., C.S. Harris, and H.E. von Gierke. 1994. *Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impact of General Transportation Noise on People*. Noise Control Engineering Journal 42(1):25-30.

Green, K.B., B.S. Pasternack, and R.E. Shore. 1982. *Effects of Aircraft Noise on Reading Ability of School-Age Children*. Archives of Environmental Health 37(1):24-31.

Griefahn, B. 1978. *Research on Noise Disturbed Sleep Since 1973*. Proceedings of Third International Congress on Noise as a Public Health Problem, pp. 377-390 (as appears in NRC-CNRC NEF Validation Study: (2) Review of Aircraft Noise and Its Effects, A-1505.1, p. 31).

Haines, M.M., S.A. Stansfeld, J. Head, and R.F.S. Job. 2002. *Multilevel Modelling of Aircraft Noise on Performance Tests in Schools around Heathrow Airport London*. Journal of Epidemiology and Community Health 56:139-144.

Harris, C.M. 1979. *Handbook of Noise Control*. McGraw-Hill Book Co.

Horne, J.A., F.L. Pankhurst, L.A. Reyner, K. Hume, and I.D. Diamond. 1994. *A Field Study of Sleep Disturbance: Effects of Aircraft Noise and Other Factors on 5,742 Nights of Actimetrically Monitored Sleep in a Large Subject Sample*. American Sleep Disorders Association and Sleep Research Society: Sleep 17(2):146–195.

Ikelheimer, B. and M. Downing. 2013. MR_NMap Noise Model Improvements. Blue Ridge Research and Consulting Technical Report. 26 August.

Klatte M., K. Bergström, and T. Lachmann. 2013. *Does Noise Affect Learning? A Short Review on Noise Effects on Cognitive Performance in Children.* Frontiers in Psychology 4:578.

Lazarus, H. 1990. *New Methods for Describing and Assessing Direct Speech Communication Under Disturbing Conditions*. Environment International 16:373-392.

Lercher, P., G.W. Evans, and M. Meis. 2003. *Ambient Noise and Cognitive Processes Among Primary School Children.* Journal of Environment and Behavior 35:725-735.

Lind, S.J., K. Pearsons, and S. Fidell. 1998. *Sound Insulation Requirements for Mitigation of Aircraft Noise Impact on Highline School District Facilities*. Volume I, BBN Systems and Technologies, BBN Report No. 8240.

Lukas, J.S. 1978. *Noise and Sleep: A Literature Review and a Proposed Criterion for Assessing Effect*, In Daryl N. May, ed., *Handbook of Noise Assessment*, Van Nostrand Reinhold Company: New York, pp. 313-334.

Lucas, M.J., and P.T. Calamia. 1997. *Military Operating Area and Range Noise Model MR_NMAP User's Manual.* Wyle Research Report WR 94-12-R. Wyle Laboratories, Inc. March.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G Cavendish. 1988. *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*. US Fish and Wildlife Service National Ecology Research Center, Ft. Collins, CO, NERC-88/29. 88 pp.

Márki, F. 2013. *Outcomes of EU COSMA (Community Oriented Solutions to Minimise Aircraft Noise Annoyance) Project.* Budapest University of Technology and Economics, London, May.

Miedema, H.M., and C.G. Oudshoorn. 2001. *Annoyance from Transportation Noise: Relationships with Exposure Metrics DNL and DENL and Their Confidence Intervals*. Environmental Health Perspectives 109.4:409–416.

Miedema, H.M., and H. Vos. 1998. *Exposure-Response Relationships for Transportation Noise*. Journal of the Acoustical Society of America 104(6):3432–3445. December.

National Park Service. 1994. *Report to Congress: Report on Effects of Aircraft Overflights on the National Park System*. Prepared Pursuant to Public Law 100-91, The National Parks Overflights Act of 1987. 12 September.

NATO. 2000. *The Effects of Noise from Weapons and Sonic Booms, and the Impact on Humans, Wildlife, Domestic Animals and Structures*. Final Report of the Working Group Study Follow up Program to the Pilot Study on Aircraft Noise, Report No. 241, June.

Newman, J.S., and K.R. Beattie. 1985. *Aviation Noise Effects*. US Department of Transportation, Federal Aviation Administration Report No. FAA-EE-85-2.

Ollerhead, J.B., C.J. Jones, R.E. Cadoux, A. Woodley, B.J. Atkinson, J.A. Horne, F. Pankhurst, L. Reyner, K.I. Hume, F. Van, A. Watson, I.D. Diamond, P. Egger, D. Holmes, and J. McKean. 1992. *Report of a Field Study of Aircraft Noise and Sleep Disturbance*. Commissioned by the UK Department of Transport for the 36 UK Department of Safety, Environment and Engineering, London, England: Civil Aviation Authority, December.

Pearsons, K.S., D.S. Barber, and B.G. Tabachnick. 1989. *Analyses of the Predictability of Noise-Induced Sleep Disturbance*. US Air Force Report HSD-TR-89-029, October.

Plotkin, K.J., B.H. Sharp, T. Connor, R. Bassarab, I. Flindell, and D. Schreckenberg. 2011. *Updating and Supplementing the Day-Night Average Sound Level (DNL)*. Wyle Report 11-04, DOT/FAA/AEE/2011-03, June.

Rosenblith, W.A., K.N. Stevens, and Staff of Bolt, Beranek, and Newman. 1953. Handbook of Acoustic Noise Control, Vol. 2, Noise and Man. US Air Force Report WADC TR-52-204.

Schreckenberg, D. and R. Schuemer. 2010. *The Impact of Acoustical, Operational and Non-Auditory Factors on Short-Term Annoyance Due to Aircraft Noise*. Inter Noise 2010; Noise and Sustainability. 13 - 16 June 2010, Lisbon, Portugal.

Schultz, T.J. 1978. *Synthesis of Social Surveys on Noise Annoyance*. Journal of the Acoustical Society of America 64(2):377-405. August.

Sharp, B., T. Connor, D. McLaughlin, C. Clark, S. Stansfeld and J. Hervey. 2014. *Assessing Aircraft Noise Conditions Affecting Student Learning*, ACRP Web Document 16, http://www.trb.org/Aviation1/

Sharp, B.H., and K.J. Plotkin. 1984. *Selection of Noise Criteria for School Classrooms*. Wyle Research Technical Note TN 84-2 for the Port Authority of New York and New Jersey, October.

Smith, D.G., D.H. Ellis, and T.H. Johnston. 1988. *Raptors and Aircraft*, In R.L Glinski, B. Gron-Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, and S.W. Hoffman, eds., Proceedings of the Southwest Raptor Management Symposium, National Wildlife Federation, Washington, D.C., pp. 360-367.

Stansfeld, S.A. and C. Clark. 2015. *Health Effects of Noise Exposure in Children*. Current Environmental Health Reports 2(2):171-178.

Stansfeld, S.A., B. Berglund, and C. Clark, I. Lopez-Barrio, P. Fischer, E. Öhrström, M.M. Haines, J. Head, S. Hygge, and I. van Kamp, B.F. Berry, on Behalf of the RANCH Study Team. 2005. *Aircraft and Road Traffic Noise and Children's Cognition and Health: A Cross-National Study.* Lancet 365:1942-1949.

Stevens, K.N., W.A. Rosenblith, and R.H. Bolt. 1953. *Neighborhood Reaction to Noise: A Survey and Correlation of Case Histories (A).* Journal of the Acoustical Society of America 25:833.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. *The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Home Experiment.* Wyle Laboratories Research Report WR 92-3, March.

UKDfES. 2003. *Building Bulletin 93, Acoustic Design of Schools - A Design Guide.* London: The Stationary Office.

USEPA. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. USEPA Report 550/9 74-004, March.

USEPA. 1978. *Protective Noise Levels*. Office of Noise Abatement and Control, Washington, DC. USEPA Report 550/9-79-100, November.

Wasmer, F. and F. Maunsell. 2024a. BaseOps 7.369 User’s Guide. Wasmer Consulting.

Wasmer, F. and F. Maunsell. 2024b. NMPlot 4.974 User’s Guide. Wasmer Consulting.

Wesler, J.E. 1986. *Priority Selection of Schools for Soundproofing.* Wyle Research Technical Note TN 96 8 for the Port Authority of New York and New Jersey, October.

WHO. 1999. *Guidelines for Community Noise*. Berglund, B., T. Lindvall, and D. Schwela, eds.

Wyle Laboratories. 1971. *Supporting Information for the Adopted Noise Regulations for California Airports*. Wyle Report WCR 70-3(R)

C.3 Air Quality

Air quality is an indicator of the suitability of the atmosphere to support human life and the environment, generally described in terms of the types and levels of air pollutants present in outdoor air. This appendix presents an overview of the Clean Air Act (CAA) and the relevant air quality regulations or standards pertaining to Oklahoma and Kansas. It also presents emissions calculations and key assumptions used for the air quality analyses presented in the Air Quality sections of this EA.

C.3.1 Criteria Pollutants and National Ambient Air Quality Standards

The CAA directed the USEPA to develop, implement, and enforce strong environmental regulations that would ensure clean and healthy ambient air quality. To protect public health and welfare, the USEPA developed numerical concentration-based standards, National Ambient Air Quality Standards (NAAQS), for pollutants that have been determined to impact human health and the environment and established both primary and secondary NAAQS under the provisions of the CAA. NAAQS are currently established for six criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulates equal to or less than 10 microns in diameter (PM_{10}) and particulates equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb).

The USEPA has divided the country into geographical regions known as Air Quality Control Regions (AQCRs) to evaluate compliance with the NAAQS. In accordance with CAA requirements, the air quality in the AQCR is measured by the concentration of various pollutants in the atmosphere. Measurements of these “criteria pollutants” in ambient air are expressed in units of parts per million or in units of micrograms per cubic meter. Regional air quality is a result of the types and quantities of atmospheric pollutants and pollutant sources in an area as well as surface topography, the size of the “air basin,” and prevailing meteorological conditions.

The primary NAAQS represent maximum levels of background air pollution that are considered safe, with an adequate margin of safety to protect public health. Secondary NAAQS represent the maximum pollutant concentration necessary to protect vegetation, crops, and other public resources in addition to maintaining visibility standards. The primary and secondary NAAQS are presented in **Table C-9**.

The criteria pollutant O_3 is not usually emitted directly into the air but is formed in the atmosphere by photochemical reactions involving sunlight and previously emitted pollutants, or “O_3 precursors.” These O_3 precursors consist primarily of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) that are directly emitted from a wide range of emissions sources. For this reason, regulatory agencies limit atmospheric O_3 concentrations by controlling VOC pollutants (also identified as reactive organic gases) and NO_x.

The USEPA has recognized that particulate matter emissions can have different health affects depending on particle size and, therefore, developed separate NAAQS for coarse particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). The pollutant $PM_{2.5}$ can be emitted from emission sources directly as very fine dust and/or liquid mist or formed secondarily in the atmosphere as condensable particulate matter, typically forming nitrate and sulfate compounds. Ammonia (NH_3), for example, is evaluated as a precursor of $PM_{2.5}$. Secondary (indirect) emissions vary by region depending upon the predominant emission sources located there and thus, precursors considered significant for $PM_{2.5}$ formation are identified for ultimate control.

Table C-6 National Ambient Air Quality Standards

Pollutant	Standard Value [6]		Standard Type
Carbon Monoxide (CO)			
8-hour average	9 ppm	(10 mg/m^3)	Primary
1-hour average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual arithmetic mean	0.053 ppm	(100 µg/m^3)	Primary and Secondary
1-hour average [1]	0.100 ppm	(188 µg/m^3)	Primary
Ozone (O_3)			
8-hour average [2]	0.070 ppm	(137 µg/m^3)	Primary and Secondary
Lead (Pb)			
3-month average [3]		0.15 µg/m^3	Primary and Secondary
Particulate <10 Micrometers (PM_{10})			
24-hour average [4]		150 µg/m^3	Primary and Secondary
Particulate <2.5 Micrometers ($PM_{2.5}$)			
Annual arithmetic mean [4]		12 µg/m^3	Primary
Annual arithmetic mean [4]		15 µg/m^3	Secondary
24-hour average[4]		35 µg/m^3	Primary and Secondary
Sulfur Dioxide (SO_2)			
1-hour average [5]	0.075 ppm	(196 µg/m^3)	Primary
3-hour average [5]	0.5 ppm	(1,300 µg/m^3)	Secondary

Notes:

Source: USEPA, 2023a

[1] In February 2010, the USEPA established a new 1-hour standard for NO_2 at a level of 0.100 ppm, based on the 3-year average of the 98th percentile of the yearly distribution concentration, to supplement the then-existing annual standard.

[2] In October 2015, the USEPA revised the level of the 8-hour standard to 0.070 ppm, based on the annual 4th highest daily maximum concentration, averaged over 3 years; the regulation became effective on 28 December 2015. The previous (2008) standard of 0.075 ppm remains in effect for some areas. A 1-hour standard no longer exists.

[3] In November 2008, USEPA revised the primary Pb standard to 0.15 µg/m^3. USEPA revised the averaging time to a rolling 3-month average.

[4] In October 2006, USEPA revised the level of the 24-hour $PM_{2.5}$ standard to 35 µg/m^3 and retained the level of the annual $PM_{2.5}$ standard at 15 µg/m^3. In 2012, USEPA split standards for primary & secondary annual $PM_{2.5}$. All are averaged over 3 years, with the 24-hour average determined at the 98th percentile for the 24-hour standard. USEPA retained the 24-hour primary standard and revoked the annual primary standard for PM_{10}.

[5] In 2012, the USEPA retained a secondary 3-hour standard, which is not to be exceeded more than once per year. In June 2010, USEPA established a new 1-hour SO_2 standard at a level of 75 parts per billion, based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

[6] Parenthetical value is an approximately equivalent concentration for NO_2, O_3, and SO_2.

µg/m^3 = microgram(s) per cubic meter; mg/m^3 = milligram(s) per cubic meter; ppm = part(s) per million; USEPA = United States Environmental Protection Agency

The CAA and USEPA delegated responsibility for ensuring compliance with NAAQS to the states and local agencies. As such, each state must develop air pollutant control programs and promulgate regulations and rules that focus on meeting NAAQS and maintaining healthy ambient air quality levels.

The Proposed Action would be located in the airspace over Kansas and Oklahoma. The Air Quality Division of the Oklahoma Department of Environmental Quality (ODEQ) in Oklahoma oversees the state's air pollution control program under the authority of the federal CAA and Amendments, federal regulations, and state laws. The ODEQ has primary responsibility and authority to prepare and implement Oklahoma's air quality management plan under the Oklahoma Environmental Quality Act and the Oklahoma Clean Air Act (27A O.S. §§ 2-1-101 et seq.). The Kansas Department of Health and Environment (KDHE) Bureau of Air is responsible for implementing and enforcing air quality regulations in Kansas, and the Bureau of Air has adopted most of the EPA's air regulations by reference. Kansas air quality rules are codified in the Kansas Air Quality Regulations (K.A.R. 28-19), the Kansas Air Quality Act (K.S.A. 65-30), and federal regulations.

Each AQCR has regulatory areas that are designated as an attainment area or nonattainment area for each of the criteria pollutants depending on whether it meets or exceeds the NAAQS. Areas designated as "attainment" have demonstrated compliance with NAAQS. An area is designated as unclassified if there is insufficient information for a compliance determination. Maintenance areas are those that were previously designated nonattainment but are now in compliance with the NAAQS. When a region or area fails to meet a NAAQS for a pollutant, that region is classified as "non-attainment" for that pollutant. In such cases the affected State must develop a State Implementation Plan (SIP) that is subject to USEPA review and approval. A SIP is a compilation of regulations, strategies, schedules, and enforcement actions designed to move the state into compliance with all NAAQS. Any changes to the compliance schedule or plan (e.g., new regulations, emissions budgets, controls) must be incorporated into the SIP and approved by USEPA.

The air quality ROI consists of the four Oklahoma and Kansas counties that underlie the Vance 1A, 1C, and 1D MOAs and the AQCRs that contain these counties. Alfalfa and Wood Counties in Oklahoma are in Northwestern Oklahoma Intrastate AQCR, Barber County in Kansas is in the Southwest Kansas Intrastate AQCR, and Harper County also in Kansas is in South Central Kansas Intrastate. These counties and associated AQCRs are in attainment (or are unclassifiable) for each of the criteria pollutants regulated under the NAAQS (40 CFR §§ 81.337, 81.317). There are no mandatory Federal Class I sites located in the region near these counties (40 CFR § 81.424) where visibility would be a concern. As such the areas within the ROI are anticipated to have relatively good air quality (currently not in near-nonattainment or maintenance for any criteria pollutants).

For determining potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 feet AGL) and coinciding with the spatial distribution of the ROIs that is considered. Because the Proposed Action is intended entirely in airspaces, and not at airfields, this impact analysis does not include landing and takeoff (LTO) and touch and go (TGO) cycles. Also not considered in the air quality analysis are the ground support and fueling activities that take place at the airfield, or personnel commutes.

State Implementation Program

Each state is required to develop a SIP that sets forth how CAA provisions will be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is twofold. First, it must provide a control strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area. Maintenance areas are subject to a maintenance plan to ensure that compliance is maintained. To demonstrate progress toward attainment or maintenance status, the Air Quality Monitoring Program monitors ambient air throughout the state. The purpose is to monitor, assess, and provide information on statewide ambient air quality conditions and trends. Air monitoring stations collect representative data that indicates how much of a pollutant is in the air. Ambient (outdoor) air pollution monitors consist of over 20 monitoring stations across Oklahoma that measure criteria pollutant concentrations, most stations being clustered around Tulsa and Oklahoma City (Oklahoma DEQ, 2023). Oklahoma currently is in attainment with all NAAQS and is not under a SIP Maintenance Plan. Similarly, the Kansas Ambient Air Monitoring Network consists of 16 sites throughout Kansas that measure criteria pollutant concentrations (KDHE, 2024) that satisfy many purposes, including monitoring compliance with the NAAQS, determining pollution trends, and establishing background conditions. The Kansas air monitoring network includes two monitoring sites specifically for the protection of visibility in Class I areas. Kansas currently is in attainment with all NAAQS, except for the 2008 lead standard. Portions of Saline County, Kansas, exceed the federal lead standard resulting in nonattainment designation for lead (USEPA, 2025).

Conformity Rules

The CAA required the USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas. These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. The General Conformity Rule and the promulgated regulations found in 40 CFR Part 93, exempt certain federal actions from conformity determinations (e.g., contaminated site cleanup and natural disaster response activities). Other federal actions are assumed to conform if total indirect and direct project emissions are below *de minimis* levels presented in 40 CFR § 93.153. The threshold levels (in tons of pollutant per year) depend upon the nonattainment status that USEPA has assigned to a region. Once the net change in nonattainment pollutants is calculated, the federal agency must compare them to the *de minimis* thresholds. The General Conformity Rule would not apply to this Proposed Action because the ROI that includes the multiple counties underlying the proposed Vance 1E MOA is in attainment with the NAAQS for all criteria pollutants.

New Source Performance Standards

Title I of the CAA Amendments of 1990 requires the federal government to reduce emissions from cars, trucks, and buses; from consumer products such as hair spray and window-washing compounds; and from ships and barges during the loading and unloading of petroleum products to address urban air pollution problems of O_3, CO, and PM_{10}. Under Title I, the federal government develops the technical guidance that states need to control stationary sources of pollutants. For stationary sources, the CAA establishes New Source Performance Standards for specific source categories. Standards and compliance requirements are listed in Title 40 CFR Parts 60 - 61. Title V of the CAA Amendments of 1990 requires state and local agencies to implement permitting programs for major stationary sources. A major stationary source is a facility (plant, base, activity, etc.) that has the potential to emit more than 100 tons annually of any one criteria air pollutant in an attainment area. The proposed operations within the airspace are classified as mobile source of emissions. As such, the requirements originating from Titles I and V are applicable only to stationary sources and would not apply for the proposed airspace operations.

Prevention of Significant Deterioration

Prevention of Significant Deterioration (PSD) applies to new major sources or major modifications at existing sources for pollutants where the area the source is located is in attainment or unclassifiable with the NAAQS (USEPA, 2023b). The rule is to ensure that these sources are constructed or modified without causing significant adverse deterioration of the clean air in the area. Sources subject to PSD review are required to obtain a permit before commencing construction. The permit process requires an extensive air quality review of all other major sources within a 50-mile radius and all Class 1 areas within a 62-mile radius of the facility. Emissions from any new or modified source must be controlled using the maximum degree of control that can be achieved. The air quality, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increase as specified in the regulations. The rule also provides special protections for specific national parks or wilderness areas, known as Mandatory Federal Class 1 Areas (40 CFR Part 81), where any appreciable deterioration in air quality is considered significant. Class 1 areas are given special air quality and visibility protection under the CAA. PSD regulations also define air pollutant emissions from proposed major stationary sources or modifications to be “significant” if a proposed project’s net emission increase meets or exceeds the rate of emissions listed in 40 CFR § 52.21(b)(23)(i); or a proposed project is within 10 miles of any Class 1 area (wilderness area greater than 5,000 acres or national park greater than 6,000 acres). The goals of the PSD program are to (1) ensure economic growth while preserving existing air quality; (2) protect public health and welfare from adverse effects that might occur even at pollutant levels better than the NAAQS; and (3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas.

The proposed Vance 1E MOA is not located within 100 kilometers (62 miles) of any USEPA-designated Class 1 areas protected by the Regional Haze Rule. No Class 1 areas would be affected by emissions associated with the Proposed Action. The designated Class 1 area in Oklahoma, Wichita Mountains Wilderness comprising of 8,900 acres (40 CFR Part 81.424), is approximately

190 miles from the ROI and would not be affected by emissions associated with the Proposed Action.

There are no major sources associated with the Proposed Action; thus, PSD does not apply. Mobile sources, including those from aircraft emissions are generally not part of the PSD permit review process.

C.3.1 Greenhouse Gases

Greenhouse gases (GHGs) are gases, occurring from natural processes and human activities, that trap heat in the atmosphere. Natural sources of GHGs include land use, such as through deforestation, land clearing for agriculture, and degradation of soils. The largest source of GHGs from human activities in the United States is from burning fossil fuels for electricity, heat, and transportation. Combustion of fossil fuels (coal, oil, and natural gas) primarily generate three main GHGs: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). These three GHGs alone represent more than 97 percent of the United States' total GHG emissions (USEPA, 2024).

Emissions from GHG are expressed in terms of the carbon dioxide equivalent emissions (CO_2e), which is a measure used to compare the emissions from various GHGs based on their Global Warming Potential (GWP). The GWP is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2. The larger the GWP, the more that a given gas warms the Earth compared with CO_2 over the same time period. Analysts cumulatively compare emission estimates of different gases using standardized GWPs.

C.3.2 Air Conformity Applicability Analysis

Section 176(c) (1) of the CAA contains legislation that ensures federal activities conform to relevant SIPs and thus do not hamper local efforts to control air pollution. Conformity to a SIP is defined as conformity to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. As such, a general conformity analysis is required for areas of nonattainment or maintenance where a federal action is proposed.

The action can be shown to conform by demonstrating that the total direct and indirect emissions are below the *de minimis* levels **(Table C-10)**, and/or showing that the Proposed Action emissions are within the State- or Tribe-approved budget of the facility as part of the SIP or Tribal Implementation Plan (USEPA, 2010).

Direct emissions are those that occur as a direct result of the action. For example, emissions from new equipment that are a permanent component of the completed action (e.g., boilers, heaters, generators, paint booths) are considered direct emissions. Indirect emissions are those that occur at a later time or at a distance from the Proposed Action. For example, increased vehicular/commuter traffic because of the action is considered an indirect emission. Construction emissions must also be considered. For example, the emissions from vehicles and equipment used to clear and grade building sites, build new buildings, and construct new roads must be evaluated. These types of emissions are considered direct emissions.

Table C-7 General Conformity Rule De Minimis Emission Thresholds

Pollutant	Attainment Classification	Tons per year
Ozone (VOC and NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_x)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
CO, SO_2 and NO_2	All nonattainment and maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$ Direct emissions, SO_2, NO_x (unless determined not to be a significant precursor), VOC and ammonia (if determined to be significant precursors)	All nonattainment and maintenance	100
Lead	All nonattainment and maintenance	25

Source: USEPA, 2022

C.3.3 Significance Indicators and Evaluation Criteria

The CAA Section 176(c), *General Conformity*, requires federal agencies to demonstrate that their proposed activities would conform to the applicable SIP for attainment of the NAAQS. General conformity applies only to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual *de minimis* thresholds identified in the rule, a formal conformity determination is required of that action. The thresholds are more restrictive as the severity of the nonattainment status of the region increases. The Council on Environmental Quality defines significance in terms of context and intensity in 40 CFR § 1508.27. This requires that the significance of the action be analyzed with respect to the setting of the Proposed Action and based relative to the severity of the impact. The Council on Environmental Quality National Environmental Policy Act regulations (40 CFR § 1508.27[b]) provide 10 key factors to consider in determining an impact's intensity.

For air quality impact analysis, project criteria pollutant emissions were compared against the insignificance indicator of 250 tons per year (tpy) for Prevention of Significant Deterioration (PSD) major source permitting threshold for actions occurring in areas that are in attainment for all criteria pollutants (25 tpy for lead). These "Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the NAAQS. These insignificance indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for each criteria pollutant is considered so insignificant that the action would not cause or contribute to an exceedance on one or more NAAQSs. Although PSD and Title V are not applicable to mobile sources, the PSD major source thresholds provide a benchmark to compare air emissions against and to determine project impacts.

For a Proposed Action that would occur in nonattainment/maintenance areas, the net-change emissions estimated for the relevant criteria pollutant(s) are compared against General Conformity *de minimis* values to perform a General Conformity evaluation. If the estimated annual net emissions for each relevant pollutant from the Proposed Action are below the corresponding *de minimis* threshold values, General Conformity Rule requirements would not be applicable. The net emissions from the Proposed Action Alternatives are assessed in the EA and compared with applicable insignificance indicators.

GHG

The Air Conformity Applicability Model (ACAM) version 5.0.23a (ACAM, 2023) was used to evaluate GHG emissions.

A GHG Emissions Evaluation establishes the quantity of speciated GHGs and CO_2e, determines if an action's emissions are insignificant, and provides a relative significance comparison. For the analysis, the PSD threshold for GHG of 75,000 tpy of CO_2e (or 68,039 metric tpy) was used as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; however, it provides a threshold to identify actions that are insignificant (*de minimis*, too trivial or minor to merit consideration). Actions with a net change in GHG (CO_2e) emissions below the insignificance indicator (threshold) are considered too insignificant on a global scale to warrant any further analysis. Note that actions with a net change in GHG (CO_2e) emissions above the insignificance indicator (threshold) are only considered potentially significant and require further assessment to determine if the action poses a significant impact. The action related GHGs have no significant impact to local air quality. However, from a global perspective, individual actions with GHG emissions each make a relatively small addition to global atmospheric GHG concentrations. If activities have *de minimis* (insignificant) GHG emissions, then on a global scale they are effectively zero and irrelevant.

C.3.4 Emissions Calculations and Assumptions

The following assumptions were used in the air quality analysis for the Proposed Action:

1. No construction would be associated with the Proposed Action. This includes no demolition, earth moving, hauling, or paving.

2. The Proposed Action would not require changes to the number of personnel or to the number or types of aircraft assigned to Vance AFB, or changes to the existing boundaries of that or any other DoD or DAF installation.
3. For the purposes of ACAM, aircraft flight operations in the proposed new airspace were assumed to start January 2026. Emissions were estimated for the Proposed Action in ACAM beginning January 1, 2026, with 2027 and beyond being considered "steady state".
4. Potential impacts on air quality from the Proposed Action would be assumed to be associated with the operation of T-38Cs and F-16Cs in the proposed new Vance 1E Low MOA starting January 2026 and operating indefinitely.
5. The assessment of cumulative impacts on air quality assessment considers emissions associated with the proposed basing and operation of the T-7A aircraft at Vance AFB and use in the proposed Vance 1E Low MOA. The cumulative impact analysis assumes that the proposed basing of T-7As at Vance AFB, if selected for implementation, would begin January 1, 2032; T-38Cs would end operations by December 31, 2031 (**AETC, 2024**).
6. Net change in annual operational emissions for the proposed alternatives were estimated in ACAM by adding or removing activities related to Vance 1E Low MOA operations, as necessary. The total estimated net change in emissions calculated in ACAM is used for analyzing air quality impacts for the proposed alternatives.
7. Mixing height of 3,000 feet (this matches USEPA and DAF Guidance) was assumed. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 feet AGL) and coinciding with the spatial distribution of the region of influence that is considered. Pollutants that are released above the mixing height typically would not disperse downward and thus would have little or no effect on ground level concentrations of pollutants. The mixing height is the altitude at which the lower atmosphere undergoes mechanical or turbulent mixing, producing a nearly uniform air mass. The height of the mixing level determines the volume of air within which pollutants can disperse. Mixing heights at any one location or region can vary by the season and time of day, but for air quality applications an average mixing height of 3,000 feet AGL is an acceptable default value (40 CFR § 93.153[c][2]).
8. Flights traveling to and from the Vance 1E Low MOA airspace are assumed to operate at altitudes above mixing height of 3,000 feet AGL and are thus not considered in the analyses.
9. Aircraft emissions at or below 3,000 feet AGL do not appreciably differ by altitude. In other words, the emissions rate at 3,000 feet AGL is assumed to be the same as that at 500 feet AGL. Moreover, ACAM does not distinguish between aircraft operations at different altitudes.
10. To represent the time spent at or below 3,000 feet, time spent in minutes for each airspace was assigned to Climb out/Intermediate power mode within the Low Fight Patterns (LFP) Flight Operations activity input field in ACAM. No time was assigned to any other power modes, but default ACAM output also lists trim tests and TGOs; however, all inputs for these fields were set to zero for time spent within the airspace.
11. The projected number of aircraft and aircraft operations and time in airspace is based on information in the data validation package prepared for the noise analysis (KBR, 2024).

12. Air quality analyses for flight operations was performed using operational data collected and compiled by the noise team for the airspace flight operations (0 to 3,000 feet AGL). Data were provided for annual operations by altitude band, engine power, airspeed, and time in minutes and percent time spent in airspace. Based on this information, ACAM input data for the total number of sorties and estimated total time spent at or below 3,000 feet AGL were estimated and are as shown in **Table C-11**.

13. ACAM can only be used to estimate emissions from a Proposed Action in one state at a time. Thus, ACAM was run separately for each of the Alternatives for each of the two states - Kansas and Oklahoma. For GHG analysis, the most conservative relative significance values estimated by ACAM is reported. Note, pollutant emissions would be the same regardless of the state used for emissions estimation. The difference is only in the total GHG emissions between Kansas and Oklahoma.

14. None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares).

Table C-8 Air Conformity Applicability Model Data Inputs for Vance 1E Low MOA

Airspace Type	Aircraft Type	Number of Sorties Per Year	Type of Operation	Estimated Time Spent At or Below 3,000 feet AGL Per Sortie (minutes)[4]
Existing Conditions: Vance 1A, 1C, and 1D MOAs	T-38C	N/A[1]	All Sorties ≥3,000 feet AGL	N/A[1]
	F-16C	N/A[1]	All Sorties ≥3,000 feet AGL	
Alternative 1: Vance 1E Low MOA	T-38C	1,170	Sorties at ≤3,000 feet AGL	31.9
	F-16C	288	Sorties at ≤3,000 feet AGL	22.8
Reasonably Foreseeable Future Action (T-7A Basing Operations)	T-38C	1,170[2]	Sorties at ≤3,000 feet AGL	31.9
	F-16C	288	Sorties at ≤3,000 feet AGL	22.8
	T-7A	1,170[3]	Sorties at ≤3,000 feet AGL	31.9

Notes:
[1] Sorties occur above the atmospheric mixing height. Aircraft operations below 8,000 ft MSL are not currently permitted in the current Vance Airspace Complex. No emissions are required to be calculated.
[2] Number of sorties per year from the complete phase-out of T38C aircraft by December 2031.
[3] Number of sorties per year from the implementation of proposed T-7A operations beginning in January 2032.
[4] Time estimated per sortie is based on noise data provided.

C.3.5 References

ACAM. 2023. Air Conformity Applicability Model. Air Impact Modeling Software by Solutio Environmental, Inc. for U.S. Air Force Civil Engineering Center (AFCEC/CZTQ), Version 5.0.23a, 2023.

AETC. 2024. *USAF/AETC e-mail correspondence from USAF/AETC* from Victoria Hernandez, dated Monday, December 2, 2024.

AFCEC. 2023. Air Force Civil Engineer Center. Compliance Technical Support Branch (CZTQ). *DAF Greenhouse Gas (GHG) & Climate Change Assessment Guide*. December. https://www.aqhelp.com/AQdocs.html. Accessed January 2024.

Air Force. 2020. Air Force Air Quality EIAP Guide, Volume II - Advanced Assessments. July.

DAF. 2022. Department of the Air Force. *JBSA T-7A Recapitalization Final Environmental Impact Statement*. https://jbsa.t-7anepadocuments.com/documents. Accessed July 3, 2023.

KDHE. 2024. Kansas Department of Health and Environment. *2024 Ambient Air Monitoring Network Plan*. July. https://www.kdhe.ks.gov/ArchiveCenter/ViewFile/Item/2966. Accessed February 26, 2025.

ODEQ. 2023. Oklahoma Department of Environmental Quality. *Air Data Report 2023*. https://www.deq.ok.gov/wpcontent/uploads/airdivision/Monitoring_Air_Data_Report_2023.pdf. Accessed February 26, 2025.

USEPA. 2010. U.S. Environmental Protection Agency. *40 CFR Parts 51 and 93, Revisions to the General Conformity Regulations*. 75 Federal Register 14283, EPA-HQ-OAR-2006-0669; FRL-9131-7. 24 March.

USEPA. 2022. *General Conformity: De Minimis Tables*. https://www.epa.gov/general-conformity/de-minimis-tables. July.

USEPA. 2023a. *NAAQS Table*. https://www.epa.gov/criteria-air-pollutants/naaqs-table. 15 March.

USEPA. 2023b. *Prevention of Significant Deterioration (PSD) Basic Information*. https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information. Accessed January 23, 2025

USEPA. 2023c. USEPA's Annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* and the new *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2020.* https://cfpub.epa.gov/ghgdata/inventoryexplorer/#iallsectors/allsectors/allgas/inventsect/current. Accessed March 2023.

USEPA. 2024. *Overview of Greenhouse Gases*. https://www.epa.gov/ghgemissions/overview-greenhouse-gases. Accessed December 12, 2024.

USEPA. 2025. *Green Book, Kansas Whole or Part County Nonattainment Status by Year Since 1992 for all Criteria Pollutants*. https://www3.epa.gov/airquality/greenbook/phistory_ks.html. Accessed February 26, 2025.

C.3.6 Detailed ACAM Report, ACAM GHG Emissions, and Record of Air Analysis (ROAA)

C.3.6.1 Detailed Air Conformity Applicability Model Report

Alternative 1

OKLAHOMA COUNTIES ONLY (EMISSIONS SAME AS FOR KANSAS)

1. General Information

- Action Location
Base: VANCE AFB
State: Oklahoma
County(s): Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: VANCE AFB LOW MILITARY OPERATIONS AREA SPECIAL USE AIRSPACE

- Project Number/s (if applicable): N/A

- Projected Action Start Date: 1 / 2026

- Action Purpose and Need:

The purpose of the DAF Proposed Action is to obtain new airspace that affords the 71 FTW autonomous scheduling and ensures nearby access to airspace necessary to perform low-altitude non-hazardous flight training from 500 feet AGL up to 7,999 feet MSL, and allows for continuous flight training to 24,000 MSL or scheduled independently (500' feet AGL to 7,999 feet MSL), as needed, to support new multidirectional tactical flying training requirements.

The Proposed Action is needed because pilots do not have regular, prioritized (scheduling / management of airspace) access to multidirectional, low altitude training down to 500 feet AGL (low altitude/ configuration), with ceilings of 7,999 feet AGL (size), within 10 minutes transit time of Vance AFB (minimize transit time).

- Action Description:

Under the Proposed Action, the DAF would obtain new low-altitude airspace to support low-altitude pilot training requirements of the FBF syllabus. The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL

Up to 1,170 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 71 FTW at Vance AFB flying T-38Cs. FBF aircraft operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace.

Under Alternative 1, the DAF would request FAA to establish a new low-altitude MOA under portions of the existing Vance 1A, 1C, and 1D MOAs.

No other alternative meets the relevant Selection Standard and were all dismissed from detailed analysis in the EA.

- Point of Contact
Name: Rahul Chettri
Title: AQ Specialist

Organization: Versar Global Services
Email: rchettri@versar.com
Phone Number: (757) 557-0810

Report generated with ACAM version: 5.0.23a

- Activity List:

Activity Type		Activity Title
2.	Aircraft	Alt 1: T-38C AOPS in Vance Low MOA
3.	Aircraft	Alt 1: F-16C AOPS in Vance Low MOA

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: T-38C AOPS in Vance Low MOA

- Activity Description:
T-38C aircraft will conduct 1,170 annual sorties in Vance Low MOA 1E
Vance Low MOA 1E is assumed to be operational on January 1, 2026
Number of aircraft is not known (but this does not affect emissions estimates); 1 aircraft is used as a place-holder

- Activity Start Date
Start Month: 1
Start Year: 2026

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	1.781178
SO_x	0.685561
NO_x	0.448498
CO	41.691097

Pollutant	Emissions Per Year (TONs)
PM 10	1.146874
PM 2.5	1.031546
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Emissions Per Year (TONs)
CH_4	0.086304
N_2O	0.016838

Pollutant	Emissions Per Year (TONs)
CO_2	2052.480848
CO_2e	2059.656816

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
VOC	1.781178
SO_x	0.685561
NO_x	0.448498
CO	41.691097

Pollutant	Emissions Per Year (TONs)
PM 10	1.146874
PM 2.5	1.031546
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
CH_4	0.086304
N_2O	0.016838

Pollutant	Emissions Per Year (TONs)
CO_2	2052.480848
CO_2e	2059.656816

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: T-38C
Engine Model: J85-GE-5R
Primary Function: Trainer
Aircraft has After burn: Yes
Number of Engines: 2

- Aircraft & Engine Surrogate

Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.23
Approach	689.00	7.96	1.07	0.84	119.23	2.42	2.17
Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	1.61
Military	2220.00	0.75	1.07	1.92	30.99	1.13	1.01
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.23

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	520.00	0.13	0.03	3203.44	3214.64
Approach	689.00	0.13	0.03	3203.44	3214.64
Intermediate	1030.00	0.13	0.03	3203.44	3214.64
Military	2220.00	0.13	0.03	3203.44	3214.64
After Burn	7695.00	0.13	0.03	3203.44	3214.64

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 1170
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins):	0
Approach [Approach] (mins):	0
Climb Out [Intermediate] (mins):	31.9
Takeoff [Military] (mins):	0
Takeoff [After Burn] (mins):	0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins):	0
Approach (mins):	0
Intermediate (mins):	0
Military (mins):	0
AfterBurn (mins):	0

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year

AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * FOC / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year

$AE_{FOC} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{FOC}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year

$AEPS_{POL}$ = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines

NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

3. Aircraft

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: F-16C AOPS in Vance Low MOA

- Activity Description:
F-16C aircraft will conduct 288 annual sorties in Vance Low MOA 1E
Vance Low MOA 1E is assumed to be operational on January 1, 2026
Engine type is F100-PW-229
Number of aircraft is not known (but this does not affect emissions estimates); 1 aircraft is used as a place-holder

- Activity Start Date
Start Month: 1
Start Year: 2026

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	0.111809
SO_x	0.341817
NO_x	5.603247
CO	0.047918

Pollutant	Emissions Per Year (TONs)
PM 10	0.223619
PM 2.5	0.201257
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Emissions Per Year (TONs)
CH_4	0.043031
N_2O	0.008395

Pollutant	Emissions Per Year (TONs)
CO_2	1023.356078
CO_2e	1026.933978

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)	Pollutant	Emissions Per Year (TONs)
VOC	0.111809	PM 10	0.223619
SO_x	0.341817	PM 2.5	0.201257
NO_x	5.603247	Pb	0.000000
CO	0.047918	NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)	Pollutant	Emissions Per Year (TONs)
CH_4	0.043031	CO_2	1023.356078
N_2O	0.008395	CO_2e	1026.933978

3.2 Aircraft & Engines

3.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: F-16C
Engine Model: F100-PW-229
Primary Function: Combat
Aircraft has After burn: Yes
Number of Engines: 1

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

3.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	1087.00	0.45	1.07	3.80	10.17	0.67	0.60
Approach	3098.00	0.24	1.07	15.08	1.17	0.70	0.63
Intermediate	5838.00	0.35	1.07	17.54	0.15	0.70	0.63
Military	11490.00	0.31	1.07	29.29	0.33	0.91	0.82
After Burn	20793.00	5.26	1.07	14.30	21.51	0.38	0.35

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	1087.00	0.13	0.03	3203.44	3214.64
Approach	3098.00	0.13	0.03	3203.44	3214.64
Intermediate	5838.00	0.13	0.03	3203.44	3214.64
Military	11490.00	0.13	0.03	3203.44	3214.64
After Burn	20793.00	0.13	0.03	3203.44	3214.64

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 288
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins):	0
Approach [Approach] (mins):	0
Climb Out [Intermediate] (mins):	22.8
Takeoff [Military] (mins):	0
Takeoff [After Burn] (mins):	0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins):	0
Approach (mins):	0
Intermediate (mins):	0
Military (mins):	0
AfterBurn (mins):	0

3.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year

AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * FOC / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year

$AE_{FOC} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{FOC}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year

$AEPS_{POL}$ = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines

NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

Cumulative Analysis

OKLAHOMA COUNTIES ONLY (EMISSIONS SAME AS FOR KANSAS)

1. General Information

- Action Location
Base: VANCE AFB
State: Oklahoma
County(s): Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: VANCE AFB LOW MILITARY OPERATIONS AREA SPECIAL USE AIRSPACE

- Project Number/s (if applicable): N/A

- Projected Action Start Date: 1 / 2026

- Action Purpose and Need:
The purpose of the DAF Proposed Action is to obtain new airspace that affords the 71 FTW autonomous scheduling and ensures nearby access to airspace necessary to perform low-altitude non-hazardous flight training from 500 feet AGL up to 7,999 feet MSL, and allows for continuous flight training to 24,000 MSL or scheduled independently (500’ feet AGL to 7,999 feet MSL), as needed, to support new multidirectional tactical flying training requirements.

The Proposed Action is needed because pilots do not have regular, prioritized (scheduling / management of airspace) access to multidirectional, low altitude training down to 500 feet AGL (low altitude/ configuration), with ceilings of 7,999 feet AGL (size), within 10 minutes transit time of Vance AFB (minimize transit time).

- Action Description:
Under the Proposed Action, the DAF would obtain new low-altitude airspace to support low-altitude pilot training requirements of the FBF syllabus. The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL

Up to 1,170 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 71 FTW at Vance AFB flying T-38Cs. FBF aircraft operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace.

Under Alternative 1, the DAF would request FAA to establish a new low-altitude MOA under portions of the existing Vance 1A, 1C, and 1D MOAs.

No other alternative meets the relevant Selection Standard and were all dismissed from detailed analysis in the EA. However, a Cumulative Impacts Analysis was conducted for reasonably foreseeable future actions.

- Point of Contact
Name: Rahul Chettri
Title: AQ Specialist
Organization: Versar Global Services
Email: rchettri@versar.com
Phone Number: (757) 557-0810

Report generated with ACAM version: 5.0.23a

- Activity List:

Activity Type		Activity Title
2.	Aircraft	Cumulative: Add T-7A AOPS in Vance Low MOA
3.	Aircraft	Cumulative: T-38C AOPS in Vance Low MOA
4.	Aircraft	Cumulative: Add F-16C AOPS in Vance Low MOA

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Cumulative: Add T-7A AOPS in Vance Low MOA

- Activity Description:
T-7A aircraft will conduct 1,170 annual sorties in Vance Low MOA, beginning January 1, 2032

- Activity Start Date
Start Month: 1
Start Year: 2032

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	4.937951
SO_x	2.327580
NO_x	35.675065
CO	4.067828

Pollutant	Emissions Per Year (TONs)
PM 10	0.282790
PM 2.5	0.239284
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Emissions Per Year (TONs)
CH_4	0.293014
N_2O	0.057167

Pollutant	Emissions Per Year (TONs)
CO_2	6968.471382
CO_2e	6992.834842

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
VOC	4.937951
SO_x	2.327580
NO_x	35.675065
CO	4.067828

Pollutant	Emissions Per Year (TONs)
PM 10	0.282790
PM 2.5	0.239284
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
CH_4	0.293014
N_2O	0.057167

Pollutant	Emissions Per Year (TONs)
CO_2	6968.471382
CO_2e	6992.834842

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-7A
Engine Model: F404-GE-102
Primary Function: Trainer
Aircraft has After burn: Yes
Number of Engines: 1

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)
Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 68
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 1170
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 31.9
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 0
Approach (mins): 0
Intermediate (mins): 0
Military (mins): 0

AfterBurn (mins): 0

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year
AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * FOC / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year
AE_{FOC} = AEM_{IDLE_IN} + AEM_{IDLE_OUT} + $AEM_{APPROACH}$ + $AEM_{CLIMBOUT}$ + $AEM_{TAKEOFF}$

AE_{FOC}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL}$ = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
AE_{TRIM} = $AEPS_{IDLE}$ + $AEPS_{APPROACH}$ + $AEPS_{INTERMEDIATE}$ + $AEPS_{MILITARY}$ + $AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

3. Aircraft

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Cumulative: T-38C AOPS in Vance Low MOA

- Activity Description:
T-38C aircraft will conduct 1,170 annual sorties in Vance Low MOA 1E
Vance Low MOA 1E is assumed to be formed by January 1, 2026
T-38C operations will cease at the end of 2031 and be replaced by T-7A operations
Number of aircraft is not known (but this does not affect emissions estimates); 1 aircraft is used as a place-holder

- Activity Start Date
Start Month: 1
Start Year: 2026

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2031

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	10.687068
SO_x	4.113368
NO_x	2.690988
CO	250.146584

Pollutant	Total Emissions (TONs)
PM 10	6.881242
PM 2.5	6.189273
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.517823
N_2O	0.101027

Pollutant	Total Emissions (TONs)
CO_2	12314.885085
CO_2e	12357.940898

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	10.687068
SO_x	4.113368
NO_x	2.690988
CO	250.146584

Pollutant	Total Emissions (TONs)
PM 10	6.881242
PM 2.5	6.189273
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.517823
N_2O	0.101027

Pollutant	Total Emissions (TONs)
CO_2	12314.885085
CO_2e	12357.940898

3.2 Aircraft & Engines

3.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-38C

Engine Model: J85-GE-5R
Primary Function: Trainer
Aircraft has After burn: Yes
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

3.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.23
Approach	689.00	7.96	1.07	0.84	119.23	2.42	2.17
Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	1.61
Military	2220.00	0.75	1.07	1.92	30.99	1.13	1.01
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.23

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	520.00	0.13	0.03	3203.44	3214.64
Approach	689.00	0.13	0.03	3203.44	3214.64
Intermediate	1030.00	0.13	0.03	3203.44	3214.64
Military	2220.00	0.13	0.03	3203.44	3214.64
After Burn	7695.00	0.13	0.03	3203.44	3214.64

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 1170
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 31.9
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 0
Approach (mins): 0
Intermediate (mins): 0

Military (mins): 0
AfterBurn (mins): 0

3.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year
AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * FOC / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year
AE_{FOC} = AEM_{IDLE_IN} + AEM_{IDLE_OUT} + $AEM_{APPROACH}$ + $AEM_{CLIMBOUT}$ + $AEM_{TAKEOFF}$

AE_{FOC}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL}$ = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
AE_{TRIM} = $AEPS_{IDLE}$ + $AEPS_{APPROACH}$ + $AEPS_{INTERMEDIATE}$ + $AEPS_{MILITARY}$ + $AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

4. Aircraft

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Cumulative: Add F-16C AOPS in Vance Low MOA

- Activity Description:
F-16C aircraft will conduct 288 annual sorties in Vance Low MOA 1E
Vance Low MOA 1E is assumed to be operational on January 1, 2026
Engine type is F100-PW-229
Number of aircraft is not known (but this does not affect emissions estimates); 1 aircraft is used as a place-holder

- Activity Start Date
Start Month: 1
Start Year: 2026

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	0.111809
SO_x	0.341817
NO_x	5.603247
CO	0.047918

Pollutant	Emissions Per Year (TONs)
PM 10	0.223619
PM 2.5	0.201257
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Emissions Per Year (TONs)
CH_4	0.043031
N_2O	0.008395

Pollutant	Emissions Per Year (TONs)
CO_2	1023.356078
CO_2e	1026.933978

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.111809
SO_x	0.341817
NO_x	5.603247
CO	0.047918

Pollutant	Emissions Per Year (TONs)
PM 10	0.223619
PM 2.5	0.201257
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
CH_4	0.043031
N_2O	0.008395

Pollutant	Emissions Per Year (TONs)
CO_2	1023.356078
CO_2e	1026.933978

4.2 Aircraft & Engines

4.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: F-16C
Engine Model: F100-PW-229
Primary Function: Combat
Aircraft has After burn: Yes
Number of Engines: 1

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

4.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	1087.00	0.45	1.07	3.80	10.17	0.67	0.60
Approach	3098.00	0.24	1.07	15.08	1.17	0.70	0.63
Intermediate	5838.00	0.35	1.07	17.54	0.15	0.70	0.63
Military	11490.00	0.31	1.07	29.29	0.33	0.91	0.82
After Burn	20793.00	5.26	1.07	14.30	21.51	0.38	0.35

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	1087.00	0.13	0.03	3203.44	3214.64
Approach	3098.00	0.13	0.03	3203.44	3214.64
Intermediate	5838.00	0.13	0.03	3203.44	3214.64
Military	11490.00	0.13	0.03	3203.44	3214.64
After Burn	20793.00	0.13	0.03	3203.44	3214.64

4.3 Flight Operations

4.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 288
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 22.8
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 0
Approach (mins): 0

Intermediate (mins): 0
Military (mins): 0
AfterBurn (mins): 0

4.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year
AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * FOC / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year
$AE_{FOC} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{FOC}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL}$ = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

C.3.6.2 Air Conformity Applicability Model Greenhouse Gas (GHG) Emissions

<u>Alternative 1</u>

KANSAS COUNTIES ONLY (most conservative scenario)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to estimate GHG emissions associated with the action. The analysis was performed in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention. This report provides a summary of GHG emissions.

Report generated with ACAM version: 5.0.23a

a. Action Location:
Base: VANCE AFB
State: Kansas
County(s): Barber; Harper
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: VANCE AFB LOW MILITARY OPERATIONS AREA SPECIAL USE AIRSPACE

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2026

e. Action Description:

Under the Proposed Action, the DAF would obtain new low-altitude airspace to support low-altitude pilot training requirements of the FBF syllabus. The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL

Up to 1,170 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 71 FTW at Vance AFB flying T-38Cs. FBF aircraft operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace.

Under Alternative 1, the DAF would request FAA to establish a new low-altitude MOA under portions of the existing Vance 1A, 1C, and 1D MOAs.

No other alternative meets the relevant Selection Standard and were all dismissed from detailed analysis in the EA.

f. Point of Contact:
Name: Rahul Chettri
Title: AQ Specialist
Organization: Versar Global Services
Email: rchettri@versar.com
Phone Number: (757) 557-0810

2. Analysis: Total combined direct and indirect GHG emissions associated with the action were estimated through ACAM on a calendar-year basis from the action start through the expected life cycle of the action. The life cycle for Air Force actions with "steady state" emissions (SS, net gain/loss in emission stabilized and the action is fully implemented) is assumed to be 10 years beyond the SS emissions year or 20 years beyond SS emissions year for aircraft operations related actions.

GHG Emissions Analysis Summary:

GHGs produced by fossil-fuel combustion are primarily carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (NO_2). These three GHGs represent more than 97 percent of all U.S. GHG emissions. Emissions of GHGs are typically quantified and regulated in units of CO_2 equivalents (CO_2e). The CO_2e takes into account the global warming potential (GWP) of each GHG. The GWP is the measure of a particular GHG's ability to absorb solar radiation as well as its residence time within the atmosphere. The GWP allows comparison of global warming impacts between different gases. All GHG emissions estimates were derived from various emission sources using the methods, algorithms, emission factors, and GWPs from the most current Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and/or Air Emissions Guide for Air Force Transitory Sources.

The Air Force has adopted the Prevention of Significant Deterioration (PSD) threshold for GHG of 75,000 ton per year (ton/yr) of CO_2e (or 68,039 metric ton per year, mton/yr) as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; however, it provides a threshold to identify actions that are insignificant (de minimis, too trivial or minor to merit consideration). Actions with a net change in GHG (CO_2e) emissions below the insignificance indicator (threshold) are considered too insignificant on a global scale to warrant any further analysis. Note that actions with a net change in GHG (CO_2e) emissions above the insignificance indicator (threshold) are only considered potentially significant and require further assessment to determine if the action poses a significant impact. For further detail on insignificance indicators see Level II, Air Quality Quantitative Assessment, Insignificance Indicators (April 2023).

The following table summarizes the action-related GHG emissions on a calendar-year basis through the projected life cycle of the action.

Action-Related Annual GHG Emissions (mton/yr)						
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**	**Threshold**	**Exceedance**
2026	2,790	0.1173303	0.02289117	2,800	68,039	No
2027 [SS Year]	2,790	0.1173303	0.02289117	2,800	68,039	No
2028	2,790	0.1173303	0.02289117	2,800	68,039	No
2029	2,790	0.1173303	0.02289117	2,800	68,039	No
2030	2,790	0.1173303	0.02289117	2,800	68,039	No
2031	2,790	0.1173303	0.02289117	2,800	68,039	No
2032	2,790	0.1173303	0.02289117	2,800	68,039	No
2033	2,790	0.1173303	0.02289117	2,800	68,039	No
2034	2,790	0.1173303	0.02289117	2,800	68,039	No
2035	2,790	0.1173303	0.02289117	2,800	68,039	No
2036	2,790	0.1173303	0.02289117	2,800	68,039	No
2037	2,790	0.1173303	0.02289117	2,800	68,039	No
2038	2,790	0.1173303	0.02289117	2,800	68,039	No
2039	2,790	0.1173303	0.02289117	2,800	68,039	No
2040	2,790	0.1173303	0.02289117	2,800	68,039	No
2041	2,790	0.1173303	0.02289117	2,800	68,039	No
2042	2,790	0.1173303	0.02289117	2,800	68,039	No
2043	2,790	0.1173303	0.02289117	2,800	68,039	No
2044	2,790	0.1173303	0.02289117	2,800	68,039	No
2045	2,790	0.1173303	0.02289117	2,800	68,039	No
2046	2,790	0.1173303	0.02289117	2,800	68,039	No
2047	2,790	0.1173303	0.02289117	2,800	68,039	No

The following U.S. and State's GHG emissions estimates (next two tables) are based on a five-year average (2016 through 2020) of individual state-reported GHG emissions (Reference: State Climate Summaries 2022, NOAA National Centers for Environmental Information, National Oceanic and Atmospheric Administration. https://statesummaries.ncics.org/downloads/).

State's Annual GHG Emissions (mton/yr)				
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**
2026	60,154,928	948,100	84,525	61,187,553
2027 [SS Year]	60,154,928	948,100	84,525	61,187,553
2028	60,154,928	948,100	84,525	61,187,553
2029	60,154,928	948,100	84,525	61,187,553
2030	60,154,928	948,100	84,525	61,187,553
2031	60,154,928	948,100	84,525	61,187,553
2032	60,154,928	948,100	84,525	61,187,553
2033	60,154,928	948,100	84,525	61,187,553
2034	60,154,928	948,100	84,525	61,187,553
2035	60,154,928	948,100	84,525	61,187,553
2036	60,154,928	948,100	84,525	61,187,553
2037	60,154,928	948,100	84,525	61,187,553
2038	60,154,928	948,100	84,525	61,187,553
2039	60,154,928	948,100	84,525	61,187,553
2040	60,154,928	948,100	84,525	61,187,553
2041	60,154,928	948,100	84,525	61,187,553
2042	60,154,928	948,100	84,525	61,187,553
2043	60,154,928	948,100	84,525	61,187,553
2044	60,154,928	948,100	84,525	61,187,553
2045	60,154,928	948,100	84,525	61,187,553
2046	60,154,928	948,100	84,525	61,187,553
2047	60,154,928	948,100	84,525	61,187,553

U.S. Annual GHG Emissions (mton/yr)				
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**
2026	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2027 [SS Year]	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2028	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2029	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2030	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2031	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2032	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2033	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2034	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2035	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2036	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2037	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2038	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2039	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2040	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2041	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2042	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2043	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2044	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2045	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2046	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2047	5,136,454,179	25,626,912	1,500,708	5,163,581,798

GHG Relative Significance Assessment:

A Relative Significance Assessment uses the rule of reason and the concept of proportionality along with the consideration of the affected area (global, national, and regional) and the degree (intensity) of the proposed action's effects. The Relative Significance Assessment provides real-world context and allows for a reasoned choice against alternatives through a relative comparison analysis. The analysis weighs each alternative's annual net change in GHG emissions proportionally against (or relative to) global, national, and regional emissions.

The action's surroundings, circumstances, environment, and background (context associated with an action) provide the setting for evaluating the GHG intensity (impact significance). From an air quality perspective, context of an action is the local area's ambient air quality relative to meeting the NAAQSs, expressed as attainment, nonattainment, or maintenance areas (this designation is considered the attainment status). GHGs are non-hazardous to health at normal ambient concentrations. Therefore, the action-related GHGs generally have an insignificant impact to local air quality.

However, the affected area (context) of GHG is global. Therefore, the intensity or degree of the proposed action's GHG effects are gauged through the quantity of GHG associated with the action as compared to a baseline of the state, U.S., and global GHG inventories. Each action (or alternative) has significance, based on their annual net change in GHG emissions, in relation to or proportionally to the global, national, and regional annual GHG emissions.

To provide real-world context to the GHG effects on a global scale, an action's net change in GHG emissions is compared relative to the state (where action will occur) and U.S. annual emissions. The following table provides a relative comparison of an action's net change in GHG emissions vs. state and U.S. projected GHG emissions for the same time period.

Total GHG Relative Significance (mton)					
		CO2	**CH4**	**N2O**	**CO2e**
2026-2047	State Total	1,323,408,405	20,858,206	1,859,546	1,346,126,158
2026-2047	U.S. Total	113,001,991,938	563,792,057	33,015,568	113,598,799,563
2026-2047	Action	61,388	2.581267	0.503606	61,602
Percent of State Totals		0.00463861%	0.00001238%	0.00002708%	0.00457627%
Percent of U.S. Totals		0.00005432%	0.00000046%	0.00000153%	0.00005423%

From a global context, the action's total GHG percentage of total global GHG for the same time period is: 0.00000727%.*

* Global value based on the U.S. emits 13.4% of all global GHG annual emissions (2018 Emissions Data, Center for Climate and Energy Solutions, accessed 7-6-2023, https://www.c2es.org/content/international-emissions).

Rahul Chettri, AQ Specialist　　　　Feb 18 2025

Name, Title　　　　**Date**

Cumulative Analysis

KANSAS COUNTIES ONLY (most conservative scenario)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to estimate GHG emissions associated with the action. The analysis was performed in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention. This report provides a summary of GHG emissions.

Report generated with ACAM version: 5.0.23a

a. Action Location:
Base: VANCE AFB
State: Kansas
County(s): Barber; Harper
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: VANCE AFB LOW MILITARY OPERATIONS AREA SPECIAL USE AIRSPACE

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2026

e. Action Description:

Under the Proposed Action, the DAF would obtain new low-altitude airspace to support low-altitude pilot training requirements of the FBF syllabus. The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL

Up to 1,170 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 71 FTW at Vance AFB flying T-38Cs. FBF aircraft operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace.

Under Alternative 1, the DAF would request FAA to establish a new low-altitude MOA under portions of the existing Vance 1A, 1C, and 1D MOAs.

No other alternative meets the relevant Selection Standard and were all dismissed from detailed analysis in the EA. However, a Cumulative Impacts Analysis was conducted for reasonably foreseeable future actions.

f. Point of Contact:
Name: Rahul Chettri
Title: AQ Specialist
Organization: Versar Global Services
Email: rchettri@versar.com
Phone Number: (757) 557-0810

2. Analysis: Total combined direct and indirect GHG emissions associated with the action were estimated through ACAM on a calendar-year basis from the action start through the expected life cycle of the action. The life cycle for Air Force actions with "steady state" emissions (SS, net gain/loss in emission stabilized and the action is fully implemented) is assumed to be 10 years beyond the SS emissions year or 20 years beyond SS emissions year for aircraft operations related actions.

GHG Emissions Analysis Summary:

GHGs produced by fossil-fuel combustion are primarily carbon dioxide (CO2), methane (CH4), and nitrous oxide (NO2). These three GHGs represent more than 97 percent of all U.S. GHG emissions. Emissions of GHGs are typically quantified and regulated in units of CO2 equivalents (CO2e). The CO2e takes into account the global warming potential (GWP) of each GHG. The GWP is the measure of a particular GHG's ability to absorb solar radiation as well as its residence time within the atmosphere. The GWP allows comparison of global warming impacts between different gases. All GHG emissions estimates were derived from various emission sources using the methods, algorithms, emission factors, and GWPs from the most current Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and/or Air Emissions Guide for Air Force Transitory Sources.

The Air Force has adopted the Prevention of Significant Deterioration (PSD) threshold for GHG of 75,000 ton per year (ton/yr) of CO2e (or 68,039 metric ton per year, mton/yr) as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; however, it provides a threshold to identify actions that are insignificant (de minimis, too trivial or minor to merit consideration). Actions with a net change in GHG (CO2e) emissions below the insignificance indicator (threshold) are considered too insignificant on a global scale to warrant any further analysis. Note that actions with a net change in GHG (CO2e) emissions above the insignificance indicator (threshold) are only considered potentially significant and require further assessment to determine if the action poses a significant impact. For further detail on insignificance indicators see Level II, Air Quality Quantitative Assessment, Insignificance Indicators (April 2023).

The following table summarizes the action-related GHG emissions on a calendar-year basis through the projected life cycle of the action.

Action-Related Annual GHG Emissions (mton/yr)						
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**	**Threshold**	**Exceedance**
2026	2,790	0.1173303	0.02289117	2,800	68,039	No
2027	2,790	0.1173303	0.02289117	2,800	68,039	No
2028	2,790	0.1173303	0.02289117	2,800	68,039	No
2029	2,790	0.1173303	0.02289117	2,800	68,039	No
2030	2,790	0.1173303	0.02289117	2,800	68,039	No
2031	2,790	0.1173303	0.02289117	2,800	68,039	No
2032	7,250	0.30485475	0.05947723	7,275	68,039	No
2033 [SS Year]	7,250	0.30485475	0.05947723	7,275	68,039	No
2034	7,250	0.30485475	0.05947723	7,275	68,039	No
2035	7,250	0.30485475	0.05947723	7,275	68,039	No
2036	7,250	0.30485475	0.05947723	7,275	68,039	No
2037	7,250	0.30485475	0.05947723	7,275	68,039	No
2038	7,250	0.30485475	0.05947723	7,275	68,039	No
2039	7,250	0.30485475	0.05947723	7,275	68,039	No
2040	7,250	0.30485475	0.05947723	7,275	68,039	No
2041	7,250	0.30485475	0.05947723	7,275	68,039	No
2042	7,250	0.30485475	0.05947723	7,275	68,039	No
2043	7,250	0.30485475	0.05947723	7,275	68,039	No
2044	7,250	0.30485475	0.05947723	7,275	68,039	No
2045	7,250	0.30485475	0.05947723	7,275	68,039	No
2046	7,250	0.30485475	0.05947723	7,275	68,039	No
2047	7,250	0.30485475	0.05947723	7,275	68,039	No
2048	7,250	0.30485475	0.05947723	7,275	68,039	No
2049	7,250	0.30485475	0.05947723	7,275	68,039	No
2050	7,250	0.30485475	0.05947723	7,275	68,039	No
2051	7,250	0.30485475	0.05947723	7,275	68,039	No
2052	7,250	0.30485475	0.05947723	7,275	68,039	No
2053	7,250	0.30485475	0.05947723	7,275	68,039	No

The following U.S. and State's GHG emissions estimates (next two tables) are based on a five-year average (2016 through 2020) of individual state-reported GHG emissions (Reference: State Climate Summaries 2022, NOAA National Centers for Environmental Information, National Oceanic and Atmospheric Administration. https://statesummaries.ncics.org/downloads/).

State's Annual GHG Emissions (mton/yr)				
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**
2026	60,154,928	948,100	84,525	61,187,553
2027	60,154,928	948,100	84,525	61,187,553
2028	60,154,928	948,100	84,525	61,187,553
2029	60,154,928	948,100	84,525	61,187,553
2030	60,154,928	948,100	84,525	61,187,553
2031	60,154,928	948,100	84,525	61,187,553
2032	60,154,928	948,100	84,525	61,187,553
2033 [SS Year]	60,154,928	948,100	84,525	61,187,553
2034	60,154,928	948,100	84,525	61,187,553
2035	60,154,928	948,100	84,525	61,187,553
2036	60,154,928	948,100	84,525	61,187,553
2037	60,154,928	948,100	84,525	61,187,553
2038	60,154,928	948,100	84,525	61,187,553
2039	60,154,928	948,100	84,525	61,187,553
2040	60,154,928	948,100	84,525	61,187,553
2041	60,154,928	948,100	84,525	61,187,553
2042	60,154,928	948,100	84,525	61,187,553
2043	60,154,928	948,100	84,525	61,187,553
2044	60,154,928	948,100	84,525	61,187,553
2045	60,154,928	948,100	84,525	61,187,553
2046	60,154,928	948,100	84,525	61,187,553
2047	60,154,928	948,100	84,525	61,187,553
2048	60,154,928	948,100	84,525	61,187,553
2049	60,154,928	948,100	84,525	61,187,553
2050	60,154,928	948,100	84,525	61,187,553
2051	60,154,928	948,100	84,525	61,187,553
2052	60,154,928	948,100	84,525	61,187,553
2053	60,154,928	948,100	84,525	61,187,553

U.S. Annual GHG Emissions (mton/yr)				
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**
2026	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2027	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2028	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2029	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2030	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2031	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2032	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2033 [SS Year]	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2034	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2035	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2036	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2037	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2038	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2039	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2040	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2041	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2042	5,136,454,179	25,626,912	1,500,708	5,163,581,798

2043	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2044	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2045	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2046	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2047	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2048	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2049	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2050	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2051	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2052	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2053	5,136,454,179	25,626,912	1,500,708	5,163,581,798

GHG Relative Significance Assessment:

A Relative Significance Assessment uses the rule of reason and the concept of proportionality along with the consideration of the affected area (global, national, and regional) and the degree (intensity) of the proposed action's effects. The Relative Significance Assessment provides real-world context and allows for a reasoned choice against alternatives through a relative comparison analysis. The analysis weighs each alternative's annual net change in GHG emissions proportionally against (or relative to) global, national, and regional emissions.

The action's surroundings, circumstances, environment, and background (context associated with an action) provide the setting for evaluating the GHG intensity (impact significance). From an air quality perspective, context of an action is the local area's ambient air quality relative to meeting the NAAQSs, expressed as attainment, nonattainment, or maintenance areas (this designation is considered the attainment status). GHGs are non-hazardous to health at normal ambient concentrations. Therefore, the action-related GHGs generally have an insignificant impact to local air quality.

However, the affected area (context) of GHG is global. Therefore, the intensity or degree of the proposed action's GHG effects are gauged through the quantity of GHG associated with the action as compared to a baseline of the state, U.S., and global GHG inventories. Each action (or alternative) has significance, based on their annual net change in GHG emissions, in relation to or proportionally to the global, national, and regional annual GHG emissions.

To provide real-world context to the GHG effects on a global scale, an action's net change in GHG emissions is compared relative to the state (where action will occur) and U.S. annual emissions. The following table provides a relative comparison of an action's net change in GHG emissions vs. state and U.S. projected GHG emissions for the same time period.

Total GHG Relative Significance (mton)					
		CO2	**CH4**	**N2O**	**CO2e**
2026-2053	State Total	1,684,337,970	26,546,808	2,366,695	1,713,251,473
2026-2053	U.S. Total	143,820,717,012	717,553,527	42,019,814	144,580,290,353
2026-2053	Action	176,244	7.410786	1.445846	176,860
Percent of State Totals		0.01046367%	0.00002792%	0.00006109%	0.01032305%
Percent of U.S. Totals		0.00012254%	0.00000103%	0.00000344%	0.00012233%

From a global context, the action's total GHG percentage of total global GHG for the same time period is: 0.00001639%.*

* Global value based on the U.S. emits 13.4% of all global GHG annual emissions (2018 Emissions Data, Center for Climate and Energy Solutions, accessed 7-6-2023, https://www.c2es.org/content/international-emissions).

Rahul Chettri, AQ Specialist — Feb 18 2025

Name, Title — **Date**

C.3.6.3 Record of Air Analysis (ROAA)

Alternative 1

OKLAHOMA COUNTIES ONLY (EMISSIONS SAME AS FOR KANSAS)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform a net change in emissions analysis to assess the potential air quality impact/s associated with the action. The analysis was performed in accordance with the Air Force Manual 32-7002, *Environmental Compliance and Pollution Prevention.* This report provides a summary of the ACAM analysis.

Report generated with ACAM version: 5.0.23a

a. Action Location:
Base: VANCE AFB
State: Oklahoma
County(s): Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: VANCE AFB LOW MILITARY OPERATIONS AREA SPECIAL USE AIRSPACE

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2026

e. Action Description:

Under the Proposed Action, the DAF would obtain new low-altitude airspace to support low-altitude pilot training requirements of the FBF syllabus. The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL

Up to 1,170 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 71 FTW at Vance AFB flying T-38Cs. FBF aircraft operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace.

Under Alternative 1, the DAF would request FAA to establish a new low-altitude MOA under portions of the existing Vance 1A, 1C, and 1D MOAs.

No other alternative meets the relevant Selection Standard and were all dismissed from detailed analysis in the EA.

f. Point of Contact:
Name: Rahul Chettri
Title: AQ Specialist
Organization: Versar Global Services
Email: rchettri@versar.com
Phone Number: (757) 557-0810

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the GCR are:

____ applicable
_X_ not applicable

Total reasonably foreseeable net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (no net gain/loss in emission stabilized and the action is fully implemented) emissions. The ACAM analysis uses the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the *USAF Air Emissions Guide for Air Force Stationary Sources*, the *USAF Air Emissions Guide for Air Force Mobile Sources*, and the *USAF Air Emissions Guide for Air Force Transitory Sources.*

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of the proposed Action's potential impacts to local air quality. The insignificance indicators are trivial (de minimis) rate thresholds that have been demonstrated to have little to no impact to air quality. These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold and 25 ton/yr for lead for actions occurring in areas that are "Attainment" (not exceeding any National Ambient Air Quality Standard (NAAQS)). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutants is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQS. For further detail on insignificance indicators, refer to *Level II, Air Quality Quantitative Assessment, Insignificance Indicators*.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicators and are summarized below.

Analysis Summary:

2026

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.893	250	No
NOx	6.052	250	No
CO	41.739	250	No
SOx	1.027	250	No
PM 10	1.370	250	No
PM 2.5	1.233	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2027 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.893	250	No
NOx	6.052	250	No
CO	41.739	250	No
SOx	1.027	250	No
PM 10	1.370	250	No
PM 2.5	1.233	250	No
Pb	0.000	25	No
NH3	0.000	250	No

None of the estimated annual net emissions associated with this action are above the insignificance indicators; therefore, the action will not cause or contribute to an exceedance of one or more NAAQSs and will have an insignificant impact on air quality. No further air assessment is needed.

Rahul Chettri, AQ Specialist	Feb 18 2025
Name, Title	**Date**

Cumulative Analysis

OKLAHOMA COUNTIES ONLY (EMISSIONS SAME AS FOR KANSAS)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform a net change in emissions analysis to assess the potential air quality impact/s associated with the action. The analysis was performed in accordance with the Air Force Manual 32-7002, *Environmental Compliance and Pollution Prevention* and the *General Conformity Rule* (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

Report generated with ACAM version: 5.0.23a

a. Action Location:
Base: VANCE AFB
State: Oklahoma
County(s): Alfalfa; Woods
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: VANCE AFB LOW MILITARY OPERATIONS AREA SPECIAL USE AIRSPACE

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2026

e. Action Description:

Under the Proposed Action, the DAF would obtain new low-altitude airspace to support low-altitude pilot training requirements of the FBF syllabus. The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to 7,999 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL

Up to 1,170 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 71 FTW at Vance AFB flying T-38Cs. FBF aircraft operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations would be proposed in the new airspace.

Under Alternative 1, the DAF would request FAA to establish a new low-altitude MOA under portions of the existing Vance 1A, 1C, and 1D MOAs.

No other alternative meets the relevant Selection Standard and were all dismissed from detailed analysis in the EA. However, a Cumulative Impacts Analysis was conducted for reasonably foreseeable future actions.

f. Point of Contact:
Name: Rahul Chettri
Title: AQ Specialist
Organization: Versar Global Services
Email: rchettri@versar.com
Phone Number: (757) 557-0810

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the GCR are:

____ applicable
_X_ not applicable

Total reasonably foreseeable net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving “steady state” (no net gain/loss in emission stabilized and the action is fully implemented) emissions. The ACAM analysis uses the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the *USAF Air Emissions Guide for Air Force Stationary Sources*, the *USAF Air Emissions Guide for Air Force Mobile Sources*, and the *USAF Air Emissions Guide for Air Force Transitory Sources.*

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of the proposed Action’s potential impacts to local air quality. The insignificance indicators are trivial (de minimis) rate thresholds that have been demonstrated to have little to no impact to air quality. These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold and 25 ton/yr for lead for actions occurring in areas that are "Attainment" (not exceeding any National Ambient Air Quality Standard (NAAQS)). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutants is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQS. For further detail on insignificance indicators, refer to *Level II, Air Quality Quantitative Assessment, Insignificance Indicators*.

The action’s net emissions for every year through achieving steady state were compared against the Insignificance Indicators and are summarized below.

Analysis Summary:

2026

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.893	250	No
NOx	6.052	250	No
CO	41.739	250	No
SOx	1.027	250	No
PM 10	1.370	250	No
PM 2.5	1.233	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2027

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.893	250	No
NOx	6.052	250	No
CO	41.739	250	No
SOx	1.027	250	No
PM 10	1.370	250	No
PM 2.5	1.233	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2028

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.893	250	No
NOx	6.052	250	No

CO	41.739	250	No
SOx	1.027	250	No
PM 10	1.370	250	No
PM 2.5	1.233	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2029

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.893	250	No
NOx	6.052	250	No
CO	41.739	250	No
SOx	1.027	250	No
PM 10	1.370	250	No
PM 2.5	1.233	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2030

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.893	250	No
NOx	6.052	250	No
CO	41.739	250	No
SOx	1.027	250	No
PM 10	1.370	250	No
PM 2.5	1.233	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2031

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.893	250	No
NOx	6.052	250	No
CO	41.739	250	No
SOx	1.027	250	No
PM 10	1.370	250	No
PM 2.5	1.233	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2032

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	5.050	250	No
NOx	41.278	250	No
CO	4.116	250	No
SOx	2.669	250	No

PM 10	0.506	250	No
PM 2.5	0.441	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2033 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	5.050	250	No
NOx	41.278	250	No
CO	4.116	250	No
SOx	2.669	250	No
PM 10	0.506	250	No
PM 2.5	0.441	250	No
Pb	0.000	25	No
NH3	0.000	250	No

None of the estimated annual net emissions associated with this action are above the insignificance indicators; therefore, the action will not cause or contribute to an exceedance of one or more NAAQSs and will have an insignificant impact on air quality. No further air assessment is needed.

Rahul Chettri, AQ Specialist	Feb 18 2025
Name, Title	**Date**

This page intentionally left blank.

APPENDIX D
U.S. FISH AND WILDLIFE SERVICE OFFICIAL SPECIES LIST

This page intentionally left blank

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467

In Reply Refer To: 04/23/2025 18:36:09 UTC
Project Code: 2025-0034229
Project Name: Vance AFB Low MOA

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Note: IPaC has provided all available attachments because this project is in multiple field office jurisdictions.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

This project's location is within the jurisdiction of multiple offices. However, only one species list document will be provided for all offices. The species and critical habitats in this document reflect the aggregation of those that fall in each of the affiliated office's jurisdiction. Other offices affiliated with the project:

Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
(785) 539-3474

PROJECT SUMMARY

Project Code: 2025-0034229
Project Name: Vance AFB Low MOA
Project Type: Military Operations
Project Description: The Department of the Air Force is seeking to obtain new airspace for low altitude training.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@36.9707775,-98.71912906766435,14z

Counties: Kansas and Oklahoma

ENDANGERED SPECIES ACT SPECIES

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

BIRDS

NAME	STATUS
Lesser Prairie-chicken *Tympanuchus pallidicinctus* Population: Northern DPS No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1924	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Rufa Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

FISHES

NAME	STATUS
Arkansas River Shiner *Notropis girardi* Population: Arkansas River Basin (AR, KS, NM, OK, TX) There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4364	Threatened
Peppered Chub *Macrhybopsis tetranema* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/532	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/ activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

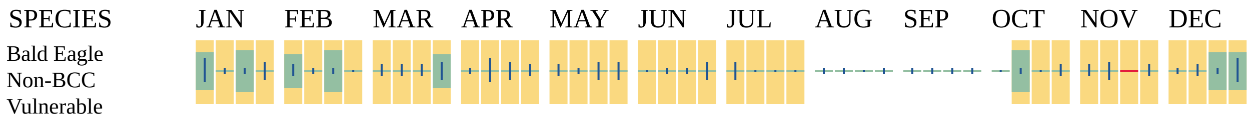
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

■ probability of presence ■ breeding season | survey effort – no data



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service). The incidental take of migratory birds is the injury or death of birds that results from, but is not the purpose, of an activity. The Service interprets the MBTA to prohibit incidental take.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31

NAME	BREEDING SEASON
Black Tern *Chlidonias niger surinamenisis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3093	Breeds May 15 to Aug 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9482	Breeds elsewhere
Lark Bunting *Calamospiza melanocorys* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9451	Breeds May 10 to Aug 15
Least Tern *Sternula antillarum antillarum* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/11919	Breeds Apr 25 to Sep 5
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Sprague's Pipit *Anthus spragueii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8964	Breeds elsewhere
Western Grebe *aechmophorus occidentalis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/6743	Breeds Jun 1 to Aug 31

NAME	BREEDING SEASON
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10669	Breeds Apr 20 to Aug 5

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

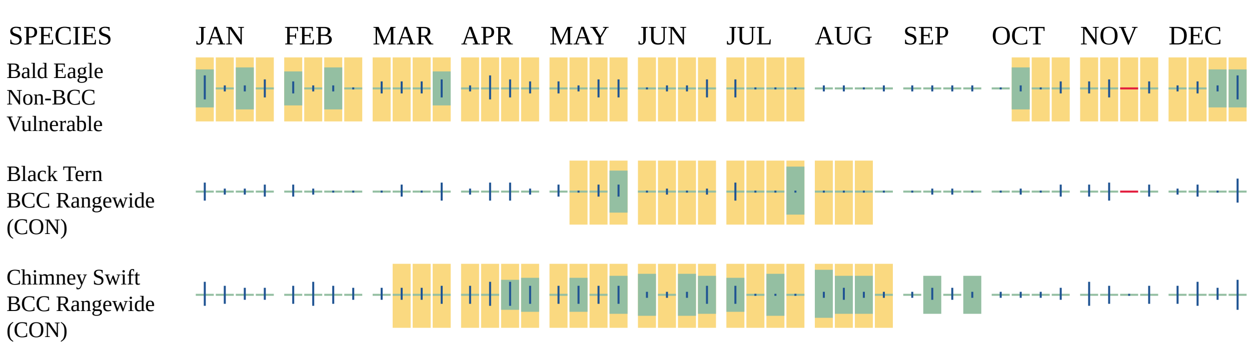
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

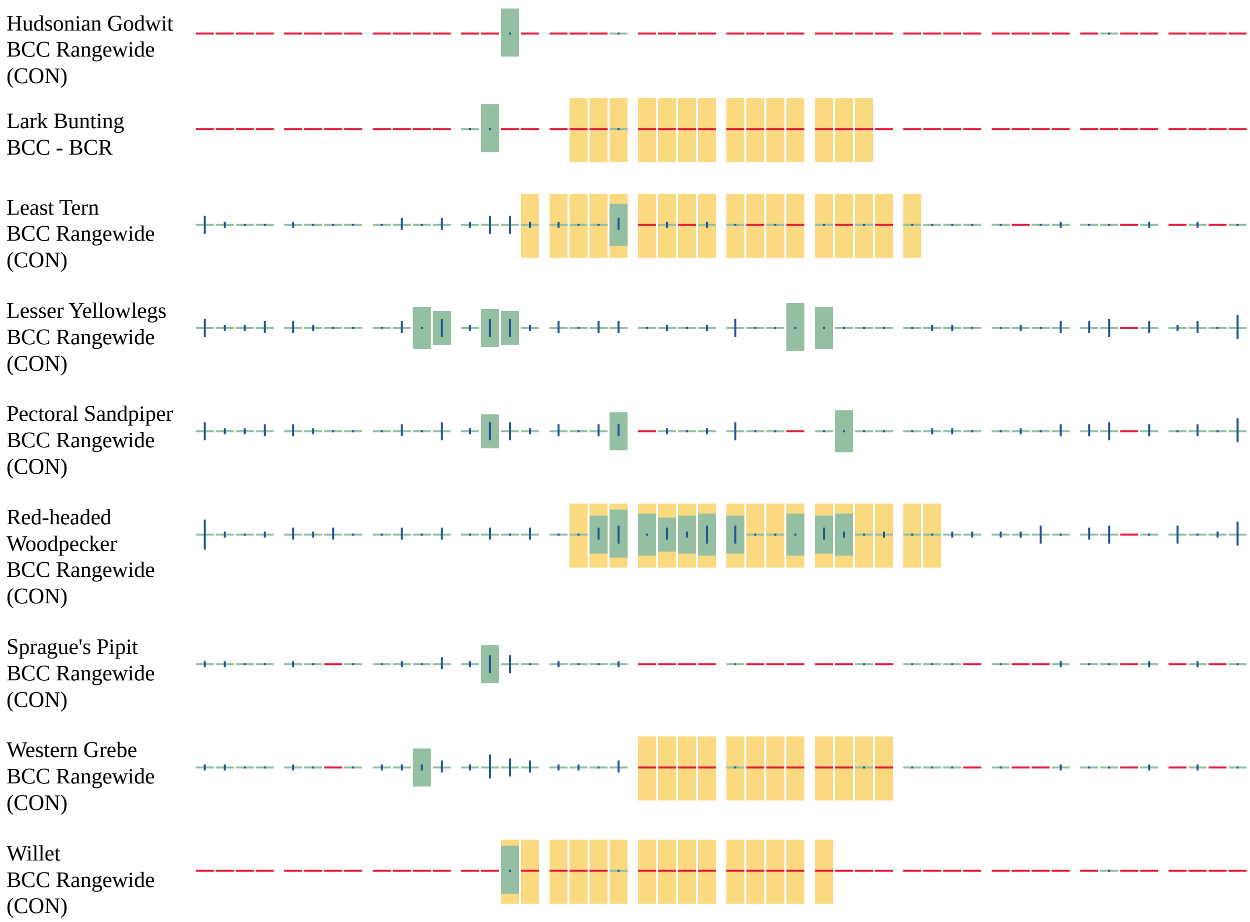
Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

■ probability of presence ■ breeding season | survey effort – no data





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

Due to your project's size, the list below may be incomplete, or the acreages reported may be inaccurate. For a full list, please contact the local U.S. Fish and Wildlife office or visit https://www.fws.gov/wetlands/data/mapper.HTML

FRESHWATER POND

- PUSAh
- PAB4Fh
- PUSA
- PUBFx
- PABFh
- PAB4F
- PUBHx
- PUBHh
- PUBFh
- PUBF

FRESHWATER EMERGENT WETLAND

- PEM1/SS1A
- PEM1/FO1A
- PEM1Fx
- PEM1Cx
- PEM1Fh
- PEM1Ah
- PEM1/SS1Ch
- PEM1Ch
- PEM1Ax
- PEM1F
- PEM1C
- PEM1A

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A
- PFO1C
- PSS2C
- PSS1Ch
- PFO1Ah

- PSS1/EM1C
- PFO1/EM1A
- PSS1A
- PSSAh
- PSS1Ah
- PFO1Ax
- PFO1Ch
- PSS1C
- PSS2A

LAKE

- L1UBHh

IPAC USER CONTACT INFORMATION

Agency:	Private Entity
Name:	Kenneth Erwin
Address:	1025 Vermont Ave. NW
Address Line 2:	Suite 500
City:	Washington
State:	DC
Zip:	20005
Email	kerwin@versar.com
Phone:	7036426915

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Air Force

This page intentionally left blank.

APPENDIX E
LIST OF PREPARERS AND CONTRIBUTORS

APPENDIX E
List of Preparers and Contributors

The following individuals assisted in the preparation of this Environmental Assessment:

Table E-1 List of Preparers and Contributors

Name	Education	EA Role	Years of Experience
Consultants – Versar Global Solutions			
Christopher Bowen	MA, Archaeology and Heritage	Cultural Resources	33
Craig Carver	Master of Urban and Regional Planning	Project Manager, Quality Control	15
Rahul Chettri	MS, Environmental Studies	Air Quality	42
Kenneth Erwin	MS, Natural Resources	Biological Resources, Quality Control	11
Benjamin Leatherland	MA, Geography/Environmental Planning	Biological Resources	29
Radhika Narayanan	MS, Environmental Science	Air Quality	29
Alex Noble	BS, Environmental Science; BA, Biological Sciences	Visual Resources	3
Angela Northrop	BS, Marketing	Technical Editing	27
Travis Smith	BA, Geography	GIS/Cartography	29
Christa Stumpf	MS, Forest Resources and Land Use Planning	Program Manager, Sr. Technical Review	30
Consultants – QRI			
Tim Hall	Ph.D., Science and Public Policy	Socioeconomics, Cumulative Projects	45
Fonda New	BS, Geology	Land Use	41
Consultants – KBRWyle			
Kevin Bradley	MS, Aerospace Engineering	Airspace, Noise, Safety	24

This page intentionally left blank.